

REVIEW PAPER

SRL-O AND GAMIFICATION –THE CONNECTION BETWEEN THE TWO ELEMENTS IN ONLINE LEARNING PLATFORMS SUPPORTING LEARNING GOALS

Julia Pausch 

FH Burgenland, Eisenstadt, Austria

Correspondence concerning this article should be addressed to Julia Pausch, FH Burgenland, Eisenstadt, Austria. E-mail: julia.pausch@fh-burgenland.at

ABSTRACT

Showing content in online platforms is a wide topic and the possibilities for representing content seem to be endless. This paper discusses the incorporation of learners' goals into content in online learning platforms, with the focus on gamification as the content representation method. In fact, the aim of this study was to explore how learning goals in an online self-regulated learning environment match with gamification as an online representation possibility. Thus, the terms gamification, self-regulated learning and learning goals as presented in different studies are analyzed and introduced in this work. The method used in this paper was a qualitative and quantitative semi-systematic literature research method. The results show how gamification and self-regulated learning go together and which key elements are used in gamification. The findings confirm that gamification supports learners' goals in self-regulated learning during the following phases: performance, forethought and self-reflection.

Keywords: SRL-O, gamification, Learning goals, self-regulated learning, online learning support

MAP EDUCATION
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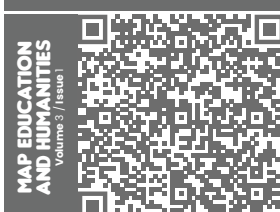
Volume 3 / Issue 1

ISSN: 2744-2373 / © 2023 The Authors.
Published by MAP – Multidisciplinary
Academic Publishing.

Article Submitted: 28 January 2022
Article Accepted: 16 March 2023
Article Published: 21 March 2023



Publisher's Note: MAP stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

<https://doi.org/10.53880/2744-2373.2023.3.1.64>

HOW TO CITE THIS ARTICLE

Pausch J. (2023). **SRL-O and gamification –the connection between the two elements in online learning platforms supporting learning goals**. MAP Education and Humanities, 3(1), 64-74. doi: <https://doi.org/10.53880/2744-2373.2023.3.1.64>



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Introduction

Teaching is no longer limited to face-to-face (F2F) instruction as instructional technology has become more common in higher education. Consequently, e-learning and face-to-face instruction should be combined to improve accessibility, flexibility, and interactivity of university classes (Sanderson & Rosenberg, 2002). Nowadays we witness the presence of a variety of technological possibilities for presenting content to a learner: from simple PDFs to gamification and e-learning with multimedia and interactive content. Whilst classical presentation of content in online platforms just gives the possibility for the learner to download and read the content without any interaction, new technologies provide learners with interactivity and responses. Thus, a basic goal of e-learning is to establish conditions in which students are motivated, satisfied, effective, and efficient (Sun et al., 2008, Yueh & Hsu, 2008). Shea and Pickett (2019, p. 5) refer to the following seven principles of learning developed by Chickering and Gamson (1987), "Contact between students and faculty members, reciprocity and cooperation among students, prompt feedback, time on task, active learning techniques, communication of high expectations, and respect for diverse talent and ways of learning" which should all be encouraged in an effective online learning environment.

Considering those principles, which are valid for online and offline teaching and learning, pure representation of content is not sufficient in online environments to support learners' progress in the right way, and to satisfy their learning goals. There are different goals in learning, but in general learning goals are the intended purposes and desired achievements of a particular training or course, which identify knowledge, skills, and capacities, "Effective learning goals are a necessary ingredient in student achievement" (Marzano, 2009, p. 3).

Interactivity is important because learners vary greatly in terms of their learning plans, styles and strategies. They keep track of progress toward their goals through evaluation and reflection, and they adapt these methods as necessary to reach their learning goals (Zimmerman, 1986). It depends on the topic and the attitude, personality, and the goal of the learner which representation will work out best to improve learners' progress over time. If objectives and goals are not met, students respond

to mistakes in learning in different ways: some see them as a challenge, while others stay dejected and frustrated (Dweck & Yeager, 2019). These different types need to be suitably supported by a platform.

Closing the gap between self-regulated learning (SRL) and the media is the topic explored in the current paper. It aims to analyze how media can best support learners in reaching their learning goals. New trends and technologies in online learning make interaction with learners possible as well as measuring their performance and supporting their progress. There are many possibilities of interactive content, but this paper will focus on gamification only. Gamification presents a trend in online learning, relying mostly on learners' intrinsic motivation to gather the content (Soepriyatna & Pangaribuan, 2022). This paper should bring the principles of self-regulated learning together with the principles of education and gamification as developed over the last 10 years.

Methodology

The method used in this paper is a qualitative and quantitative semi-systematic literature research method (Snyder, 2019) as the topic was studied in different contexts as covered by various authors. The objective of this pre-study was to provide an overview and clear definition of the key terms – SRL and SRL-O, gamification and learning goals. Furthermore, the study attempted to bring these concepts together, compare the key elements and finally analyze the connection between SRL-O and gamification. In other words, it aimed to see how much these terms correlate and to test the hypothesis predicting that gamification influences learners' progress in a positive way.

Data sources

Identifying the terms was the first step, so one of the most popular scientific databases ResearchGate – which besides google scholar currently contains most books and articles for general use – was explored. Then, the key authors, terms and citations were investigated in various articles to qualify them.

As this work has two key terms: SRL(-O) and gamification, those were the terms researched in various existing scientific and peer-reviewed articles included in online databases with the aim to identify the most common authors and articles

dealing with them. Further queries for SRL-O were taken, but as it is a very new term found in articles in the third quarter of 2022, its base SRL was more intensely researched, and these findings were also described in the corresponding section. The search criteria were always reduced to one year, so the results are not summed up but they are presented for one particular year. This is an example how the data were fetched: The search criteria for ERIC were (e.g. for 2016): gamification pubyearmin:2016 pubyearmax:2016

Results and discussion of a semi-structured literature review

This chapter contains all theoretical pieces regarding the introduction into SRL, gamification, learners' goals, and SRL-O, which is a further development of the SRL especially in the context of online world. Literature research for the most common issues and most cited authors was done to build the base for the later comparison of different aspects.

Self-regulated learning (SRL)

Self-regulated learning focusses on goal settings, time management and learning. Students establish objectives, track their progress through self-reflection, and continually assess their learning strategies, which supports and enables them to adapt their engagement in academic tasks (Hawe, Lightfoot & Dixon, 2019). Thus, the key principles of self-regulated learning are setting the goal and positioning learners as active participants in the learning process (Winne & Perry, 2000). Although learning environments have altered as a result of emerging technologies and learners receive instruction online, so learners and educational information are not physically present at the same place, they should still have the chance to master essential skills through online instruction (Adam et al., 2017), and self-regulated learning becomes even more important.

Barry Zimmermann was one of the first – if not the first – who developed Self-regulated learning. We have found no study about SRL which refers to self-regulated learning and not mentioning Zimmermann's early or later studies. According to ResearchGate – fetched on 3rd of January 2023 – Zimmermann is cited 56.137 times in various articles about self-regulated learning, which was his focus topic for most of his active

years as a researcher. He published 170 articles there, around half of them being connected to self-regulated learning and being the most cited ones. In every article referring to SRL here, Zimmermann was at least cited with one of his articles published between 1986 and 2012, when he changed the focus of his work and papers.

His major first work in 1986 led to the triadic analysis of self-regulated functioning. Through active feedback, a student's proactive use of a self-evaluation technique will reveal the level of accuracy and whether checking needs to continue. In this reciprocal representation, causation is started directly (by oneself), carried out through the application of strategies, and controlled through perceptions of efficacy. That model also provides the triadic illustration and connection of environmental self-regulation, as Zimmerman states (1986, p. 330), "A student's proactive use of an environmental manipulation strategy (e.g., arranging a quiet study area for completing schoolwork at home) would involve an intervening behavioral sequence of room-altering responses such as eliminating noise, arranging adequate lighting, and arranging a place to write." The continuous use of the schematic structured setting for learning depends on supporting the effectiveness of learners. Through a mutually reinforcing feedback loop in the environment, the information is alternately transported both ways. According to this formulation, learning strategies can be initiated from the environment (for example, through instruction), but they would not be classified as self-regulated unless they were influenced by significant personal processes (i.e., goal-setting, and self-efficacy perceptions). The model also gives attention to covert self-regulation. The illustration shows, that a person's covert processes also influence one another in a mutual way.

A later work of Zimmermann contains A *Cyclical Phase Model of Self-Regulatory Feedback* based on his work in 1989 and combines the feedback loop and behavioral outcomes. The three phases are: forethought, performance and self-reflection. The forethought phase describes learning processes and motivational factors that come before learning-related efforts and have an impact on students' readiness for and willingness to self-regulate their learning. The processes that take place during learning and have an impact on focus and performance are included in the performance phase, whereas the processes that

occur after learning efforts but have an impact on learner's reactions to that experience are included in the self-reflection phase. The self-regulatory cycle is completed when these self-reflections have an impact on future learning efforts. This led to the development of a new model proposed by Zimmermann and Moylan (2009), based on which the following resume might be made: Students analyze the task, set goals, and make plans for how to achieve them during the forethought phase. Several motivational beliefs fuel the process and have an impact on the activation of learning strategies. During the performance phase, students carry out the assignment while keeping track of their performance and using self-control techniques to keep their minds on the task at hand and to be motivated to complete it. Finally, during the self-reflection stage, students evaluate how they handled the assignment and assign blame for their success or failure (Panadero, 2017). When students make these attributions, they experience self-reactions that may have a positive or negative impact on how they approach the task in subsequent performances. This Zimmermann's work with the 3 phases of self-reflected learning can be applied to online learning strategies, so they will be taken as a base for analyzing the gamification as an online learning strategy.

Online Learning possibilities

The possibilities nowadays in online learning are much more than just presenting downloadable or readable content to the learner. They involve interacting with learners, understanding their objectives and goals, and representing the content in a proper way to support learners' progress.

Technically, online settings offer the following advantages in comparison to traditional ones (New Zealand Ministry of Education, 2023; Debevc et al., 2011, pp. 182–184) :

- On a computer or tablet, language and visual assistance can be accessed whenever necessary;
- Information can be conveyed using a variety of media, and the presentation can be customized to a person's needs in order to promote independence;
- There are visual and audio stimuli available;
- Students are allowed to learn at their own pace and return as frequently as they like to review what they have learned;

- Flexible presentation of differentiated work is possible to accommodate varying learning needs;
- A multisensory approach that incorporates manipulable, physical activity, and real-world experiences can be applied;
- Concrete and illustrative examples (interactives, real objects, images, video, and infographics on devices) of information are offered;
- Audio and visual materials can be used in addition to text;
- Text might be available digitally rather than on paper so that students can choose how they want to access it;
- Different versions of content, like a YouTube video, a graphic, and some text, are gathered in one place by using blogs, wikis, and online tools like Moodle.

There are some general guidelines existing, supporting the learner to gather the content better, which were evaluated in various studies. The 6-point list below is a summary of various studies about content representation and how it influences learners' perception of content – mainly in online formats found in reference articles (Bangert, 2004; Hidayati, 2021; Lin & Atkinson, 2011; Sayed et al., 2023; Shabiralyani et al., 2015; Wang, Zhang, et al., 2013):

- Help comprehension with visuals;
- Provide information in multiple formats;
- To illustrate text, use symbols and graphics;
- Maintain a clean and uncluttered layout;
- Use movies and animations;
- Use subtitles and highlights in videos.

All of above items were researched in various studies and it was concluded that they improve learners' progress and that following those rules helps learners to gather content more quickly, especially in a self-regulated environment where no teacher is present to ask or to present the content.

SRL-O

In 2022 the SRL-O identified scales for the self-regulation based especially on online learning in comparison to the SRL which is focused on traditional self-regulated learning. This recent study by Broadbent, Pandero, Lodge and Fuller-Tyszkiewicz (Broadbent et al., 2022) is used as the base in this article for the further analysis and comparison with gamification elements. SRL-O is based on

the SRL Zimmermann developed, just now in the context of online learning. This study compared SRL-technologies and as the outcome of this study following elements were found relevant for SRL-O in the work of Broadbent et al. (2022, pp. 13; 21-26):

- Motivational beliefs
 - Online self-efficacy
 - Measures the students' perception of their own abilities and expectations for success in online courses.
 - Online intrinsic motivation
 - Measures whether learners participate in a task for reasons such as interest, challenge, curiosity, enjoyment, and mastery. A higher score indicates higher intrinsic motivation.
 - Online extrinsic motivation
 - Measures whether learners perceive themselves to be participating in a task for reasons such as grades, rewards, performance, evaluation by others, and competition. A high score indicates high extrinsic motivation.
 - Online negative achievement emotion
 - Includes both negative activating emotions (such as anxiety and shame), as well as negative deactivating emotions (such as hopelessness and boredom). Negative deactivating emotions can have a detrimental impact on motivation, mental processing and increase worry and mental distraction. Negative activating emotions may prompt effort but may also reduce intrinsic motivation and increase ridged strategy use.
- Learning strategies
 - Online planning and time management
 - Structuring of learners' efforts toward studying online
 - Online metacognition
 - Contains metacognitive planning, monitoring, and evaluating. Online metacognitive planning includes goal setting and task analysis, which makes organizing and comprehending material easier. Online metacognitive monitoring includes reflecting, questioning and self-testing as one studies. Online metacognitive evaluating is adjusting and correcting one's cognitive activities and behaviors in response to one's own evaluation of performance during the task.
 - Online study environment
 - Having a study environment that is quiet and distraction-free.
 - Online effort regulation
 - The ability to persist even when the task is not of primary interest, there are distractions, or there are other interesting things to do. It requires learners to be committed to their study goals, control their efforts, and implement a range of strategies to do so.
 - Online social support
 - The learner's willingness to seek help from and collaborate with peers, teachers and online. A higher score here indicates a greater willingness to seek help and collaborate with others.
 - Online task strategies
 - Including strategies that help learners integrate and connect new information with prior knowledge, select appropriate information and construct connections among the information to be learned. In other words, it refers to applying previous knowledge and experience to new situations.

As this study also takes into account not only the results and questionnaires by Zimmermann in 1986 and 2009 (Zimmerman, 1986; Zimmerman & Moylan, 2009) but also those by other authors who covered the topic of SRL like Pintrich (Pintrich et al., 1993), it shows that there is some overlap in terms of elements, but now they are all adapted to online usage.

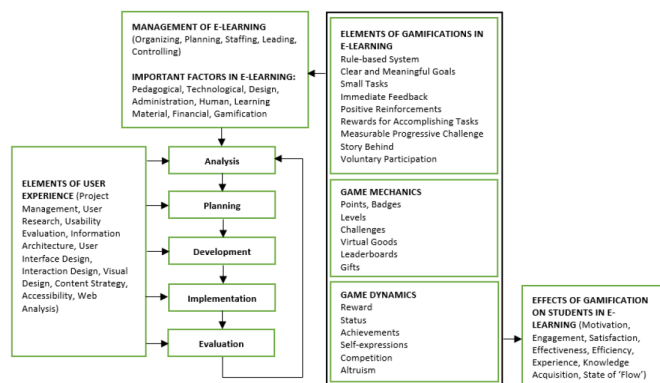
Gamification

"Gamification" is the use of game design elements in non-game context (Deterding et al., 2011). As this work aims to represent the term gamification, other similar terms used for gamification (also in earlier studies than 2002) like "productivity games", "surveillance entertainment", "funware", "playful design", "behavioral games", "game layer" or "applied gaming" (Deterding et al., 2011) are not considered. Gamification has managed to institutionalize itself as the common household term.

It is often used in the context of digital media but can also be applied to physical spaces or processes. Gamification can be used in a variety of settings, including business, education, and health care to increase user engagement and motivate desired behaviors. For example, a company might use gamification to encourage employee participation in a training program, or a fitness app might use gamification to motivate users to exercise regularly.

It is a "set of activities and processes that employ or apply game-design elements and game concepts in non-game contexts" (Deterding et al., 2011, p. 9), to improve user experience and engagement or as a tool for influencing people's motivation or engagement to solve hard problems, complete specific actions, or simply have fun (Sarkar & Datta, 2014). Some see it as a new way of thinking about problems, devising solutions, and implementing them. The following (Figure 1) shows how gamification is in the process of e-learning included with its elements, management, and effects.

Figure 1. Gamification in online Learning (Soepriyatna & Pangaribuan, 2022, p. 41)



The major difference between online gaming and gamification is that gamification is not developed as a complete game but uses the elements above (Game Mechanics and Game Dynamics as well as the Elements of Gamification with its Systems) to transport the learning content within a gaming environment to learners to fulfill their learning goals.

The first use of the word gamification is dated differently. In ResearchGate and Eric the earliest found article containing the word 'gamification' was found in 2002 (Torres-Rodriguez & Martínez-Granada, 2002) which conflicts with the findings of Deterding (2011, p. 1) who states that, "The first documented use dates back to 2008" whilst it is true when he mentions: "did not see widespread adoption before the second half of 2010.". A search in 8 best ranked databases for science according to google (BASE, 2023; DOAJ, 2023; ERIC, 2023; Google Scholar, 2023; IEEE Xplore, 2023; JSTOR, 2023; ResearchGate, 2023; Web of Science, 2023) showed similar results. For access reasons the Web of Sciences is not considered in this study. Only in ResearchGate we could find an early article of 2002, in all others the term first appeared in 2008. The following table and figure summarize the search results in different databases considered as relevant science databases.

Figure 2. Graphical Representation for gamification over the years

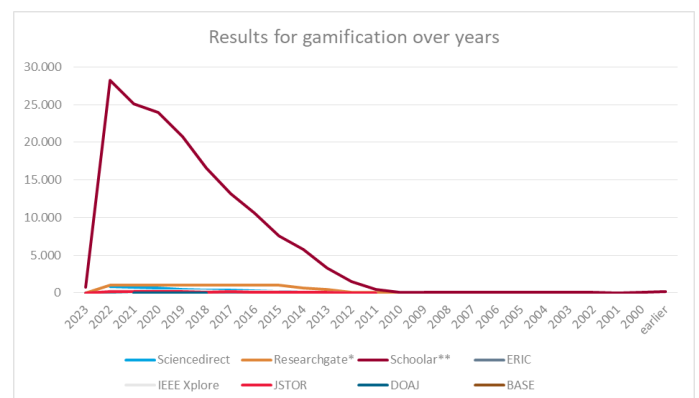


Table 1.

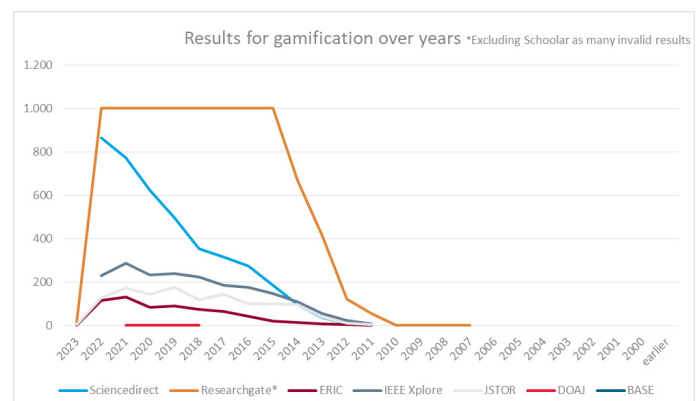
Search results for gamification over the years in the 8 considered science databases

Year	Sciencedirect	Researchgate*	Scholar**	ERIC	IEEE Xplore	JSTOR	DOAJ	BASE
2023		14	747	2		6		
2022	863	1.000	28.200	115	231	128		
2021	773	1.000	25.100	132	287	172	1	
2020	622	1.000	24.000	85	232	144	1	1
2019	495	1.000	20.700	89	240	175	1	
2018	355	1.000	16.600	74	223	119	1	
2017	317	1.000	13.200	64	186	145		
2016	274	1.000	10.600	43	175	100		
2015	186	1.000	7.540	21	148	101		
2014	97	669	5.730	14	110	96		
2013	38	413	3.330	7	54	39		
2012	11	122	1.510	4	23	11		
2011	5	54	442	1	7	5		
2010		2	102					
2009		2	83					
2008		1	81			2		
2007		2	62					
2006			50					
2005			61					
2004			36					
2003			36					
2002		1	29					
2001			28					
2000			31					
Earlier			135					
		*1000 max count	**invalid results on opening random samples					

For representing the results over years graphically, another graphic was created to exclude the results of google scholar as there were, on the one hand, many invalid year results on random sampling opening, and, on the other hand, there were many not well reviewed or just online blog articles. To have a better overview, another diagram was created showing the development of 'gamification' over years.

Figure 3.

Graphical Representation for gamification over the years excluding google scholar



These findings show that before 2012 there was no mention of the term gamification in any article in these databases. In fact, the exact and correct numbers of articles mentioning the term 'gamification' was only possible to determine in ScienceDirect, as all other databases had errors in correct searching for the years. The tagging algorithm of the contained pdfs was taken wrongly for some randomly opened sample articles. There were articles found when entering 1980 from 2017 (Google Scholar, 2023) and ResearchGate (ResearchGate, 2023) stops at delivering 1000 results. However, the broad picture was almost the same on each search engine, the number of found results increased dramatically from 2011 onwards.

Learning Goals

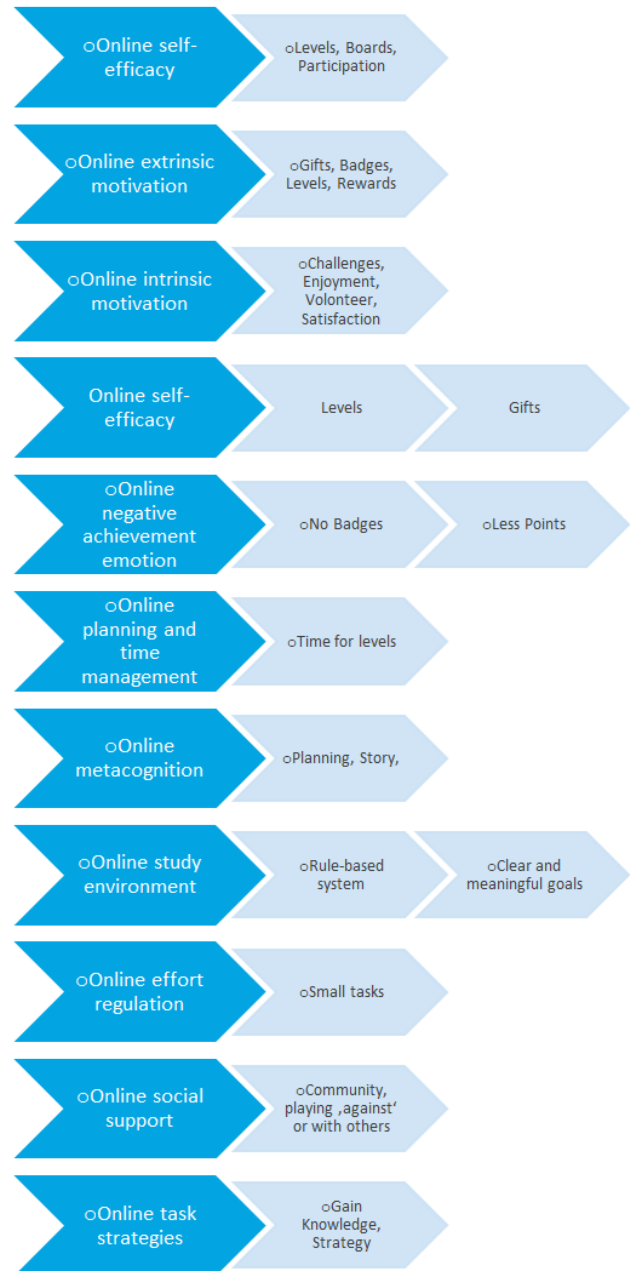
Learning goals are the intended purposes and desired achievements of a particular course, which generally identify the knowledge, skills, and capacities a student should achieve in that class (Elliot, 1999; Elliot & McGregor, 2001). Goals that require students achieve a certain score are performance goals (e.g., Students will be determined proficient or higher in reading by the end of the school year). Goals that ask students to master content are called mastery goals (e.g., Students will be able to use word segmentation and syllables to decode an unrecognized word).

Studies have shown that mastery goals are more often associated with higher order learning and better performance (Marzano, 2009). Of course, there are institutional goals but also the personal learners' goal referring to their expectations of the course. However, we should bear in mind that goals can vary. It might be that the goals change during a course or a training, so the online platform should be able to cope with a change in learners' goals.

Rewarding and Goals are key elements of gamification which match the self-reflection phase as proposed by Zimmermann in his behavioral study, but also help in the performance and forethought phase. As in every game you must think strategically to get your rewards and get forward in your levels, badges, and other rewards. In fact, gamification takes many research results of SRL and SRL-O. Comparing the later work of Zimmermann (Zimmerman & Moylan, 2009), we see that the elements of gamification can be linked to the SRL-O identified items. Figure 4 shows, which methods are sufficient for supporting the identified SRL-O in combination with gamification:

Figure 4.

Comparing Gamification with the SRL-Goals (own graphic out of SRL-O added to gamification)



Conclusion

Showing content in online platforms is a wide topic and the possibilities of representing content seem to be endless. The 'best' practice of showing content always depends on the goal of learning. Therefore, there is no such thing as 'good' or 'bad' content as it depends on the learners' individual needs and expectations. The possibilities for presenting content in online platforms for self-

regulated learners have increased exponentially over the past few years. AI, graphical improvements and having a good 'gaming' experience help a lot in using this technology. Gamification ranges in its possibilities which depend on the support that learners need. Thus, we can say that gamification was developed to enhance the SRL-process. Both gamification and SRL-O are in the context of learning very new topics. Only the last decade in the whole history of learning analyses gamification, as the technical possibilities have increased a lot over the past years. SRL-O has developed just recently as an outcome of the SRL for an online setting. For sure, the corona crisis and distance learning contributed to innovations in self-regulated online learning. This crisis was also a driver for technology development, with the focus on SRL-O and gamification as some of the outcomes.

Of course, gamification does not mean that any platform using gamification to transport content is made well. There are software designs, design principles, usability conventions and general guidelines which make a learning game – gamification – better or worse. However, the discussion here is not about good or bad software or usability design, but the gamification itself which can enforce as well as support learners' progress in the context of self-regulated learning. The hypothesis that designing learning content as game will improve learners' progress was already researched in various environments and contexts, and basically the results of this work confirm that gamification helps in improving learners' progress and goals. Of course, disturbing factors in learning need to be identified, both those inside the online platform and those outside factors like the learners' environment itself. Thus, the surrounding and the place the learner is learning in are factors for the learning progress. It also depends on the learner's personality, so some people learn better with music, some learn better on the beach, and some need absolute focus to read content.

As the presented study is just summarizing the theoretical possibilities based on literature research, by identifying and bringing the terms together and visualizing the overlap of gamification and SRL-O, there needs to be more practical research on this topic done to identify better the connection between the SRL-O and gamification and how it supports learners' goals.

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