GAMIFICATION IN HIGHER EDUCATION:TEXT MINING APPROACH

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ABSTRACT

BACKGROUND

Gamification is a growing trend in research (Caponetto, Earp, and Ott, 2014; Erenli, 2013; Kasurinen and Knutas, 2017) as well as in educational settings (Azmi, Ahmad, Iahad, and Yusof, 2017; Dicheva, Dichev, Agre, and Angelova, 2015). While a more common definition of gamification is still under evaluation throughout the research community, for this research we adopt the definition from (Deterding, Dixon, Khaled, and Nacke, 2011) - gamification is "*the use of game design elements in non-game contexts*".

Higher education is among one of those "*non-game contexts*" where the implementation and usage of gamification techniques, is evolving in an ascending trend and in various educational settings (e.g., Faghihi et al., 2014; Galbis-Córdova, Martí-Parreño, and Currás-Pérez, 2017).

Different research methods have been used to explore not only the potential of gamification but also its pros & cons, regarding all areas of valuable application. In the present research, text mining techniques were used to perform an automated literature analysis, from 2011 to 2017, of gamification application in higher education settings.

METHOD

To carry out this research, a single query was applied in a single data source (Proquest database). The query used was unique and consisted in a simple Boolean expression containing two terms/expressions connected through an AND, which means that both terms/expressions had to be present in every article: "gamification" AND "higher education". The search was performed in October 2018 and included only *peer reviewed* articles with available *full text*, published in *Scholarly Journals*. Only the article title, abstract, and keywords were analyzed since those are the most relevant article areas where more important terms and concepts, should be mentioned. The search results returned a total of 187 articles that, after a unitary manual analysis, a total of 9 articles could not be considered for this research due to the following reasons: 3 articles were digitized images; 2 articles were in Spanish language; 4 articles were in Portuguese language. After this unitary manual analysis, the final number of articles considered for this research was 178.

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All 178 articles were converted into text (.txt) files, using a free pdf to text converter solution and, all the bibliographic references were pruned from all articles, to avoid non-significant term duplications while running the text mining procedure.

MAIN FINDINGS

We found 8 topics. The first topic, with a total of 66 matching articles stands out as the most relevant topic for "gaming", which indicates the predominance of gaming related technologies and methodologies through the set of the researched articles. The term "gaming" is also present in 7 out the total 8 topics, which seems to confirm its relevance and impact through learning. As stated by (Erenli, 2013), the gaming industry has a huge impact on society and the increasing number of players, can also be considered as an evidence that most students are familiar with gaming and feel it as a joyful experience. Hamari and Keronen (2017) also point that games have become the "largest form of leisure information systems [providing] enjoyment and usefulness" to players. For the second topic, with a total of 41 matching articles, the term "learning" is also highly related with this topic, which seems to suggest a relevant presence of these related subjects in the set of the researched articles. In the same topic the terms "gaming" and "ai" also show a significant relation with "learning" due to their correspondent low beta values. According to Williams and McOwan (2016), artificial intelligence methods together with human perceptual observations, can provide some "insight into certain high-level human perceptual and cognitive processes.".

The third topic, with 24 matching articles, shows a good relation between software quality assurance, gaming and gamification, which seems to confirm some of the main concerns from educators when starting to implement gamification classes supported in information technologies (LMS – Learning Management Systems software). As mentioned by Azmi & Singh (2015), some of those concerns are related with the fact that, despite all the importance and capacities of LMS in learning, most students do not utilize the system to its fullest potential. LMS's are not being used effectively and efficiently. Rucker and Edward (2015) in their study also support that faculty, most of the times, as some specific needs for additional LMS's training and support.

Topic 4, with 16 articles, seems to indicate a significant relation between software and education, what suggests the usage of software-based tools for educational purposes. Stanisavljević-Petrović, Stanković, and Jevtić (2015) corroborate the relevance of using software for educational purposes, as well as its positive impact in learning. Topic 5 with 8 articles and topic 5 with 7 articles. Topic 7 (11 articles) highlights the need to study critical success factors in gamification, with an emphasis on gaming. Topic 8 comprises only 5 articles. Despite the relation with gaming and learning.

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Observing the yearly distribution of the articles, through the period under analysis, the years of 2015 (50 articles) and 2016 (61 articles) stand out as the years with more published research on *gamification* and, *gamification* AND *higher education*.

According to the results, the most relevant conclusion seems to be that gaming and learning are closely linked together. Gamification has also been playing a growing role in teaching and learning over the years and revealing a tendency of growth in attention from academic research.

This research also seems to highlight that further research must be carried out looking for results and relevance of gaming and gamification for learning purposes, giving special attention to student performance and results.

Keywords: Gamification, Higher education, Text mining, Topic analysis, Engagement

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