Framework for Mapping Learner and Gamer

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Abstract – **How to make education more effective while increasing the learner's are very important issues. Using educational games or so-called game elements in learning is one possible approach to achieving that goal. The main idea of the paper is to put on a convergence between learning and gaming styles including various types of user characters. In order to achieve that goal, we propose the framework which the learner and gaming style was included into a new learmer (learner and gamer) model. That helps in answering question how to choose appropriate games and how to apply them to achieve the learning objectives best suited to the learner as a gamer.**

Keywords – **learner style, gamer style, learner, learning games, e-learning**

I. INTRODUCTION

How to make education more effective while increasing the learner's are very important issues. Using educational games or so-called game elements in learning is one possible approach to achieving that goal. An educational game can be defined as an instructional method that can provide students with real-time response, thus enabling them to gauge how well they retain the main concepts presented in the instruction session [1]. Then it is necessary to create the framework for evaluation of the game and game elements and how to use them in e-learning.

Business games are already well proven mean for effective learning the entire life cycle of products and processes for all stakeholders involved into business. Games similar to the PRIME game typically should model complex sets of real-life industrial processes and enable the creation and evaluation of specific Virtual Business Environments [2]. Thus, such games can help for example gaining practical experience in strategic manufacturing through intensive and fascinating gaming and e-learning.

Caillois defines four different types of games: those that involve competition; those that involve chance; those that involve simulation; and those that involve what he terms vertigo, such as fairground rides [3].

This paper discusses the main problem of how to choose appropriate games and how to apply them to achieve the learning objectives best suited to the learner as a gamer.

In the next section of this paper a methodology of research is presented which we will follow in modeling games and gaming styles. The third section gives definition of gaming

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styles which will be used in further research. The next forth section of the paper we propose the framework which map the gamer and learning style in a new learmer model. The last section makes out conclusions and outlines future work, as this paper is only a starting point for further research into building a software framework for successfully incorporating games and game elements into e-learning programs that can adapt to the learner according to his or her needs.

II. METHODOLOGY

The methodology followed in this paper is depicted in Fig. 1 below.

This paper's research falls into follow blocks above: "3. Research model", "4. User model" and partially into block "5a. Select game(s)".

In order to build content for the user as both a learner and gamer in the data represented by extensible modelling language (XML) or other technical format of choice which will be made in later stage, we first need to build a user model in a modelling language.

All research stages, most of which are out-of-the-scope of current paper, nevertheless important to oversee the whole picture are: first - (1) *review of games and game elements*, next (2) *review of learning styles*, then combining (1) and (2) we received (3) *research model* which leads to (4) *user model*. As (4) outcome from one hand is (5a) *select game(s)* and (5b) *evaluate* those *selected games*, from the other hand (4) user model and (5a) selected games(s) makes interface to external system (in our case adaptive e-learning system) - shown on top of the figure. And last, but not least building block is (5c) which is *refining of game(s) or models* and returning feedback on (3) research model, in order to improve it.
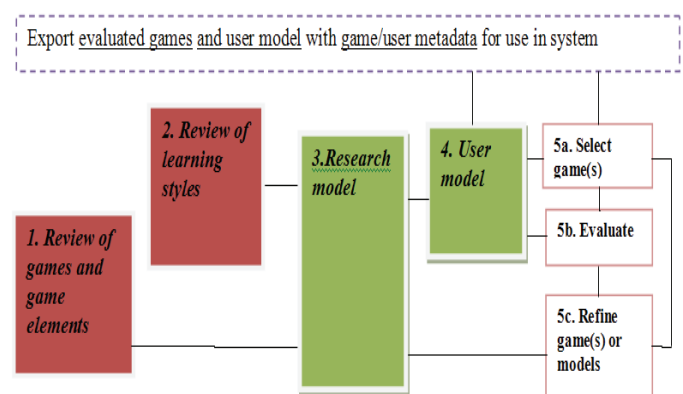

Fig. 1. Dependencies between learning style, resources and methods with gaming styles and game goals

In the next third section we start with a conceptual model of games and game elements and gaming style related to e-learning, which is referenced above as research model.

III. GAMING STYLE

According the above review we can summarize the following gaming styles:

A. *Logician*

Logician gaming styles are those in which gamer likes logic challenges and used spatial awareness, verbal skills, numeracy skills and spelling.

B. *Competitor/Shooter*

Competitor and shooter gaming styles we combine in order to characterize gamers that –enjoys action and shooting and focussed on the competition itself. That gaming styles uses not only shooting but also various instruments in a sports game.

C. *Strategist*

Strategist – is attracted by resolving complex problems within a game.

D. *Dreamer*

Dreamer gaming style is dedicated to a person who likes playing roles and thrives in the fantasy world of avatars.

E. *Other - gaming styles and learning goals.*

As many gaming can be defined according to different criteria, keeping styles is limited to mentioned four styles in order to keep research feasible.

Gaming style, learning activity and possible games are given below according to style and activities as outlined in Table 1.

TABLE I

GAMER STYLE, LEARNING ACTIVITY AND POSSIBLE GAME TYPES

Gamer style	Learning activity	Possible games
Logician	logic, spatial awareness, verbal skills, numeracy skills, and spelling	puzzle quiz
Dreamer	problem-solving and lateral thinking, collaborative skills, social interaction, negotiation, management of complex systems, strategy and working through scenarios	role-playing games adventure games
Competitor	hand–eye coordination, planning and strategizing, problem-solving, teamwork and the ability to think quickly	sports platform shooter
Strategist	Strategy games can be used to teach planning, decision-making, testing hypotheses, strategic thinking, and management skills and seeing the consequences of actions taken.	strategy games

For mapping learner style - there are used four learning styles, proposed by Honey and Mumford - activist, theorist, reflector and pragmatist [4].

Classification of gamers' style which we relate to learning activities in the table below leads to following important according to our research remarks:

1. Learning style, which characterizes the *activist learner* can be mapped and used with *competitor or shooter* style of gamer. Typical for gamers with that style are open minded for new ideas and tend to experiment. They also like teamwork and prefer to be active.

2. On the opposite of activist is *theorist learning* style. That learning style can be mapped in higher degree to *logician style* of gamer. In that case is valid logical thinking and step-by-step solution of the problems.

3. Third learning style is known as *reflector learning* style. That style can be mapped to gamers' style named *dreamer* in the classification above. Usually that style of gamer prefers to stay aside and to analyse problem from different birth-eye views.

4. Last learning style we used is *pragmatist learning* style. That style can be mapped to strategy games and corresponding gamers' style of *strategist*. Pragmatists tend to describe and conceptualize the things which can be applied to their work.

Examples of research on different games and games elements are many in the literature - for example one research is done in [5], where are outlined three possible games - HangMan, Crosswords and Sudoku, which can be classified to first gaming style - logician. Deep investigation of classification of different appropriate games to learning and gaming styles as map proposed above is out of the scope of the paper.

Beside that there are needed strong indicators in order to classify different games as appropriate for one or another learning or gaming style. To facilitate that need in the next section of the paper we proposed framework for games and game elements components, as needed in e-learning systems and particularly in adaptive e-learning systems - which are target of our research.

IV. CONCEPTUAL FRAMEWORK FOR GAMES AND GAME ELEMENTS COMPONENTS IN E-LEARNING

Fig. 2 outlines the dependencies and relationships between different key concepts (represented in the figure as blocks). The figure is divided into three horizontal layers and one upper right building block (game indicators).
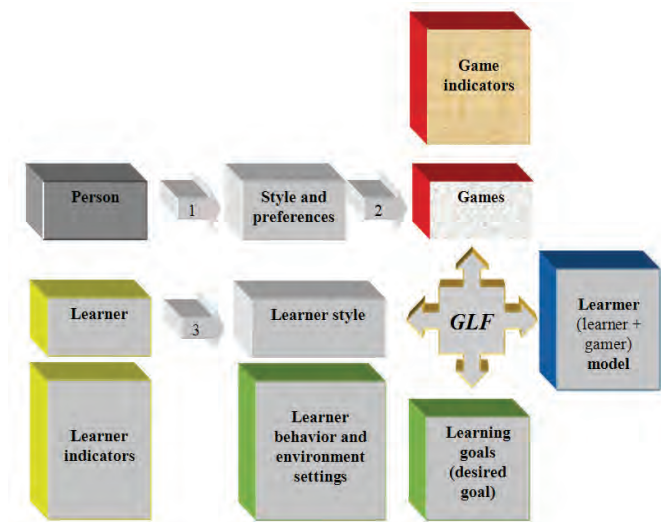

Fig. 2. System used to evaluate the relationship between learner and gamer to learning goals

In the *first horizontal layer* a person (or gamer) as an actor is represented, with its own personal style and preferences (represented as second building block), and the last block is selecting games without any care or knowledge of what exactly this game will teach him or her. This kind of learning without intention is known as informal learning [6].

Each game has its own characteristics, referred to in the figure as indicators. Some of these indicators are related to what the person learns, while others are not directly related to learning. We call useful indicators from the learning perspective *game learning indicators* (GLI).

The union between "pure" entertainment indicators and educational (game) learning indicators makes up general game indicators. In our framework we must track both types of indicators, as the entertainment indicators are very important and will retain attention of the learner.

The *second horizontal layer* represents the person as a learner. Any learner has his or her own learning style or blend of styles. Learning styles are outside the goals of this paper.

Learner model stores information about the final user, receiver of the e-learning content, such as personal data, preferences, goals, level of knowledge, performance shown during assessment, etc.

Nonetheless, learning styles are certainly an important aspect of this research. One of the most popular learning style classifications includes four styles: activist, reflector, theorist and pragmatist (as mentioned above). Other learning styles are reviewed in more detail in [7].

The *third horizontal level* represents different characteristics related to the learner: learning indicators represent learning style, while learning behaviour and environmental settings represent the influence of the existing environment on one's learning style.

Last, there are three very important concepts in this current research: mapping function and the relation between learning goals (selected before starting the learning process), learning style (which already incorporates environmental settings and behaviour) and goals achieved (on the figure this is the block on the far right) and games selected (achieving both formal and informal learning), which incorporates game learning indicators. The mapping function which is defined above is called the *game learning function* (GLF). Investigation of the GLF is beyond scope of this paper.

V. CONCLUSIONS

The primary goal of this paper is to classify games and related game learning indicators as a first step in modelling and developing a software framework that evaluates games according to their ability to support and enable learning.

The second goal of this paper is to classify games according to the classification system described in relevant literature. That will be of use in further research into building and investigating the GLF and to help classify gamer characteristics according to game indicators and personal style and preferences.

The learner and gaming style was be included into a new learner (learner and gamer) model, which will be used for managing adaptation within the adaptation model. Thus, the development of modern learning systems that are adaptable to one's own learning characteristics is often oriented toward the integration of game elements and their application in ways that take into account the learner's unique learning style [8].

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