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# DIGITAL LEARNING METHODOLOGIES AND TOOLS

## – A LITERATURE REVIEW

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### **Abstract**

This paper main goal is to make a literature review about digital learning methodologies and tools with the aim of identifying and analyze the different methodologies which potentiates the learning process. Digital learning is increasingly influencing both classroom/campus-based teaching but more import is leading to new models or designs for teaching and learning.

This research will be framed by the constructivist approaches to learning and the development of the online collaborative learning theory (OCL) developed by [1].

The OCL uses the following methodologies, supported on text: expositive, demonstrative, interactive, and practical. The first relates to the presentation of theory, concepts and other information and it is based on text enriched with animation. In the second, scripts underlying the schematics demonstrate behaviors. In the third, the learner interacts with properly designed tools to practice and test her/his level of proficiency. The last methodology is based on the use of simulators.

Besides the analysis of all of those methodologies and the tools associated to them, the research will also identify the necessary conditions for digital learning success in order to accomplish that goal a systematic literature review will make possible to identify the methodologies and also the more recent tools used to promote digital learning and teaching.

**Keywords:** digital learning, learning methodologies, digital teaching, digital tools; digital learning systems

## **1 INTRODUCTION**

Creating a theoretical framework that helped preparing and understanding the methodologies and tools for digital learning was the first goal of this research.

To achieve this goal, we conducted a literature review from which have resulted the following research question: What are the main methodologies which emerged from the literature and that are being used in digital learning?

The research was linked with concepts such as digital learning and research on digital learning methodologies. To verify the effectiveness of digital learning, it was important to first identify the various ways in which digital learning can take place. First, digital learning includes a wide range of methodologies and may take place on just about any place and any time. Second, digital learning can adopt different forms. A lot of researchers and scientists have already tried to organise and name this variety of forms. So ranks [2] digital learning of implied learning to reactive learning and finally deliberate learning, in which the distinction is the degree of intent. Implicit learning is learning without that we are aware of this and with absence of explicit knowledge about what exactly is learned. Reactive learning is intentional and takes place during an action leaving little time to think. Finally, deliberate learning has the final goal to learn. It generates new knowledge and there is a clear commitment in activities such as planning and problem solving [2]. In addition, the input of [2] stressed that digital learning takes shape through doing, thinking and communicating.

According to these contexts the article briefly explores the digital technologies which potentiates the learning process, followed by the presentation of the methodology and the research findings. It concludes with a proposal of a model for promoting the use of digital learning methodologies and tools.

## **2 LITERATURE REVIEW**

### **2.1 Online Collaborative Learning (OCL)**

[2] proposes a modern learning theory with such a framework that takes into account the universality of the Internet and the societal shift toward collaborative learning. It features the intellectual growth rather than the conventional teaching approach. [2] proposal is an Online Collaborative Learning (OCL) which renders a model of learning in which students are encouraged and supported to work together toward knowledge. To invent, to explore ways to innovate, and, by so doing, seek to understand, therefore, stimulate a sharp solution-finding rather than presenting literature statements. This learning method is collaborative so that students are expected to work collectively through it, alternatively to the approach that merges individual and closed decisions to accomplish an outcome. [1]

A constructivist framework approach points to the value of educators as key drivers for the OCL instructional process. Aforementioned encourages an inherent disposition from student's awareness through real-case scenarios and encourages curiosity and discussions that support their autonomy [2]. Likewise, the term participatory pedagogy [3] represents a shift in educational paradigm that combines instruction with a net-worked and connected education. The results mentioned above ends in a promotion of the student's engagement and their enthusiasm to focus on enhancing theoretical transmission of knowledge [4].

### **2.2 Digital learning success**

To what regards the use of Information and Communication Technology (ICT) as a digital learning resource for OCL, educational stakeholder's attitudes and perceptions of ICT's significantly impact their student's digital literacy. The student's use of ICT is related to teacher's confidence level of their digital competencies. Evidence shows a significant relationship between the efficient use of ICT as a learning methodology and the "respondents' age", as well as, high relationship between teachers "technological anxiety" and age [5]. Nevertheless, educators may require continuous professional development and training regarding their ICT capabilities. Skilful teachers in a poor ICT learning environment can perform better [6]. Moreover, a survey reported that 20 to 25 percent of European students are taught by digitally competent teachers [7].

ICT supports the learning process by the use of text, images and audio and by that, each person can create their story and engage in an in-depth learning [8]. Digital Storytelling stands as one technology application that is well positioned to take advantage of user-directed content and to help instructors use technology productively in their classes [9]. Nonetheless, the use of innovative ICTs alone does not guarantee effective learning processes and outcomes in OCL environments [10]. There is evidence to favour that digital storytelling (DST-OCL, here and further on) is more effective than a lecture-based (G-OCL, here and further on) instructional strategy [11]. Adopting a DST-OCL strategy promotes student's cooperation in learning activities, such as script review, image selection and storyboarding as well as, "online communication", "interactivity" and "privacy". There is evidence to conclude also that using a DST-OCL student are relatively more motivated to have a discussion between group members, in a constructivist point of view [12].

To what regards digital problem-based learning (PBL) research, concludes that students that are provided with autonomy support have a greater sense of autonomy and those who received structural directives, clear expectations, guidance and procedures contributes experience greater sense of competence. The study in matter also concludes that both autonomy support and structure in a OCL promotes a positive effect on intrinsic motivation. Even with a single aforementioned dimension, student's fostered their intrinsic motivation, therefore, they are mutually supportive. However, if both are absent, autonomy support and structure, evidence shows a low intrinsic motional usage of ICTs. Nonetheless, this study also confirmed that structure OCL strategy has a positive learning outcomes but autonomy support doesn't. Yet, if both are combined, autonomy support is able to stimulate greater outcomes. [13]

### 3 METHODOLOGY

The methodological approach of the research was qualitative and the main technique to collect and analyse data was content analysis from the literature review of papers on digital learning methodologies and tools. For this paper a bibliometric research was performed using b-on, which is a research resource that allows access to thousands of scientific texts included in places such as Elsevier, ISI, Sage and Springer, among others.

For the beginning of the segmentation, the terminology "Digital learning methodologies" was used as the initial filter, obtaining a total of 228,474 publications. Subsequently, new segmentations were used, limiting the number of articles: exclusive research of peer-reviewed scientific articles in academic publications (170,851 articles).

With the introduction of the keywords higher education (2,123) and teaching methods (96), we obtain a smaller number of publications, which will set a total of 64 when the time horizon of research for the last 3 years is reduced (2014-2017).

It also happens that the total viewing screen is configured for 30 items per page and, when changing pages to continue the analysis, the system ends up eliminating articles that may be repeated, setting the total number of articles to 54.

After analysis, one of the articles had little relation to the keywords one was eliminated. The final analysis focuses on 53 articles.

### 4 FINDINGS AND DISCUSSION

The content analysis goal was to extract and analyse the article's title, abstract and keywords to extract expressions related to digital learning methodologies and we classify them into 4 main categories which emerged from the literature analysis. As a result, the expressions identified were grouped thematically. It was possible to identify 46 expressions considered valuable as presented in table 1, extracted from 33 articles that clearly reveal them in the analyzed texts:

*Table 1 - Digital Learning Methodologies, Tools and Contexts*

<b>Descriptor</b>	<b>Expressions</b>	<b>Authors</b>
Digital learning methodologies	Project based-learning; Problem based-learning; Digital stories; Online learning environments; Digital Moments; Technology integrated teaching methods; Digital storytelling; Educational games; Authentic learning	Barber, W.; King, S.; Buchanan, S. (2015) Epure, Manuela; Mihães, Lorena Clara (2017) Kocaman-Karoglu, Aslihan (2016) Abdulmajed, Hind; Park, Yoon Soo; Tekian, Ara (2015) Mantri, Archana (2014) Amory, Alan (2014)
Digital learning contexts	Collaborative Communities; Cooperative learning; Digital combinational system; Collaborative learning; Flipped classroom using digital media; Moving from fixing to online space; Experiential online development; Open educational practice; Network participation.	Barber, W.; King, S.; Buchanan, S. (2015); Chen, Liwen; Chen, Tung-Liang; Chen, Nian-Shing (2015) Trotskovsky, E.; Sabag, N. (2015) Muñoz González, Juan Manuel; Rubio García, Sebastián; Cruz Pichardo, Ivanovna M (2015) Sohrabi, Babak; Iraj, Hamideh (2016) Liwen Chen; Tung-Liang Chen; Nian-Shing Chen (2015) Patricia; Curwood, Jen Scott; Carvalho, Lucila; Simpson, Alyson (2015)

Descriptor	Expressions	Authors
		<p>Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015)  Masterman, Elizabeth (2016)  Stewart, Bonnie (2015)  Liyaganawardena, Tharindu Rekha; Lundqvist, Karsten Øster; Williams, Shirley Ann (2015)</p>
Tools and Simulators	<p>Web-based video; Computerised environments; Spatial science technology; Slowmation: Narrated stop-motion animation; Generic modelling language; Digital video; Augmented reality; Design based research; Gamification; Learning manager; Simulation; Computer based teaching; Library webinars</p>	<p>Moorefield-Lang, Heather; Hall, Tracy (2015)  Alhajri, S (2016);  Joshua Rudow &amp; M. Anwar Sounny-Slitine (2015);  Unger, Daniel R.; Kulhavy, David L.; Busch-Petersen, Kai; Hung, I.-Kuai (2016)  Wendy Nielsen and Garry Hoban (2015)  Kosonen, K., Ilomäki, L. &amp; Lakkala, M. (2015)  Friend, Jennifer; Militello, Matthew (2015)  Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)  Wood, Denise; Bilsborow, Carolyn (2014)  Stansbury, Jessica A.; Earnest, David R. (2017) Guerra, Wendy Josefina Guzmán; de los Ángeles Martín Hernández, María; Pérez, Luisa Elvira Rojas (2014)  Rai, S. S.; Gaikwad, Anil T.; Kulkarni, R. V. (2014)  Lau, K H Vincent (2014)</p>
Support Systems for Digital Learning	<p>eLearning; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses.</p>	<p>Tena, Rosalía  Romero; Almenara, Julio Cabero; Osuna, Julio Barroso (2016)  Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)  Xu, Hong (2016)  Martin-Garcia, Antonio V.; Hernández Serrano, M<sup>a</sup> José; Sánchez Gómez, M<sup>a</sup> Cruz (2014)  Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015)  Guerra, Wendy Josefina Guzmán; de los Ángeles Martín Hernández, María; Pérez, Luisa Elvira Rojas (2014)</p>

Descriptor	Expressions	Authors
		Stewart, Bonnie (2015) McNaughton, Susan M; Westberry, Nicola C; Billot, Jennie M; Gaeta, Helen (2014)

Digital learning context with 13 expressions in 10 publications and Tools and simulators also with 14 expressions in 12 publications seems to take the lead in the investigations trend.

This fact, together with the strong presence of recent publications, seems to highlight the validity of [1] ideas, since the context and its support are two inseparable faces of collaborative learning as well as learning facilitators Which can mean elements of success or failure in a digital learning experience.

For a more sustained understanding of the categories created it is important to conceptualize them and make a breve description:

Digital learning methodologies are new methods of teaching using technology with the purpose to improve the quality of education and involve students in the educational process. Our findings lead us to the following methodologies: Project based-learning; Problem based-learning; Digital stories; Online learning environments; Digital Moments; Technology integrated teaching methods; Digital storytelling; Educational games; Authentic learning

Digital learning contexts are spaces, facts or situations of learning which supports innovative pedagogical models, and empower learners facilitating and promoting the learning process. In our research we found: Collaborative Communities; Cooperative learning; Digital combinational system; Collaborative learning; Flipped classroom using digital media; Moving from fixing to online space; Experiential online development; Open educational practice; Network participation.

Tools and Simulators are considered learning tools that utilize technology or the internet in order to facilitate the learning process, such as computers, mobile phones, tablet PCs, projectors or electronic books. Our findings lead us to the following tools: Web-based video; Computerised environments; Spatial science technology; Slowmation: Narrated stop-motion animation; Generic modelling language; Digital video; Augmented reality; Design based research; Gamification; Learning manager; Simulation; Computer based teaching; Library webinars.

Support Systems for Digital Learning are systems which helps managing the learning process and have the infrastructure to use interactive features such as threaded discussions, video conferencing, and discussion forums in order to potentiate students learning outcomes. In our research we found: eLearning systems; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses.

## 5 CONCLUSIONS

This paper identified the main digital learning methodologies, context and tools which have emerging from the literature review. Our contribution is to filling up the lack of understanding around digital learning methodologies and our focus was on higher education.

In summary, the results of the present study show that the use by teachers of digital learning methodology is increasing in education, as we can see in all the study's made in the last 3 years. These technologies can enhance the engagement of the students and innovations such as mobile technologies, tablet and smart phone applications become more and more popular among the higher education students.

As the main methodologies, tools, systems and contexts in digital learning our finding point out for an increasing mix of those in education with the goal to prepare students to think critically and solve complex problems, work collaboratively, communicate effectively and have more autonomy an independence in the learning process.

Digital learning uses technology to strengthen the student's learning experience with a mix of tools and practices, including, among others, online and formative assessment; an increase in the focus and

quality of teaching resources and time; online content and courses; and applications of technology in the course curricula.

Finally, digital learning promotes deeper learning allowing personalized competencies development of the students with deeper learning possibilities and extended access to information and knowledge.

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