Design Tools for Online Educational Games: Concept and Application

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Abstract. A research and development program initiated under the aegis of the Center for expertise and research of lifelong learning (SAVIE) has developed a series of generic educational game design shells to enable teachers, trainers and community service workers to create educational games that provide effective learning conditions and are adapted to their distance learning needs. These environments were based on the frame game concept and on the essential attributes of games. In this paper, we will first describe the context which deals with the development of generic shells for educational games. Then, we define the concept of educational games and present the indicators for choosing an educational game that is efficient. Then, we define the concepts of generic game shells and describe the interactive pedagogical design model. Finally, we show an example to illustrate how a generic shell such as that of the Parcheesi game can generate quality educational games adapted to the needs of learners studying in distant locations at various levels of schooling.

Keywords: Design, Game, Educational, Online.

1 Introduction

Digital games are seen more and more as effective learning resources (DeMaria, 2007; Gee, 2007; Moline, 2008). Their effectiveness is such that the Federation of American Scientists (FAS) supports the use of these educational games in teaching academic content, in improving critical thinking in students and also in evaluating their learning process (FAS, 2006).

Academic literature often discusses the creative potential of new technologies including educational games, in practice this promise has yet to be realized. What has been found, as it pertains to the learner, is that certain new aptitudes lay dormant when they are susceptible to being developed, such as: cooperation abilities, abilities for structuring knowledge and also problem solving abilities. It seems that schools do not explore the educational potential of these new techniques. In many countries including Canada, the educational potential of digital games have not become reality (Dempsey et al., 2002; J. Piette, personal communication, April 9, 2005; Prensky, 2006). A European Union inquiry into education and the media (Mediappro, 2006) found a major gap between Internet use at home and in the schools; all important learning tools were found outside the schools including those essential for self-directed learning and learning among peers – functions which online educational games can support.

In order to facilitate the use of online educational games in schools, we focused on developing and experimenting with learning environments that evolved from games. This is done in order to provide teachers with the ability to easily develop online educational games that are adapted to their pedagogical requirements.

In the first section we present the context which deals with the development of generic shells for educational games from the Educational Games Central– EGC (http://egc.savie.ca. In the second section, we define an educational game and the pedagogical needs of teachers who will use these games in their teaching environment. In the third section we describe the concept of generic educational game shells and their creation process. Furthermore, we briefly explain how the framework of the Parcheesi game was adapted to answer the needs of educators. Finally, in the fourth section we illustrate an example of an educational game that was developed with the generic game shell of Parcheesi.

2 Context

Currently, millions of students invest a phenomenal amount of time playing with computers, the internet and with games. These young people, strong on techno, are hooked on games of skill. An investigation in 20 American colleges and universities has shown that "all students play video games and study with the use of their computer and that 65% of the students describe themselves as regular or occasional digital game players (Jenkins, 2005). Other studies have shown that 80% of people 18 years old or younger and more than 70% of adults play video games (ESA, 2005).

In 2007, the video game sector represents a 25 billion Euro turnover (FUTURN, 2007). Forest (2006) estimates that the 2010 video game market will be $1.3 billion in Canada and $46.5 billion in the US. In Canada, 63% of 15-69-year-olds had a mobile phone in 2004 (Ericsson Canada Inc., 2004). In Quebec, the NetAdos poll (Lamy, 2004) found that 60.7% of Quebecois aged 12 – 17 years play online and that 26.5% of young adults (18-24 years) do so regularly. A more recent Quebec poll found that 68% of Quebecois use the Internet and 26% own a fixed or portable game console (Centre francophone d'informatisation des organisations [CEFRIO] and Léger Marketing, 2007). The success of video games now rivals television and the film industry since it has become the most desirable form of entertainment (Hutchison, 2007). Who are these students to whom we teach?

Online games offer to the digital generation (Digital Natives) the opportunity to make use of inductive reasoning, to increase their visual abilities and their capacity for cross-checking information sources (Van Eck, 2006). The game allows the player to resolve cognitive conflicts. "Playing a game demands a constant cycle of hypotheses, tests and revisions".

"The game generation" has developed a new cognitive style characterized by multitasked learning, a relatively short attention span during the learning process, and a way of learning which relies on exploration and discovery. Today's teenagers are "born" communicators, intuitive and visual. They have strong spatial and visual aptitudes which are due most assuredly to their practice of video games. They prefer to learn through experimentation rather than following a teacher; they pass easily from one subject matter to another and also from one activity to the next when the activity

does not offer great interest. They respond with promptness and demand a rapid answer in return. The use of video games has modified the way young people learn from a constructivist approach: the student first plays, then comprehends and finally generalizes to apply what has been learned to new situations. The young internet user wishes the following during the learning process: interactivity, interaction, active visualization, kinesthesis and immediacy.

What happens to the role of the teacher? The role for conveying information of the traditional teacher transforms itself little by little to the context of the digital generation: the student becomes active and participates in the construction of his knowledge base and the teacher collaborates to this learning process. It is more and more clear that the introduction of games into the learning environment of this new generation will favour learning and for some students it will help bring them back into the learning environment. Knowing this, how can teachers integrate digital games into their learning environment?

The task for every teacher is to put into place situations that are susceptible in favouring learning in the students. To carry out this task, the teacher must choose the most appropriate pedagogical formulas for the situation in order to reduce the obstacles for learning. We have noted that even though there are certain advantages for using video games, few teachers and trainers use them because of the lack of material appropriate for their teaching or training situation. To facilitate their use, a developmental research program, started in July 2000 and successively financed by Fran-communautés virtuelles (Industry Canada), Office of Learning Technologies (OLT), Inukshuk Wireless funds, The Initiative on the New Economy (SSHRC, Canada) and Standard Research Grants (SSHRC, Canada) have permitted the development and the experimentation of 6 educational generic game shells.

To create these generic shells for educational games, we first defined what we mean by a game, and then we centered on the demands of the teachers and then based ourselves on these demands to create generic shells for educational games from the EGC.

3 Defining and Designing Educational Games to Meet Pedagogical Needs

A game is a fictitious, whimsical or artificial situation in which players are put in a position of conflict. Sometimes players square off against one another and at other times they are on the same side and are pitted against other teams. Games are governed by rules which structure their actions in view of a learning objective or a purpose determined by the game such as to win or to take revenge (Sauvé, Renaud, Kaufman and Marquis, 2007).

In order to add an educational aspect, O'Neil (2004) summarized the demands of teachers in relation to digital devices and to the content offered by these devices:

- The device must be reliable, convenient and complete;
- The device must be flexible so that it can be easily used in different learning situations. This signifies, among other things, that the teachers can adapt these devices to the particularities of their students (knowledge, level of language, age);
- the device must be ready to go, friendly and easily accessible so the teachers can easily find all the necessary elements for a given context or situation;

- The content presented must be accurate and directly linked to the teaching programs.

Based on these requirements and the work of Sauvé & Hanca (2007), Table 1 proposes a series of indicators that the teachers can use when choosing a digital educational game.

Table 1. Some Indicators for choosing an Educational Game that is efficient with respect to its Structure

Game play aspect of the game
• Game board format in relation to the visualization • Presence and well placed display of the scores • Full time access to the game rules. • The presence of pawns or elements that permit active participation of the players.
Intuitive dimension of the interface
• Clarity of the directions. • Clarity of the rules. • Ease of navigation. • Ease of game execution.
Pedagogical legibility of the game content
• Vocabulary adapted for the target audience. • Size and color of the characters. • Display format for the pictures and video. • Quality of sound reception. • Display quality for the pictures and video. • Presence of feedback messages linked to navigation to permit players to visualize at any moment the results of their actions within the game.
Game Dynamics
• Various types of questions. • Chance and Misfortune cards. • Voting system. • Scoring system. • Diversified routes (optional). • Number of levels to reach the end of the game (optional). • Degree of interactivity (manipulation, rapidity of the actions) in relation of the targeted audience.

4   Developing Design Environments for Educational Games

In view of the difficulties encountered by teachers searching the Internet for pedagogical games adapted to their needs, six generic shells for online educational games were developed at the Center for expertise and research in lifelong learning (SAVIE).

We define a generic shell for educational games to be an online design environment that facilitates the creation of games for teachers or trainers by providing them with the necessary tools for: (1) setting the game parameters; (2) generating the rules governing the movement of the players; (3) creating pedagogical material; (4) defining the criteria dealing with the end of the game and determining the winner, and (5) elaborating the tools necessary for the revision and evaluation of the game. This is done so that the game is continually updated in order to ensure its impact on learning.

The concept of the generic shell is based on the frame game concept elaborated by Stolovitch and Thiagarajan (1980). A frame game is an already existing game, such as Snakes and Ladders, from which the contents are removed, leaving only its basic structure. Any game can be broken down into two main components:

- The structure determines the way in which you play: the rules, the steps for the course of the game, the movements of the players, the challenges the players must face and the strategies they must employ to win. The game's contents have been eliminated so that the underlying structure of the game can be exposed. This structure, once clearly defined and analyzed, becomes a "frame" or a generic game shell once it is programmed and placed online.
- The content refers to the information conveyed during the game: this content is usually found in the game cards or on the game board. In the case of a pedagogical game, it is also the objectives being pursued and the abilities that will be developed by practicing the game. When the game is elaborated, you only need to insert the new content accompanied by the predetermined objectives to generate a new educational game which is adapted for a particular target audience.

Every existing game is potentially a frame game. The game must be carefully analyzed to separate the structure from the contents. A good game can be recognized by the harmony between its structure and content. A frame game would be a good example of this, but what renders it particularly useful is that the contents can be switched to something else while remaining perfectly compatible with its structure. It is this fundamental characteristic, the interchangeability of the contents, which makes the frame game an interesting pedagogical tool.

In general, board games are easier to adapt into a game shell and this for several reasons: (1) they are generally known to the public at large (who has not played Snakes and Ladders, Tic-Tac-Toe or even Parcheesi!); (2) they offer simple structures with few rules which makes them easily adaptable and, more importantly, (3) they correspond to the notion of a game by distinguishing themselves from simulations since board games rely on an imaginary environment rather than a simulated one.

In order to create an online generic educational game shell, an interactive pedagogical design model has been developed by Sauvé (2002) and validated by Sauvé et al. (2002, 2004). It consists of five phases:

- Analysis: analysis of the target learner group(s) and the context in which learning will take place; specification of the shell's pedagogical and technological requirements; review of existing frame-games and selection of the structure of the game to be adapted; and identification of the shell's compositional elements, based on the structure and contents of the existing game.
- Design: identification of the structure and content elements of the game that need to be modified to create the shell; description of the elements of the shell

and its functions; and design of a visual model using screen images of the shell and its variants and scenarios.

- Technical development: drafting of technical specifications that take into account the principles of online construction; graphic and multimedia development of the shell; programming of different elements and their functions in the shell; and functional integration testing of the shell with the contents of an educational game.

- Formative evaluation of the generic game shell: specification of the formative evaluation criteria and process; development of evaluation instruments for the target population; target population trials; and making any necessary revisions.

- Summary evaluation of the games created using the generic game shell: development of an educational game using the shell; specification of the experimental framework; development of measurement instruments to be used by experts and the target population; validation of the game by experts, and revisions if necessary; game trial by the target population, and revision of the game and the shell if necessary.

Examine briefly the modifications made to the original version of Parcheesi (Fig .1) during the design phase.
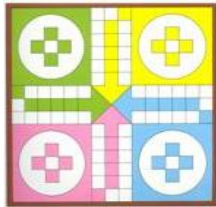
Purpose of the game: be the first player to arrive with all four pawns into the final zone.
Number of players: 2 to 4
Length of game: 30 to 45 minutes
Game play:
1. Four pawns are then automatically placed into each team's personal space.
2. To get to the starting square of your personal square, a player must roll a six.
   A player that rolls a 6 is rewarded by another roll of the die.
3. The pawn advances along the arm of the cross in a clockwise fashion (in a counter clockwise fashion for the Indian version). A pawn that stops on a square already occupied by a pawn from another player forces that player to remove his pawn and place it back in his personal space. The pawn that was removed can only be placed back in the game if the player rolls a six at his turn in the game.
4. A pawn can only enter the end zone of the game by an exact die result. For example, if a pawn is five squares away from the end zone and the player rolls a six, the player must wait for his next turn to try and roll a five. But since the player rolled a 6, the player can move any other pawn or he can also liberate one pawn from the personal space.
5. Different throws of the die can be made to move different pawns. A throw of the die cannot be split in two; for example, a result of 6 cannot be separated to move one pawn forward 4 squares and another pawn moved forward by 2 squares.
6. A pawn that enters the end zone is removed from the board. The first player to remove all his pawns wins the game.

Fig. 1. Original board game and rules of Parcheesi

Structure Adaptation

Concerning the structure of the game, the game board, in general, is rarely modified in a generic shell. In this case, we have taken into account the pedagogical demands and we have added a second route, which is much faster, to the initial route of the game board all while maintaining the number of spaces and the square shape of the board. The materials of the game, the number of pawns for each player or team (4) and the number of dice (2) are maintained.

Three types of game cards have been added (Learning cards, Team cards and Chance cards) and also the use of two dice instead of only one for the movement of the pawns. These additions required us to review the unfolding of the events that constitute the scenario of the game. Seven events have been inserted and this has led to modifications to the presentation of the game board and the original rules.

Mechanisms have also been put into place: (1) to ensure competition between players by integrating a system of points according to the level of difficulty of the learning activity; (2) to ensure cooperation by permitting teams to regroup and offering them Team cards to stimulate both cooperation and competition; (3) to be able to vary the number of players using the game by creating a fictitious player if one is playing alone, and (4) to motivate the players that answer correctly by allowing them access to a faster path to reach the center of the game board.

The rules which govern the movement of players in the game have been improved (Table 2). These rules are accessible Online to the players whether before or during the game. The procedure rules describe the components of the game: the number of participants (players) or the number of teams, the role of each participant, their activities, and the way they move and their possible movements, how the game starts, how the players proceed throughout the game, the scoring and the duration of the game. In our adaptation, we have added the following rules: 5 to 8, 10, 12 and 13 which deal with the actions of the players during learning activities and the movement of the pawns between the normal and rapid route.

The end rules explain how the game can be won and how the game ends. Generally, the end of the game determines a winner; however, there are certain games where there can be a draw. In Parcheesi, the end of the game happens when a player or team have completed the route. We have added a second way to end the game in order to respect the time constraints of a study period and this is shown by rules 2 and 14 of the adapted version. The rules of control describe the consequences for a player who executes an action which does not conform with the rules or a player who does not respect the directives and the preceding rules. In the shell of Parcheesi, we did not have any control rules link to the original structure but we have added movement constraints to the pawns, as shown in rules 5 to 7, when a team does not successfully pass a learning activity.

Table 2. Structure of the Generic Shell of Parcheesi

Goal of the game: there are two ways to win the game:
- Be the first player or team to move your four pawns into the end zone and also succeed in the final challenge.
- After a set time for the length of the game, be the player or team with the most points when the game ends.

Table 2. *(Continued)*

Number of players or teams: the minimum number of players is at least 2 players or two teams of two players and the maximum number of players is 4 or four teams of four players.

Length of the game: When players are creating their teams, they can decide in advance what the length of the game will be. They can also decide not to impose a time limit to the game and simply let the game go on until one team has moved their four pawns into the end zone and have completed the final challenge.

Game Play

1. The game must be played with a minimum of two players each forming a team or a maximum of 16 players divided into 4 teams. Any other combination is also possible.

2. Before starting the game, teams have to decide how the game is to be won:
- When all four pawns of a team have reached the end zone and correctly completed the educational activity.
- When the predetermined amount of time has elapsed.

3. To start a game, the system records the number of teams and their make-up. Four pawns are then automatically placed into each team's personal space.

4. Who begins the game is purely random. Each team clicks on the dice. Whichever team rolls the highest number begins the game.

5. A team must obtain a double (1-1, 2-2, 3-3-, 4-4, 5-5, 6-6) for the system to move a pawn to the Start square. The team then clicks on the coloured pawn they want to move to the Start square. When a pawn is placed on the Start square, the team in question must attempt to complete an educational activity which corresponds to the color of their pawn:
- If the team successfully completes the first activity, they can then roll the dice and move the pawn the appropriate number of squares along the fast track.
- If the team does not complete the first activity, the pawn remains on the Start square and the team waits their next turn to try again.
- If, on the next turn, a team completes the second activity, the pawn on the Start square is allowed to move along the regular track.
- If a team does not complete the second activity, the pawn remains on the Start square. The team must then wait another turn to try again until they do complete an activity.

6. As soon as a team has moved a pawn, turns will happen as follows:
- Players must complete an educational activity corresponding to the colour of the pawn which was moved during the last turn.
- If the team successfully answers the question in the time allotted, the team then clicks the dice and can move a pawn the number of squares corresponding to the result of the dice. A team can also decide to bring a pawn into the game if the result of the dice allows it. Two pawns from the same team cannot occupy the same square. This means that a team cannot bring new pawns into the game if there is already a pawn on the Start square.
- If a team fails an activity, they cannot click the dice. They will have to wait until the next turn to try to answer a question of the same category in order to be able to click the dice.
- Once a team has finished their turn, the next player or team plays.

Table 2. *(Continued)*

7.   When a team moves their pawn (either on the regular or the fast track) and crosses a Start square, the team must successfully complete an educational activity. This has to be done even if, given the results of the roll of the dice, the pawn crosses over the Start square. Successfully completing the educational activity is important since it determines which track the pawn will take, whether in finishing the move in progress or with regard to the next turn. If a team successfully completes an activity, the pawn may continue to move along the fast track. If the team fails, the pawn will move to the regular track. The same rule applies if the team lands on the Start square with an exact roll of the dice. When successful (in completing an activity), the team does not click on the dice but the pawn will go on the fast track at the next turn even if the team decides to move another pawn after having completed the activity. In other words, a pawn retains the ability to move along the fast track if the team has successfully completed an activity.

When a pawn crosses a Start square before embarking on a track that leads to the end zone, the team must yet again complete an educational activity. If the team does not succeed in this, the pawn remains where it is. The team must complete a new activity before being able to take the track that leads to the end zone. If a team completing an activity has a pawn that was interrupted in its movement because it crossed the Start square, the pawn can resume its movement along the track that leads to the end zone.

8.   Each team who successfully completes an activity earns points. The points vary according to the amount of time taken to complete the activity.

9.   If a pawn lands on a square already occupied by another pawn, the latter is sent back to the Start square. If the returning pawn lands on a Start square which is already occupied by another pawn, it is sent back to the team's personal space.

10.   Each pawn can only reach the end zone on the board with an exact throw of the dice. The result of the dice has to be the exact number of spaces needed to reach the end zone (the center counts as one space). When arriving in the end zone, the pawn is removed from the game and the team gets 200 points.

11.   When a team throw the dice and get a higher number than the number of spaces required for a pawn to reach the end zone, they have two options:

- The team can decide not to move the pawn until they obtain an exact result and, instead, move another pawn which can move according to the result obtained by the dice.
- They can move the pawn to the center square and move the pawn back corresponding to the roll of the dice. For example: say the pawn is two spaces away from the end zone and the team rolls a 5, the pawn moves forward 3 spaces and then moves back two.
- The pawn cannot move back further than the first space of the track. If the pawn reaches this first space and still has moves to make, the pawn simply returns in the direction of the end zone with its remaining moves.

12.   Once a team draws a Team card, all of the teams may compete simultaneously. The first team to successfully complete the activity earns additional points.

- If a pawn of the winning team is on the Start square, it immediately accesses the fast track.

Table 2. *(Continued)*

- The team that drew the Team card does not lose their turn. Immediately after having played the Team card, their team may attempt to complete another educational activity.

13.   When a team draws a Chance card, the team then performs one of the following actions:

- Win a Free Start. This card allows the team to move one of their pawns to the Start square, which requires that the team immediately attempts an educational activity. If the Start square is already occupied by one of the team's pawns or if all of the team's pawns are currently in play, the team may keep the Chance card and use it later on in the game to position one of its pawns on the Start square.

- Exact Throw. This card allows the team to move one of its pawns (any pawn which is currently in play and not on the Start square) into the end zone. If the team has only one pawn in play and that pawn is on the Start square, the Chance card is kept by the team to be used later on in the game to move one of their pawns directly into the end zone.

- Go back to Start. This card moves a team's pawn back to the Start square. If the square is already occupied by another pawn, the latter returns to the personal space of the pawn's team. If the team has only one pawn currently in play and that pawn is on the Start square, the card is kept by the team and the pawn will have to return to the Start square the next time it is moved. If the pawn associated with the card is removed from play before the card is played, the team puts the card back (it is discarded).

- Fast-tracking. This card allows a team to move the pawn used to pick the card from the regular track to the fast track without having to complete an educational activity, if the pawn is on the Start square or past it.

- A maximum of two Chance cards can be retained at any one time by a team. If a team has two Chance cards in reserve, any new Chance card will replace the first Chance card held.

14.   Game over:

- When a team moves all four pawns into the end zone, successfully completing an educational activity, it wins. If a team picks a Team card as the final educational activity, the team wins the game only if they complete the educational activity. If the team does not correctly answer the question, the team must wait till their next turn to try to successfully complete another educational activity and win the game.

- When the allotted time has run out, the team with the most points wins the game.

In traditional board games, there are no distinctions between the rules and the directives as in computer games. In a board game the players themselves move their own pawns on the board. In a computer game, a game engine moves the pawns, identifies which player will start the game and the player who follows, etc. These directives (Table 3), which we distinguish from the rules, only have as a goal to facilitate comprehension for the players on the constraints imposed by a game engine. For example, it indicates the name of the player that must click the dice or the player that must attempt a learning activity in order to obtain points, etc. No other player can act in the game until the identified player has finished their turn.

Table 3. Example of the directives

1. Please select a set of pawns for your team.

2. The game is initializing. Please wait untill all teams are ready to play before beginning the game.

3. To determine which team will start the game, each team must click on the dice one after the other. The team with the highest result begins the game.

4. The team **Player`s Name / Team** has obtained the highest result.

5. Player`s Name / Team , you have obtained a double! You can move your pawn to the Starting square.

6.The team **Player`s Name / Team** has successfully passed the Educational activity! The team Player`s Name / Team must click on the dice to move a pawn.

7. Player`s Name / Team , you have picked a Team card: all the teams are in play!

8. Player`s Name / Team , you have picked a Chance card!

9. Player`s Name / Team , click on the pawn you wish to move.

10. Player`s Name / Team , your four pawns have been removed from the game. You must successfully pass the final Educational activity on your next turn to win the game.

11. Player`s Name / Team , you have not successfully passed the final activity. Wait for the next turn to try again.

12. The game is now finished. **Player`s Name / Team** , you have won the game!

13. Player`s Name / Team , you have obtained a result that makes your pawn cross over the centre square. By clicking on it, the pawn will move to the centre then move back the number of moves in surplus.

14.Player`s Name / Team you have won a start! Place the pawn of your choice to the Starting square!

15.Player`s Name / Team , you have won a start but you cannot use this Chance card right now. The card will be placed in your bank to be used later on.

16. Player`s Name / Team , you have won an exact throw of the dice! Move one pawn that is not on your Starting square to the centre square!

Etc.

Content Adaptation

In general, the content of a game can be completely modified. First of all, we have added learning activities to the shell in order to respond to certain demands previously stated. The predetermined formats linked to thirteen types of learning activities have been included in the shell in order to develop simple to complex knowledge and to modify behaviors and attitudes: True or False questions, Yes or No questions, Multiple Choice questions (2, 3 or 4 choices), Missing Segment questions (2 or 3 segments), Logical Sequence questions, Open questions with short answers, Open questions with long answers, Role-playing type questions and Modeling type questions. All of the activities include a correction mechanism as well as a real time mechanism for feedback.

Other tools have also been integrated into the shell. Tools for the conception of pedagogical materials in the form of learning objects have been integrated. This material is available for players either before or after the game. The creator of the game

can activate a whiteboard for debriefing and also for feedback from the players. This debriefing is strongly recommended because it is an important step to the integration of the knowledge, emotions and attitudes developed by the game.

Technological options

Several technological options were also integrated in the Parcheesi game shell, such as:

- the option of playing the game on a single or on many computers in order to facilitate its integration in schools;
- an identification mechanism when the game is played on a single computer so that all the players who are playing the game can identify themselves with their password;
- a mechanism that allows for single players to play alone;
- a real time communication tool as well as a team display mode (up to 16 players) when the game is played in multi-player mode in order to favor audio exchanges between the players or the members of a same team that are playing at a distance;
- a real time communication tool as well as a display mode that varies according to the number of players (2 to 6) that allows exchanges (textual, audio or audiovisual) between the players.

In order to achieve a higher level of user-friendliness and usefulness, a first formative evaluation (phase 4) was carried out by nine teacher candidates. The participants considered the generic Parcheesi game shell to be user-friendly, useful and easy to master. They reported that the majority of its templates were easy to use and that their level of pedagogical readability was very high regarding the language quality, the structure of the contents and the ease of navigation. Few recommendations for improvement of this generic educational game shell were made by these teachers (Sauvé & Hanca, 2007).

5 Developing Your Own Educational Games

The adaptations brought to the original structure permits the integration of the learning content needed from elementary schools to universities The Parcheesi game shell works well with simple or complex learning: acquisition, integration, use of knowledge, transfer of learning, evaluation, etc. The game requires that you write down a minimum of 40 educational activities to challenge the players. The ideal number of activities ranges from 48 to 64. You wish for a team game where the level of difficulty is more elevated? If this is the case, choose this shell. This game plays with at least 2 players or 2 teams and with a maximum of 4 players or 4 teams. This game can also be played alone.

In this section, we illustrate how we used the Parcheesi game shell to create an online game offered in a program for asthma prevention, therapeutic monitoring and health promotion that aims to improve the well being and the quality of life of people suffering from asthma (http://asthme.savie.ca).

Fig. 2. Asthma: A question of Control! Adaptation of the Game of Parcheesi

Financed by the Inukshuk Wireless Fund, the game Asthma: A Question of Control! has the following objectives: to identify the elements that may trigger an asthma attack and the measures to prevent these attacks; to differentiate the different treatments for asthma; to identify the causes of asthma and finally to identify the ways to diagnose and monitor this condition.

Created in under 4 hours, the creators have created 85 learning activities with varying levels of difficulties. They have completely modified the game board (colors, illustrations and pawns) and also the wording of the rules. Fig.2 shows the four aspects dealt with in the game: (1) control and prevention, (2) triggering factors, (3) asthma treatment and (4) diagnosis and monitoring. Observe also that the screen is divided into two zones. The red zone, common to all users who participate in the game in real time, allows them to consult the rules of the educational game, answer questions or perform activities, display results (scores, successful or failed activities) and consult the help functions online. The green zone permits the coordinator and each player to talk to (voice) and see (video image) the other players of his team (private communication), talk to the players of the other teams (public communication) and write messages in a chat space (private or public).

6   Conclusion

The appearance of the information superhighway and the diversification of learning technologies have resulted in an increased interest in educational games within the

learning environment, whether initial or ongoing. According to Livingstone (2002) and Ridley (2004), games have become the principal form of entertainment for learners when compared to books or other types of media.

A systematic analysis of the literature over the last ten years (1998-2008) shows that games provide favorable conditions for learning, such as: competition and challenges, feedback, active participation on the part of the learner, teamwork, interaction, repetition and breaking the learning content down (Sauvé, Renaud, Kaufman & Sibomana, 2008). This analysis also emphasizes that games have a positive impact on cognitive, affective and psychomotor learning. The consensus of the authors is that games motivate the learners, structure and consolidate their knowledge, promote problem solving skills, changing of attitudes, as well as the development of transversal skills (communication, negotiation, decision making, cooperation, etc.).

The generic shell of the game Parcheesi proposes to the creators all the tools necessary to define the game parameters, generate the directions and the rules concerning the movement of players, constructing learning activities and the pedagogical materials, establish the criteria about how the game ends by declaring a winner and the elaboration of debriefing, evaluation instruments so that the game is always revised and also tools to measure its effectiveness on learning. This shell allows for the generation of team games supported by a multiplayer platform (ENJEUX, http://enjeux.savie.ca) and also provides real time communication tools (audio or videoconference) according to the equipment that the players possess (headphones or webcam) at the moment they access the game.

This pioneering work in the development of generic shells for educational games on the Internet, with its varied environments (Snakes and Ladders, Concentration or Memory, Tic-Tac-Toe, Trivia, Mother Goose or Parcheesi), provides an opportunity for teachers, trainers, pedagogical counselors and education specialists to quickly develop educational games. These games can be created in four languages (French, English, Spanish and Greek) and made available to teachers and students all over the world. To know more and to become part of these game creators, register at the Educational Games Central at the following Internet address: http://egc.savie.ca.

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