Playability of Serious Games in Information Literacy: The Findings of the European Project NAVIGATE

Marina Encheva,

University of Library Studies and Information Technologies, Sofia, Bulgaria, m.encheva@unibit.bg

Nicole Krüger

ZHAW - Zurich University of Applied Sciences, University Library, Winterthur, Switzerland

Plamena Zlatkova,

University of Library Studies and Information Technologies, Sofia, Bulgaria

Abstract:

The article deals with the playability of serious games in information literacy applied by academic libraries and university departments in Library and Information Sciences in the training sessions with students. Is it possible these games to be more playful and what is path we must follow to achieve this goal? In the literature review on the concepts of playfulness / gamefulness we are focusing on two opposite sides of a spectrum presented by Roger Caillois: Paidia (or playing; for pure joy, without any goals) and Ludus (or gaming; based on rules and competition). The author's view is that the games can be at either end or somewhere in the middle (Caillois, 2001). We have a hypothesis that the serious games in information literacy can never be only playful but if they contain a higher level of playability it will be easier for the students to achieve the learning objectives set by the university teachers and librarians. In the framework of the European project NAVIGATE – Information Literacy: A Game-based Learning Approach for Avoiding Fake Content (https://navigateproject.eu) 70 games used for teaching information literacy in academic libraries and programs were identified and evaluated. We have selected among them 20 best examples of such games and ranked them according to the following criteria: Playability, Lastability, Engagement, User Interface, and Storytelling. An interactive database (https://www.navigateproject.eu/navigamesearch-tool/) was created in order to visualize the list and the categories (the NaviGAMESearcher). Taking into account the results of the evaluation of the top information literacy games and the two original digital games developed within the project (Information Trap Manager and the Navigator) we analyzed where are these games located on the scale of playfulness versus gamefulness and what is the correlation between the level of playability of these games and the students' achievements. The further steps for evaluation of information literacy games according to the Playful Experiences (PLEX) framework were also defined in the article.

Keywords: NAVIGATE project, higher education, information literacy games, playability, gamefulness, PLEX framework

1. Introduction

When we create serious games in information literacy, we are usually professionals in library and information sciences and no professional game designers. So, for the success of our serious games, and for being able to evaluate existing games for our students, we need a deeper understanding of "serious games", of "games" in general, and of evaluation criteria for (serious) games.

1.1. Defining "serious games" and "games"

Michael and Chen (2006) define serious games as "(…) games that do not have entertainment, enjoyment, or fun as their primary purpose". For Djaouti, Alvarez, and Jessel (2011) on the other hand serious games are: "(…) any piece of software that merges a non-entertaining purpose (serious) with a video game structure (game)".[1] These two definitions differ in one central aspect. While Michael and Chen (2006) define serious games as "games", Djaouti, Alvarez, and Jessel (2011) define them as software, that meets certain criteria. In their eyes, when we design serious games, we create mergers – we combine the aspect of education, of business, marketing, work, etc., with the aspect of playing and games.
But what are games? And is it true that we cannot count serious games under their definition, as Djaouti, Alvarez, and Jessel (2011) suggest?

In 1938 Huizinga published his famous classical work "Homo ludens" in which he defines six characteristics for games (Huizinga 2004):

1. Play is free action: It can only be voluntary, not forced. The player can stop the game at any point s/he wishes.
2. Play is not the ordinary or the real life: It stands outside the process of immediate satisfaction of necessities and desires; indeed, it interrupts this process.
3. A game has boundaries and limits (in space and time).
4. A game can be repeated.
5. Play binds and releases: it captivates, spellbinds, enchants, has suspense and release.
6. A game has rules: Regarding the rules there is no skepticism possible.[2]

Regarding the first two criteria of Huizinga it can be doubted that serious games can meet the definition of games in general. Serious games are often required as homework or played in a class context, they are not entirely free action that stands outside the process of immediate necessities or desires. Playing them is usually driven by the wish to learn something, to acquire new knowledge. Thus, in this article, serious games shall be defined as: "Resources and materials that merge a non-entertaining purpose (serious) with elements of entertainment, enjoyment, or fun (game)".

1.2. Paidia and Ludus as two aspects of playing and games

In English the term "playing" has a very wide range of meanings: We can play the guitar, play a character in a movie or the theater,[3] we can play football, in the lottery, play cards, video games, dolls or characters from Disney or Marvel.[4] Amazingly all this can fit under the umbrella of Huizinga's six characteristics of games. Still, already Huizinga (2004) describes the distinction of paidia (παιδιά) und agon (ἀγών) in Ancient Greek; the distinction of children plays, fun and games (paidia) and competitive games (agon), like sports, public contests, and the Olympic games.
Caillois and Barash (2001) take up this idea of differentiating between different kinds of games in 1958 – and defines four categories of games: agon (competition), alea (chance), mimicry (simulation), and ilinx (vertigo) presented in (Figure 1). In each category there is a spectrum from wild and turbulent "paidia" ("spontaneous manifestations of the play instinct" (Caillois & Barash, 2001)), and rulebound

[1] The authors do not agree that serious games can only take place in a virtual setting (see definition below).
[2] Translated from the German version, Huizinga (2004).
[3] When we play in these two categories, this cannot be called a "game", however.
[4] The term is so broad that Wittgenstein uses the word "game" to demonstrate his theory of "family resemblance" in language. For him, the word "game" is a loose connection between different terms, that cannot be brought to a common denominator (Wittgenstein 1972, 66). This way of understanding the term would probably also allow "serious games" to be considered as games:
"Consider for example the proceedings that we call 'games'. I mean board-games, card-games, ball-games, Olympic games, and so on. What is common to them all? — Don't say: 'There must be something common, or they would not be called games '—but look and see whether there is anything common to all.—(…). And the result of this examination is: we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail. (Wittgenstein 1972, 66)

"ludus"[5] (Caillois & Barash, 2001). Caillois & Barash (2001) display his matrix of game types in a table with examples.

Figure 1. Matrix of game categories and the spectrum of paidia and ludus by Caillois & Barash (2001).

	Agon (competition)	Alea (chance)	Mimicry (simulation)	Ilinx (vertigo)
Paidia (Tumult, agitation, immoderate laughter)	Racing, Wrestling (without rules)	Counting out rhymes, heads or tails	Children's imitation games, masks, disguises	Whirling, swinging, waltzing
Ludus (Rules, acquisition of skills)	Billiards, Fencing, chess, contests, sports in general	Betting, Roulette	Theatre, spectacles	Skiing, tightrope walking

After our first hypothesis, serious games tend to stand rather at the ludus-end of the scale between paidia and ludus. In our words, they seem to be rather gameful than playful. Eppman, Bekk, and Klein (2018) name "challenges" and a "quantified outcome" as common elements of serious games. Often the challenge is connected to a story – which might be an element of imagination, and thus "paidia", but this imagination is directed towards a goal, towards a quantifiable outcome, e.g. the acquisition of points, badges, or the competition against other players. The imagination of a story in serious games often takes you along a rather well-defined pathway and might not allow many options or space for creativity. Game elements for pure entertainment, fun or laughter, the spontaneous, creative, or tumulus elements of paidia, seem to rarely play a role in serious games.

After our second hypothesis, serious games in education, e.g. in information literacy, can never only consist of game elements of the paidia-side of the scale, they need to contain ludus elements to fulfil their educational purpose. But nonetheless we assume that integrating paidia elements into serious games of information literacy would enhance the game experience for the players; namely enjoyment and fun, absorption, creative thinking, activation, absence of negative affect, and dominance, evaluation criteria for gameful experiences defined by Eppmann, Bekk, and Klein (2018).

As serious games are mergers of a serious purpose and game elements, and not a hundred percent games, that are played voluntarily, the element of fun, of binding release as Huizinga (2004) describes it, must be very strong to create an intrinsic motivation in the student.

In 2010 Lucero and Arrasvuori introduce the playful experience (PLEX) framework with 22 PLEX cards (n.d.). The authors do this with a background in user experience design (UX) and not directly or only connected to gamification or games. With designing the PLEX framework they assume that "[i]n addition to functionality and usability, interactive products are increasingly expected to provide pleasurable experiences to their users" (Lucero & Arrasvuori 2010). Interestingly, they stress the aspect nongoal-orientedness, when they state that "[b]y playful experiences we mean experiences that are mostly nongoal-oriented and mainly evoked by fun or pleasurable aspects of using a product" (Arrasvuori et al. 2012).[6] Lucero and Arrasvuori (2010) do not limit their categories to playful experiences but also regard the gameful categories (ludus elements) but nevertheless their categories contain many elements that Caillois & Barash (2001) describe in connection with "paidia" (Table 1).

[5] Caillois (2001) takes this term from the Latin language – although in Latin there are no different terms for different types of games or play. In Latin "ludus" means "game, play, sport, pastime, entertainment, fun" but also "school, elementary school" (Olivetti, n.d.).

[6] At the time of the publication the authors were located at the Nokia Research Centre and were probably researching in the context of UX with smartphones or mobile phones. The aspect of nongoal-orientedness might therefore be even more relevant or more applicable than in serious games.

Table 1. PLEX framework consisting of 22 categories and examples by Caillois & Barash (2001) for paidia games.

PLEX: Experience	PLEX: Description	Examples
Captivation	Forgetting one's surroundings	One of six characteristics of games by Huizinga (2004).
Challenge	Testing abilities in a demanding task	
Competition	Contest with oneself or an opponent	
Completion	Finishing a major task, closure	
Control	Dominating, commanding, regulating	Autonomy in the game (Eppmann, Bekk, & Klein, 2018)
Cruelty	Causing mental or physical pain	Drop any accessible object, holding up a queue, deliberately destroying the creations of others (Caillois & Barash 2001)
Discovery	Finding something new or unknown	
Eroticism	A sexually arousing experience	
Exploration	Investigating an object or situation	
Expression	Manifesting oneself creatively	
Fantasy	An imagined experience	
Fellowship	Friendship, communality or intimacy	
Humor	Fun, joy, amusement, jokes, gags	Immoderate laughter (Caillois & Barash 2001)
Nurture	Taking care of oneself or others	
Relaxation	Relief from bodily or mental work	
Sensation	Excitement by stimulating senses	Whirling, Swinging (Caillois & Barash 2001)
Simulation	An imitation of everyday life	
Submission	Being part of a larger structure	
Subversion	Breaking social rules and norms	Sticking out the tongue, grimacing, seemingly touching or throwing a forbidden object
Suffering	Experience of loss, frustration, anger	Contest of looking into the sun, standing on one leg,
Sympathy	Sharing emotional feelings	
Thrill	Excitement derived from risk, danger	Seeking anxiety, which one can stop at will

2. Methodology

In the current research we step on the findings of NAVIGATE – Information Literacy: A Game-based Learning Approach for Avoiding Fake Content, a project funded by the Erasmus+ program under Key Activity 2 - Strategic partnership supporting innovation. NAVIGATE (https://navigateproject.eu) aims at enhancing students learning using serious games that can support the improvement of Information Literacy competencies. The project is focused on Higher Education students in Humanities and Social Sciences as major target. In the framework of NAVIGATE 70 games used for teaching information literacy in academic libraries and programs were identified and evaluated (Menon et. al., 2018). The final result of the project was the development of two original serious games in the field of information literacy – a topic included in a complex of many disciplines in the university curricula of humanities students in Bulgaria, Italy and Sweden. For example, in libraries it is common to understand the concept of "information literacy" as including skills for working with a catalogue (searching and finding information), using the capabilities of the catalogue (advanced and specialized search), which can be related to the skills for selection and analysis / filtering of the sources. However, the broad understanding of the term also includes the evaluation of information (reliable or not, of good or poor quality, etc.), its synthesis, the creation of new original content, the application of ethical standards for the use of information, etc.

Expert Heuristic evaluation is the preferred method for evaluating games, however it does not consider enough user evaluation. Guo&Goh (2016) and Sweetser&Wyne (2005) have tried to put together Expert Heuristic evaluation with GamesFlow evaluation done by learners in the process of gaming.
Guo & Goh (2016) adopted the heuristic evaluation method adding end-users to evaluate an information literacy game for tertiary students according to the Heuristic Evaluation of Playability framework. Expert-based heuristic evaluation uses simple questions to examine different aspects of the software and find usability problems that may have deleterious effects on the users' interaction with the software (Carmody, 2012). However, expert-based heuristic evaluations cannot provide attitudinal or behavioral data from actual users (Köffel & Haller, 2008). Building on prior studies, Desurvire, Caplan, and Toth (2004) created a set of heuristics called Heuristic Evaluation of Playability (HEP). The 43 heuristics in HEP were organized into four categories: game play (16), game story (8), mechanics (7), and usability (12).
Sweetser & Wyeth (2005) evidence that are many heuristics in the literature, based on elements such as the game interface, mechanics, gameplay, and narrative. However, there is a need to integrate these heuristics into a validated model that can be used to design, evaluate, and understand enjoyment in games. They have drawn together the various heuristics into a concise model of enjoyment in games that is structured by flow. Flow is an experience "so gratifying that people are willing to do it for its own sake, with little concern for what they will get out of it, even when it is difficult or dangerous" (Csikszentmihalyi, 1990).

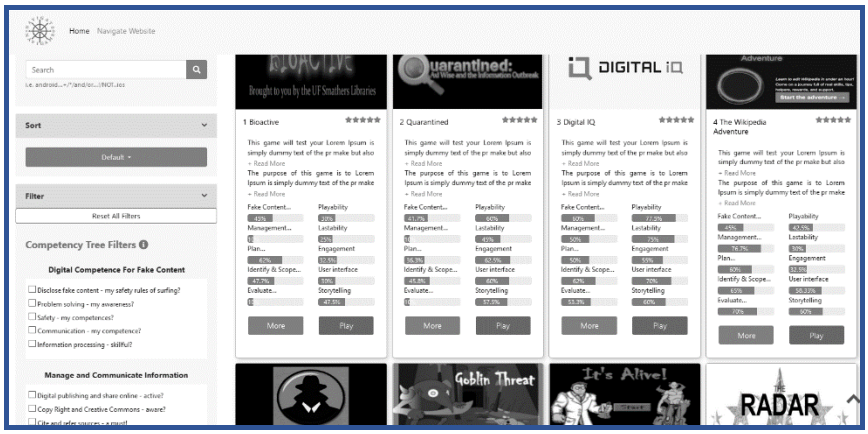
Flow experiences consist of eight elements, as follows:
1. a task that can be completed;
2. the ability to concentrate on the task;
3. that concentration is possible because the task has clear goals;
4. that concentration is possible because the task provides immediate feedback;
5. the ability to exercise a sense of control over actions;
6. a deep but effortless involvement that removes awareness of the frustrations of everyday life;
7. concern for self disappears, but sense of self emerges stronger afterwards; and
8. the sense of the duration of time is altered.

Evaluating two real-time strategies (RTS) games, one high-rating and one low-rating, with the GameFlow criteria provided insight into how the criteria manifest in RTS games, what makes RTS games enjoyable and the relative importance of each GameFlow element.
The combination of these elements causes a sense of deep enjoyment so rewarding that people feel that expending a great deal of energy is worthwhile simply to be able to feel it (Csikszentmihalyi, 1990).
As a phase preceding the development of our own conceptual and real model for information literacy games, we conducted a study aimed at determining the key to the success of the serious games, what do the successful games offer according to the opinions of the experts and what must be taken into account in the design of game-based learning.
To achieve this goal, we started to look for information literacy games that are applied in universities and/or libraries around the world, without striving to be completely exhaustive. First, we compiled a list that originally included 70 games. As a next step, we formed a team of experts in e-learning and game-based learning, information literacy experts and librarians, and shared with them the table with the selected information literacy serious games The playfulness/gamefulness of the games had to be evaluated according to the following criteria: Playability, Lastability, Engagement, User Interface, and Storytelling. These criteria can be defined as very important in terms of the quality of the games. A scale from 1 to 10 points was used in the evaluation process.

3. Results

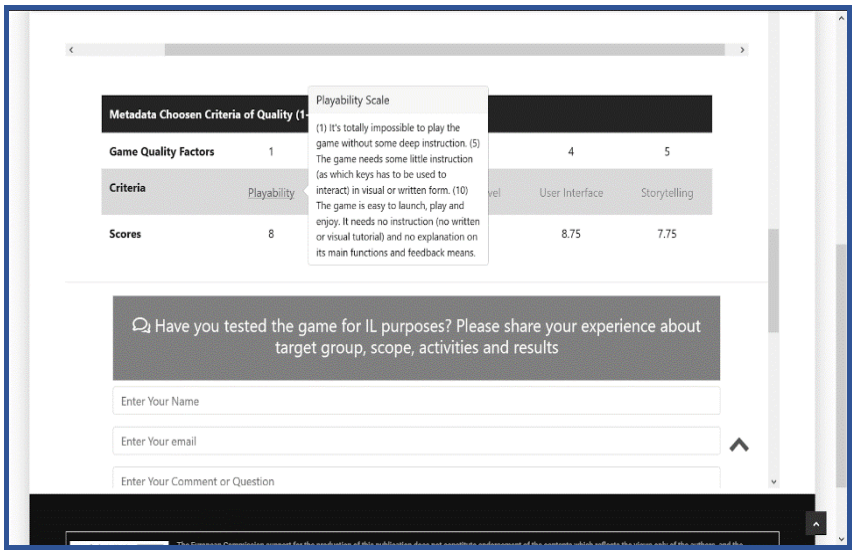
The final list, containing the 20 best games in information literacy, served as a basis for the development of an interactive database in the framework of NAVIGATE project - NaviGameSearcher (https://www.navigateproject.eu/navigamesearch-tool/). In the NaviGameSearcher (Figure 2), games are presented through summary cards showing what their purposes are. As illustrated in the figure, the filters on the left side of the page are particularly important, as they help users to select games based both on educational purposes and on different features related to their playfulness.

Figure 2. Home page of the NaviGameSearcher



When the user finds a game that meets their needs, the detailed information about the game can be accessed by clicking “more”. Scrolling down, the librarian or educator finds the results of the peer review. The results of the peer review focusing on the different aspects of playfulness are illustrated in Figure 3. This data could help him/her to have a better understanding of some features of the game. For example, “How long does it take to play this game?”, “Is it articulated with the learning goal?”, etc.

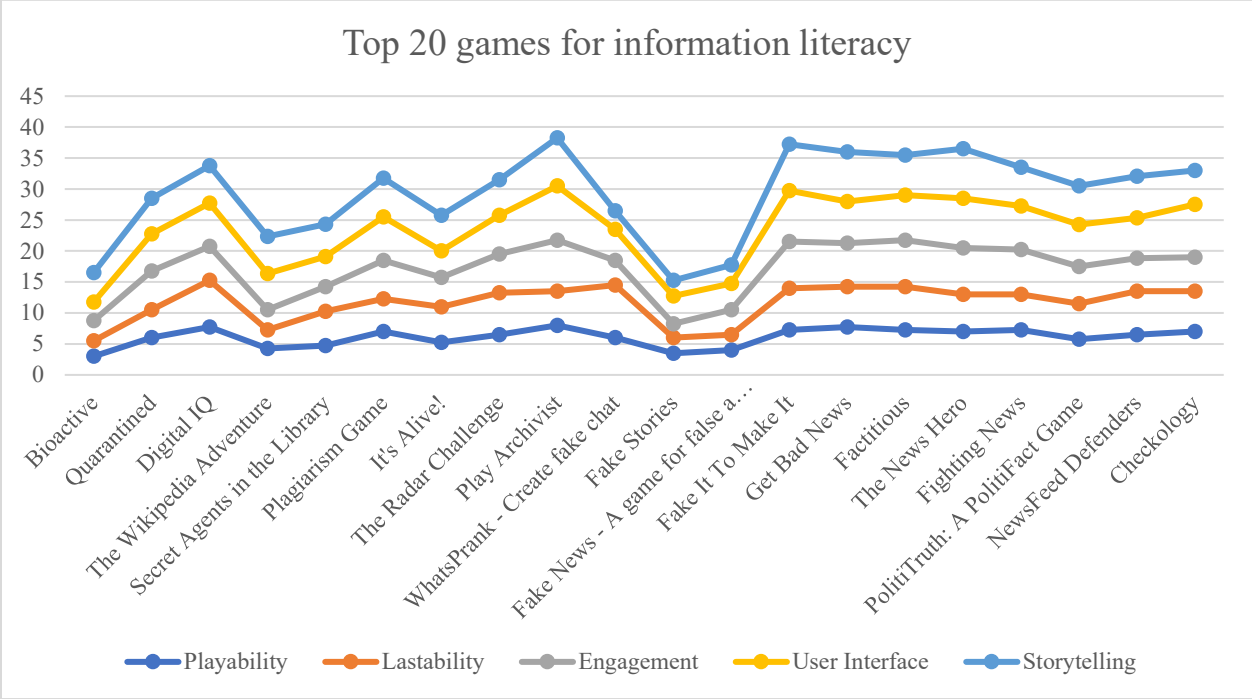
Figure 3. Evaluation of the playfulness of a game included in the NaviGameSearcher.



The peer review doesn't stop here. If a librarian or a teacher chooses one of these games, they can come back to the NaviGameSearcher to report their experience of the application of the game in an educational setting. The feature is especially useful to new librarians and teachers that will test the interactive tool.

The evaluation of information literacy games by the expert team with regard to criteria as Playability, Lastability, Engagement, User Interface, and Storytelling is presented in Figure 4.

Figure 4. Evaluation of the playfulness of information literacy games.



The figure shows that the information literacy games created so far, as a total score of all five criteria (Playability, Lastability, Engagement, User Interface, Storytelling), range between a score of 3 to 7.5 points, i.e. it is difficult to meet at a satisfactory level the users' requirements for all of them. Two of the evaluation criteria adopted by NAVIGATE - Lastability and Storytelling, are most often evaluated unsatisfactorily or on average. For example, one of the highest rated games is Play Archivist. It was developed by Promemoria Group and is relatively new, from 2018. However, it is low rated by the Lastability criterion. The opinions of the specialists stand out: "The game is either perceived as endless or ends up in such a short time that it is tasteless or useless". According to another opinion, "The game is engaging but too long or end up too quickly". As for Storytelling, although it receives a high rating, there are opinions that say that it is necessary to think about this element of the design: "The game storytelling side is totally weak and the metaphor used is weak, useless and not clear".

In understanding the concepts of playfulness / gamefulness, according to Roger Caillois, it is necessary to have an element of competition. The rivalry between the participants/players for achieving better educational results, as well as the economic sphere, can be used to achieve higher added value, more innovations in training, better quality of the provided service. In this regard, the NAVIGATE team found that only a few of the information literacy games included in the analysis have a multiplayer version.

Taking into account the results of the analysis of different information literacy games, we developed two original information literacy games in the framework of the project. The first game, Information Trap Manager is an adventure and strategy game simulating a university campus. It has interface in four languages (Bulgarian, Italian, Swedish and English) and provides middle and advanced Information Literacy competences for undergraduate students. Learning in the game is attained through students' dormitory, student's caffe, students' club, library, examination centre, classrooms and knowledge centre. Players have to roll the dice and keep moving around the campus board in order to explore the eight learning outcomes and to face series of challenges related to Information Literacy. The second game, the Navigator is a storytelling based mini-game simulating the social texting apps with interface in Bulgarian, Italian, Swedish and English. It aims to raise the awareness of higher education students in humanities about the risks related to the quality of information sources. The CRAAP (Currency, Relevance, Authority, Accuracy, Purpose) test model is embedded in the game. The game starts with a breaking news followed by a chat-based dialogue with an AI-based robot assistant. The timing in the both games allows an easier use for trainers from an organizational point of view.

Both products were presented and tested by humanities students, teachers and librarians from the partner universities in Bulgaria, Italy and Sweden. Opinions, as they are not rated on a scale, are summarized as positive and negative in the Tables 2 and 3.

Table 2. Students' opinions on the both NAVIGATE games.

Students Positive Opinions Information Trap Manager	Playability	Lastability	Engagement	User Interface	Storytelling
	It's very good / good	I find the game's navigation system is easy to use	The different encounters with the various characters make the game exciting	User interface is friendly and adoptive for the game	The storytelling is quite good
	Playability is good and we enjoy playing this game		Enough, could be better	User interface is ok	The game's script is exciting
	It is easy and useful to play				
Students Negative Opinions Information Trap Manager	Playability	Lastability	Engagement	User Interface	Storytelling
	It should be more emotional and more immersive	The time is not enough	It's not really engaging	The instruction count be better	Storytelling not so clear
	The game is difficult for an average student and user	The player feels nervous. Premise to develop aggression	Engagement interactions: when we play we are not sure if we can talk with the others who are playing in game. There is no much information about it	Instructions are too long and some of them are unclear	Could be a diversity with more visits to different cultural institutions
	My point is just about the unclear purpose of the game			There are too many buildings, too much information and this can be confusing	
Students Positive Opinions The Navigator	Playability	Lastability	Engagement	User Interface	Storytelling
	Rapid and interactive game	Simulates an informal conversation	The game is very accotiantive and text creates many collections for the player	Has a better quality. Better colors	The narrative is fine

	It's very easy to play		Interactive and more fun, more entertaining		The idea of a conversation in the game is pleasant
Students Negative Opinions The Navigator	Playability	Lastability	Engagement	User Interface	Storytelling
	The documents does not working	This chat is a little rushing	Could be more engaging and challenging	About the speed of the typing: sometimes is was too slow and other times I couldn't follow the new text coming out	The answers which I can gave are template, most of them. It will be good more possible answers to be available for the players
				A little part of the button is hidden on the bar	

The teachers who participated in the testing of our original information literacy games were more concise in their assessment as it is reflected in Table 3.

Table 3. Teachers' opinions on the both NAVIGATE games.

Teachers Opinions Information Trap Manager	Playability	Lastability	Engagement	User Interface	Storytelling
	Good	Short	Good	Decent	Good
Teachers Opinions The Navigator	Playability	Lastability	Engagement	User Interface	Storytelling
	There is not a discovery	Too fast	Low/Keep the user focus the whole time	Simple	Good

But they also shared with us valuable opinions about the both games. Concerning Information Trap Manager game, the teachers said the following: "No obstacles to overcome"; "It all comes down too simply to a series of questions"; "Questions are too difficult"; "It's not so clear how does the game end"; "The game has an unnecessary crowded interface and a lot of graphics with background function only: these elements must be integrated into the game mechanics"; "Almost no replayability"; "The choice of the setting could be engaging but it doesn't have to mask the actual didactic task of the game", etc.

With regard to the second game - the Navigator, the following opinions were shared with us: "The story is engaging but the game is too linear"; "There are no possible alternatives"; "Sometimes the right question is the first one: not good for teaching!", "There is no any replayability"; "The idea has a lot of potential but the actual implementation has many gaps"; "The game is extremely linear and the way in which we can suggest the correct answer makes the overall experience more similar to reading an

article"; "Easy, light and pleasant to play"; "The idea of Fakeland is fresh and creative", "It's nice and joyful"; "Main character is also fine"; "The Game is interesting; it's helpful", etc.

4. Conclusion

From the evaluation of the top 20 information literacy games presented in the current paper, it is clear that there is a product gap to be filled, especially in conditions of pandemic and distance learning, where the games can be the key to a more serious engagement of the students in educational process. On one hand, the serious games in information literacy are not numerous, on the other hand - it is necessary more attention to be paid on the design elements of the game-based product as a whole. We must consider these elements as a complex in order the final product to be more effective in the learning process. From the test of the original information literacy games developed by the NAVIGATE project, it is obvious that the team, focusing on the content, has "escaped" from the element of pleasure that each game must bring. The main purpose of the serious games is to educate but if they bring fun, they will be more engaging and will provide the students and the teachers with full playful experience. The shortcomings of the NAVIGATE games – Information Trap Manager and the Navigator, are in process of improvement thanks to the feedback by the participants in the focus groups. In addition to this, a more comprehensive evaluation of the both information literacy games will be done by our focus groups of teachers and students according to the Playful Experiences (PLEX) framework encompassing criteria as: Captivation, Challenge, Competition, Control, Discovery, Exploration, Expression, Fantasy, Fellowship, Humour, Nurture, Relaxation, Sensation, Simulation, Sympathy, Thrill, etc. (Lucero et. al., 2013). This approach can be replicated by teachers and librarians who are interested to select or develop playful games for teaching information literacy in universities and academic libraries. We are convinced that the aspect of playfulness of the games must be taken into account when they are used for teaching in a higher education context as it affects the motivation of the students and improves the learning outcomes.

References

Arrasvuori, J., Boberg, M., Holopainen, J., Korhonen, H., Lucero, A., & Montola, M. (2011, June). Applying the PLEX framework in designing for playfulness. In: *Proceedings of the 2011 Conference on Designing Pleasurable Products and Interfaces* (pp. 1-8). https://doi.org/10.1145/2347504.2347531

Caillois, R. & Barash, M. (2001). Man, play, and games. Translated by Meyer Barash. Urbana and Chicago: University of Illinois Press.

Carmody, K. W. (2012). Exploring Serious Game Design Heuristics: A Delphi Study. Ph.D. thesis, Northeastern University. Retrieved May 29, 2021 from https://www.learntechlib.org/p/127041/.

Csikszentmihalyi, M. (1990). Flow: The Psychology of Optimal Experience. New York: Harper and Row.

Desurvire, H., Caplan, M., Toth, J.A. (2004). Using heuristics to evaluate the playability of games. In: CHI EA '04: CHI '04 Extended Abstracts on Human Factors in Computing Systems. April 2004, Pages 1509–1512. https://doi.org/10.1145/985921.986102.

Djaouti, D., Alvarez, J., & Jessel, J. (2011). Classifying Serious Games: The G/P/S Model. In P. Felicia (Ed.), *Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches* (pp. 118-136). IGI Global. https://doi:10.4018/978-1-60960-495-0.ch006 [Cited from the accepted, open access version at http://www.ludoscience.com/files/ressources/classifying_serious_games.pdf]

Eppmann, R., Bekk, M., & Klein, K. (2018). Gameful experience in gamification: Construction and validation of a gameful experience scale [GAMEX]. *Journal of Interactive Marketing*, *43*, 98-115.

Guo Y. R., Goh D. HL. (2016) Heuristic Evaluation of an Information Literacy Game. In: Proceedings of the Association for Information Science and Technology. 2016, Volume 53, Issue1. https://doi.org/10.1002/pra2.2016.14505301107

Huizinga, Johan (2004). *Homo Ludens: Vom Ursprung der Kultur im Spiel.* 19th ed. Rowohlt.

Köffel, C., Haller, M. (2008). Heuristics for the evaluation of tabletop games. In: International Conference on Human Factors in Computing Systems: workshop Evaluating User Experience in Games.

Lucero, A., & Arrasvuori, J. (2010, September). PLEX Cards: a source of inspiration when designing for playfulness. In *Proceedings of the 3rd International Conference on Fun and Games* (pp. 28-37). https://dl.acm.org/doi/pdf/10.1145/1823818.1823821

Olivetti, E. (n.d.). *Latin dictionary*. Website [last retrieved on May 30th, 2021]. https://www.online-latin-dictionary.com/latin-english-dictionary.php?lemma=LUDUS100

Menon, S., Uggeri, M., Yancheva, G., Zanichelli, F. (2018). NAVIGATE - Information Literacy: a game-based learning approach for avoiding fake content. *EDULEARN18 Proceedings*, pp. 906-914.

Michael, D., & Chen, S. (2006). *Serious games: games that educate, train, and inform*. Thomson Course Technology PTR.

PLEX cards: Playful Experiences Cards (n.d.). [last retrieved on May 30th, 2021]. http://www.funkydesignspaces.com/plex/

Sweetser, P., Wyeth, P. (2005). GameFlow: A model for evaluating player enjoyment in games. *Computers in Entertainment 3*(3), 3-3. https://doi.org/10.1145/1077246.1077253.

Wittgenstein, L. (1972). *Philosophical investigations*. Translated by G. E. M. Anscombe. 3rd ed. Blackwell.