Transmedia narratives in the teaching and learning of mathematics: challenges in the practice of the teacher as an orchestrator

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Abstract

The use of digital technologies as a support to the learning process may contribute to a more dynamic and participatory way of developing knowledge. Transmedia narratives assume characteristics congruent with this by facilitating the incorporation of educational methodologies that foster learning skills in interaction with digital devices during the exploration of a narrative. Simultaneously, in the case of mathematics, many students interpret the subject without connecting it to their social context and, therefore, do not understand its applicability and usefulness in the real world. This article presents a literature review related to these concepts and their interplay in mathematics learning. An integrative literature review was performed following five steps to collect evidence: 1) formulation of the review question, 2) search, screening and selection (sampling) of information, 3) critical evaluation of the selected information (data collection) ,4a) data extraction (data analysis), 4b) synthesis of the extracted data and thematic analysis, and 5) presentation of data. It was found that the practices of teachers as orchestrators and facilitators of learning and the impact of transmedia narratives in the attempt to motivate students draw them closer to the mathematics subjects explored in classes.

Keywords

Contextualized mathematics; learning; transmedia narratives; teacher as an orchestrator

I. Introduction

This article presents a literature review on the use of transmedia narratives to foster digital and mathematical skills in a pedagogical context of social interaction, knowledge sharing and the establishment of connections among didactic content. The suggestion of new pedagogical approaches will obviously result in new challenges in terms of teaching methods and, therefore, the role of the teacher as an orchestrator in supporting learning is also discussed.

This work is part of an ongoing PhD project carried out with vocational education students with a significant risk of failure or of dropping out of their school education. In this context and considering the analysis of the evolution of the different political measures to reduce school drop-out and failure, it is considered that vocational education, due to the high number of students with the aforementioned characteristics, would be a clear indicator of the relevance of the study and a stimulus to the creation of a pedagogical project. This project establishes a connection between the contents recommended by the Ministry of Education for Mathematics and the creation of multimedia materials suitable for the acquisition of knowledge through transmedia narratives. It is intended that this connection results in creative and innovative educational practices, responsible for the development of collaborative work dynamics, increasing motivation and autonomy, and through which students assume a central role in their learning process. In this process, transmedia narratives, due to the multiplicity of technologies used, constitute a potential way to raise the levels of motivation and autonomy of students in school contexts (Scolari, 2016). In this process, it is important that mathematics can be contextualized and applied to real world situations, instead of giving the students an abstract point of view which they might not practice in daily life circumstances (Kindt, 2004). Consequently, it is a priority to guide learning in a more practical and contextualized context, where learning is not just based on pre-established rules like the simple memorization of mathematical formulas, for example. The excessive attention given to rule training does not encourage the development of flexible thinking, so necessary in students. In this perspective, the teacher assumes a predominant role in monitoring learning as an orchestrator of different learning technologies, environments and contexts.

The article begins with a brief contextualization of the literature review methodology used. The following sections present the results achieved by the application of the integrative literature review method and consist of four subsections: ´The use of digital technology in educational contexts`, ´Transmedia narratives in support of learning`, ´The importance of context in mathematics as a bridge for the creation of meaningful environments` and ´Orchestration: Role of the teacher in the monitoring of learning`. Finally, the results are discussed, and some conclusions are put forward.

II. Method

The literature review presented in this article results from a bibliographical survey of scientific sources that aimed at the contextualization and/or problematization and questioning of the most important theoretical topics that frame this research. Further analysis determined the choice of the literature review method that was used between two main options: a systematic review method or an integrative review method (Unesp, 2015).

The systematic literature review method is a descriptive-discursive method that focuses on the survey of scientific productions articulated from different sources. This method, therefore, focuses on a careful and rigorous synthesis of pertinent themes from different areas of knowledge, related to a specific question on a topic (Souza, Silva & Carvalho, 2010). The systematic literature review allows the acquisition of scientific knowledge through a detailed plan that must be credible, accessible, and repeatable to guide a rigorous research strategy on a given topic (Uman, 2011; Pantaleão & Veiga, 2019). To this end, inclusion and exclusion criteria are used to avoid

overlapping publications (Pantaleão & Veiga, 2019).

The integrative literature review (ILR) is a method that consists of building a broad analysis of the literature with methodological rigor and clarity in the presentation of results. This method focuses on a synthesis of knowledge that allows precise generalizations about a certain phenomenon. It is a method that provides a more complete understanding of the theme by combining data from theoretical and empirical literature (Unesp, 2015; Gwen, 2010). The IRL method therefore offers a broader view for the understanding of a phenomenon. The knowledge of a theme is determined by independent studies in order to identify, analyze and synthesize the results obtained as well as the knowledge of the studies of different methodologies (Souza, Silva & Carvalho, 2010; Pantaleão & Veiga, 2019). It is a review that allows new knowledge to be generated on a given topic and allows new perspectives on it (Torraco, 2016).

In this article, the authors decided to do an integrative review of the literature. The integrative literature review proposal allows for the gathering and synthesizing of the evidence available in the literature to create perspectives on emerging topics such as the use of digital technology in the context of education, the creation of transmedia narratives in support of learning, the importance of context in mathematics as a bridge to the creation of meaningful environments and the new orchestration role of teachers as active actors monitoring learning, the management of different technologies and platforms for participation, and learning and knowledge sharing activities.

This article aimed to seek evidence, in the literature, of the application of transmedia storytelling in mathematics. The integrative literature review that was made included 5 steps: 1) the review question, 2) the search, screening and selection (sampling), 3) critical evaluation of the selected information (data collection), 4a) data extraction (data analysis), 4b) synthesis of data extracted data and thematic analysis, and 5) presentation data." (Lubbe, Ham-Baloyi and Smit, 2020, p. 310-312). A Flow chart that details the application of the integrative literature review method is presented in Figure 1. Table 1 presents a systematization of the main literature review steps and a description of the analysis process performed in each one of these steps.

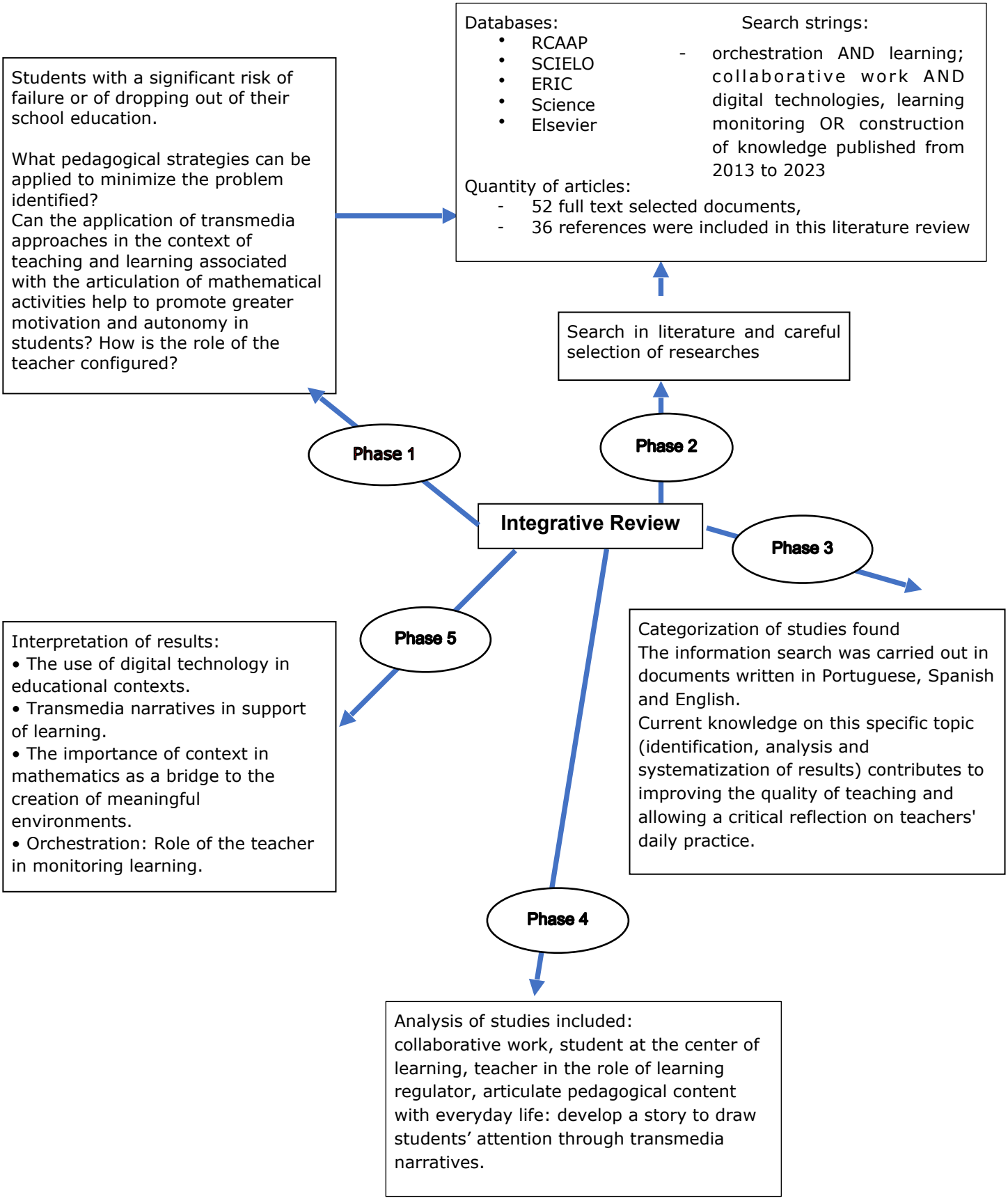

Figure 1 – Flow chart of the method: integrative literature review, adapted from Nogueira, Medeiros, Bittencourt, & Nóbrega (2016)

Steps	Integrative literature review process
1) the review question	The problem identification arises from the interest in researching effective and efficient teaching and learning processes, researching evidence in the literature of: • More contextualized educational environments in Mathematics education: the importance of situating mathematical content, addressed in a school context, with the surrounding reality. • Forms of social interaction (individual work, in pairs, in groups) and ways to promote, in students, a sense of responsibility, autonomy and the ability to critically intervene in their learning process. • Different learning strategies, resorting to self-learning, shared regulation of knowledge and sharing/debate of ideas. • The contribution of digital technologies to implement a collaborative and motivating learning environment, namely through the integration of transmedia narratives for the development of knowledge and skills in students.
2) the searching, screening and selection (sampling)	According to the principles of the IRL method, the databases consulted were not limited only to scientific articles databases. Other relevant academic databases were included, such as the Portuguese Open Access Scientific Repositories (RCAAP), the Scientific Electronic Library Online (SCIELO), ERIC, along with Web of Science and Elsevier. The following search strings were used: orchestration AND learning; collaborative work AND digital technologies, learning monitoring OR construction of knowledge and the search filters were transmedia narratives and mathematical contexts published from 2013 to 2023. Inclusion and exclusion criteria were defined according to title, abstract and full text. After the initial search 52 full text selected documents were found and read and 36 references were included in this literature review.
3) critical appraisal of selected information (data collection)	Of the 36 references used for this paper, the following information was selected: • Existence of a conservative approach – there are still educational contexts that do not fully reflect digital technology – implies a creative and collaborative approach. • Teachers and students with different perspectives – the teacher is responsible for managing the efficiency of digital technologies in class. • Strategies to support learning: collaborative work, different digital technologies, motivating students with the development of a story and capturing their attention to the syllabus – transmedia narratives. • Putting the student at the center of learning, which poses new challenges to teachers: a more dynamic and motivating classroom environment. • Realize the practical application of mathematics in real situations to promote mathematical reasoning, have students motivated, adjust the level of task demands, offer mediated support and creating opportunities to reflect. • Putting the teacher in a regulatory role to promote more autonomous students.

4a) extracting data (data analysis), 4b) synthesis of extracted data and thematic analysis	From the evidence found in the literature, clarified in step 3 and the selection of the final analysis, this review was developed around 4 main constructs: • The use of digital technology in educational contexts. • Transmedia narratives in support of learning. • The importance of context in mathematics as a bridge to the creation of meaningful environments. • Orchestration: Role of the teacher in monitoring learning.
5) presentation data	The four constructs mentioned in step 4 will be presented in detail in the next section (results).

Table 1 - Steps of integrate literature review.

III. Results

This section presents four subsections that form the thematic analysis of the integrative literature review method (step 4b): ´The use of digital technology in educational contexts`, ´Transmedia narratives in support of learning`, ´The importance of context in mathematics as a bridge to the creation of meaningful environments' and 'Orchestration: Role of the teacher in monitoring learning`.

a. The use of digital technology in educational contexts

This section presents Learning, guided by the appropriation and renewal of knowledge, implies the adoption of educational methodologies that engage students in dynamics which foster the development of learning in interaction with others. Ramos & Moreira (2014) clearly present the determinant role of communication technologies at the service of the teaching and learning process, when they mention them as "key elements" with the potential for motivation and innovation, an opinion supported by Camacho & Esteve (2016), when they emphasize the power of technology and its potential in different disciplinary areas. However, Ramos & Moreira (2014) also reinforce the gap between this potential and its full exploitation in the education sector, highlighting the fact that communication technologies are still used for the transmission of knowledge.

In the perspective of the authors, this approach is not compatible with the requirements imposed by the Knowledge Society, for which students must prepare themselves throughout their school / academic years. Countless limitations have been identified in the current education system regarding the full integration of technology and a transversal exploration of its potential in learning and, consequently, in students' motivation. Some of the reasons for this are: the fact that teachers and students generally have very different experiences in dealing with technology (Ferreira, 2016); the still scarce implementation of alternative pedagogical strategies more focused on education for knowledge and innovation; the specific setup of most classrooms which is unsuitable to the needs of a student-centered learning process, not taking into account the important role that technologies assume in their daily lives (Camacho and Esteve, 2016) and time constraints and the volume of additional work associated with teachers' continuous training in the area of technologies (Ferreira, 2016). These are some of the reasons mentioned in the literature exploring why many teachers are reluctant to integrate the use of these technologies in their pedagogical practices.

Knowledge is built from the interaction and confrontation of ideas and people and communication plays an essential part on this process. The continuous negotiation, sharing and mutual engagement of the students contribute to the joint building of knowledge, and, in

this context, the teacher should act as a facilitator of the processes inherent to the building of knowledge, ensuring the support and monitoring required for learning (Sharples, 2013).

The main objective of any education system is to promote learning, requiring thus that the teacher knows, masters and even combines several pedagogical strategies, including the role of technology as a medium for the promotion of flexible models of learning and teaching, which are increasingly enriched from the point of view of the technological mediation that they promote. Zancanaro et. al (2015) refer to the relevance that the concept of open access to learning has currently been acquiring, because knowledge is considered to be a right for all and should therefore be accessible to the majority. In this context, the authors emphasize the determining role of technology, specifically the Internet, for the disseminating role and the opportunities it generates in terms of the use, re-use, review and distribution of knowledge.

However, the use of digital technology in the teaching and learning process, in addition to allowing the use of different media in the school context, may also reflect the difficulty of adapting to the changes in the use of different digital technologies and new types of language. Among the multiple components that these pedagogical approaches can present, the expectations of teachers and students may not coincide. This problem is defined by Pedro and Matos (2019) which highlight that teachers and students are sometimes on different levels of communication because they live in very different contexts at a social-historical level, sometimes resulting in maladjusted practices. Therefore, they suggest the need for teacher training in digital technologies so that the use of different digital tools can provide them with new skills and new learning scenarios, drawing them closer to the reality of students. This principle should foster the implementation of strategies that facilitate students' engagement in activities leading to the construction of knowledge.

b. Transmedia narratives in support of learning

Different digital technologies can be used in a transmedia narrative approach. The term transmedia refers to a communicative practice in which a narrative is told through multiple media, using the best of each one to generate interest in students and hold their attention (Scolari, 2016). Current studies indicate that storytelling can act as a stimulating factor in keeping students engaged, although it is not known precisely how developed the narrative must be to attract students' attention (McCarthy, Tiu, & Li, 2018). The use of transmedia narratives in support of learning appears to allow the articulation of pedagogical content with the activities of the students' daily lives in terms of collaborative work, information sharing and interaction (Fleming, 2013; Pereira & Ferreira, 2018). From this point of view, transmedia narratives can help the teaching and learning process by allowing the development of strategies that encourage students to produce content and bring them closer to the technologies that they use daily outside of the classroom, and thus be active participants in their own education process.

Branco and Costa (2013) share the same opinion as they consider that transmedia narratives can enhance stronger links to content, establishing an effective strategy in the scope of learning. The fact that transmedia narratives allow access to different types of media encourages students to be motivated and curious about the unfolding of the story, being actively engaged in the acquisition of knowledge and the development of the story. "Recent studies have found positive impacts in transmedia learning environments, including a deepened motivation to engage in academic content and persevere in problem solving; the creation of unified learning experiences by means of integrating knowledge and skills, and gains in student achievement" (McCarthy, Tiu, & Li, 2018, p.224-225). In this process, the increase in creativity becomes evident in the process of research and in the direction of the solutions found to the challenges proposed for the development of the story (Pereira &

Ferreira, 2018). Loertcher (2014) presents three important characteristics for the development of a story: personal experience, cooperative group work and collaborative intelligence. The transmedia narrative thus may contribute to the development of creativity by providing students with an environment conducive to knowledge sharing and collaborative work (Branco & Costa, 2013; Pereira & Ferreira, 2018).

The convergence of different media can promote a more realistic emotional engagement resulting in productive pedagogical experiences where the student assumes a central role in learning in an integrated and motivated way (Fleming, 2013). The appropriation and integration of these digital technologies will introduce a new pedagogical reality, especially for the teacher (Sung et al., 2016). Recent studies indicate that teachers who have used transmedia narratives with their students recognize their potential as a way of supporting mathematical learning in which students collaborate and solve problems as a team (McCarthy, Tiu, & Li, 2018).

In this context, the teacher can take advantage of the strengths of each application to enrich the teaching and learning process (Fleming, 2013). However, you will also have to compete with attention span limitations and the concentration capacity of students when integrating these digital technologies in the teaching and learning processes, as they are strong and stimulating distractions. In these cases, it sometimes conditions the students' academic performance (Shirky, 2014). In this line of thought, the role of the teacher is fundamental in the efficient management of all moments of interaction brought into educational contexts by digital technologies in general, and transmedia narratives in particular, transforming the classroom into a more significant and innovative space (Pereira & Ferreira, 2018). In fact, every teacher desires a more dynamic and motivating classroom environment with learning strategies in which students can be engaged Fleming (2013). Pereira & Ferreira (2018) refer, however, some criteria which need to be considered in a transmedia project, namely: the skills to be developed, the platforms to be used and the creation of an emotional connection to the content.

In view of this information the next subsection "The importance of context in mathematics as a bridge to the creation of meaningful environments" covers mathematics in situations that encourage the teaching and learning process to be more contextualized and motivating.

c. The importance of context in mathematics as a bridge to the creation of meaningful environments

In mathematics, it is fundamental to understand what drives students to learn the subject so that meaningful contextualized paths are developed. Prestridge (2017) reinforces that the use technology in contextualized pedagogical content meaningful to students favors the process of their engagement with the learning process, as researchers, creators and evaluators of the learning process itself.

This approach to mathematics can foster interest in the subject, allowing the progression into program contents with an understanding of the relationships, the procedures, and the concepts (Kindt, 2004). These aspects are extremely important since most students think that mathematics is based on memorized rules and often do not understand how to apply them. This finding emphasizes the need to develop students' capacities to research, understand new situations and build associated meaning (Fernandes, 2018). In this line of thought, transmedia narratives may help to establish connections, because the ability to interact technologically with people and knowledge of a different nature is essential to the evolution of concepts (Fleming, 2013). This evolution of concepts takes place either through the communication and sharing of ideas, or through the formulation of conjectures with sustained argumentation which is so important in mathematics. The use of diversified teaching methods may create stimulating learning situations that are fundamental to

promote students' mathematical reasoning. To this end, it is important to select the most appropriate tasks, but also to consider the teacher's professional practice in implementing actions that support the development of students' mathematical reasoning (Mata-Pereira & Ponte, 2018). Because the selection of task proposals is essential to the success of students' learning, it is essential to determine the type of task and the way students are engaged in them as well as the type of interactions that may arise in their completion. The same authors point out that the mathematical tasks which most enhance the development of mathematical reasoning are problem solving and exploration and investigation activities.

Therefore, for learning to occur it is necessary that students feel motivated to express enthusiasm in carrying out activities (Jesus, 2008). Mata-Pereira and Ponte (2018) support this perspective and claim its use in mathematics learning contexts so that there is student engagement in solving the proposed tasks. However, a high level of complexity may bring about a loss of motivation and lack of interest on the part of the students. To prevent this situation, it is essential to promote different interactions among the students, such as peer learning, to encourage them to explore, discuss and present their reasoning processes. In this way, persistence in a challenge, with tasks of a varied nature, may lead to the exploration and resolution of problems that stimulate the development of mathematical reasoning (Araman, Serrazina, & Ponte, 2019). Motivation is closely linked to action, to its dynamics, which can initiate, maintain, persist, end or inhibit a determined task (Fontaine, 2007). Fontaine (2010) also states that in these circumstances the type of feedback offered to the students is decisive, being necessary a balance between praise and criticism. However, Fontaine (2010) differentiates praise/criticism centered on the individual and praise/criticism centered on the strategies of problem solving, the attention and the effort invested. The first focuses on the internal characteristics of the person who receives the praise/criticism because he evaluates himself based on his results. The second highlights the usefulness of the analysis of results to identify effective strategies and behaviors or to reflect on them and modify them in order to make them more efficient. From the teacher's point of view, it is necessary, then, to redirect learning to a stage where the student learns to interpret meanings and is directed to a dynamic participation with the content and the pedagogical practice.

In mathematics, more specifically, Mata-Pereira and Ponte (2018) highlight questioning as an action to promote students' mathematical reasoning, and the teacher's attitude is a crucial aspect in monitoring activities in order to support students' reasoning. If the clues given to the students are excessive, the teacher runs the risk of not challenging them, leading to the resolution of the task without the stimulus and support required to develop mathematical reasoning. However, this does not mean that there no indications are provided because students need to feel that they are being supervised and that mediated support is sufficient for the development of mathematical reasoning.

It is therefore extremely important that the teacher establishes precise objectives for the discussion of the tasks proposed to the students and to expand the formulation of questions that promote reasoning and direct knowledge construction. Since mathematical reasoning is a set of complex mental processes, the acquisition of new knowledge is based on prior knowledge to validate true propositions (Araman, Serrazina, & Ponte, 2019). The teaching and learning process provided in this way may enable the understanding of concepts, properties, and procedures useful for learning. However, the existing knowledge is not the only factor to take into consideration. It is also important to focus learning on the student. For this purpose, Blau & Shamir-Inbal (2017) suggested the "flipped classroom" pedagogical model. This model underlies the fact that technology rises as a mean and not an end to the learning and teaching process, never replacing the crucial role of the teacher.

The "flipped learning" pedagogic strategy proposed by the Association of Flipped Learning Network (2014, Blau & Shamir-Inbal 2017 page 71), as an innovative alternative to the

previous "flipped classroom" concept, frames a dynamic and interactive learning environment. Camacho & Esteve (2016) strengthen this idea when stating the implications that derive from the introduction of technology in the educational process of teaching and learning. Moreover, they support the replacement of the unidirectional teaching method by a more flexible and multidirectional dynamic process, where teachers and students learn from each other.

In this context, the teacher promotes support and monitorization to the student in a creative and responsible process of knowledge building. Blau & Shamir-Inbal (2017) also present a more solid version of this pedagogic strategy, splitting it into two parts having in consideration the context, the communication model, the developed competences, and the type of interaction. On one side, there is a moment of active learning in the classroom, which is generally based in synchronous communication made mainly in group and focused on critical thinking development. On the other side, the process of learning is self-regulated and based in asynchronous communication in which the learning process occurs in an individual rhythm, supported by technology, and centered in the access to knowledge (Blau & Shamir-Inbal, 2017). It is the teacher's responsibility to create challenging learning environments that enable discussion in the classroom to achieve the best solution to the problem and, consequently, provide students with the opportunity to think and reflect in problem solving and in the learning process.

d. Orchestration: Role of the teacher in the monitoring of learning

In the context of teaching and learning, there is a need to adopt approaches that, as Ramos & Moreira (2014) refer, may replace a traditional approach with a more participatory and collaborative learning approach. Such a change naturally implies changes in the roles and dynamics of interaction between teachers and students, in order to provide greater enthusiasm, interest and motivation in the learning process. Thus, it becomes essential that there is a monitoring of learning by the teacher so that students can reflect on their learning by questioning, intervening, reflecting, and debating ideas with each other, relating, and interacting between groups or peers. This role of facilitator and regulator of pedagogical situations is extremely important to help the students become more autonomous and independent. Regarding the understanding of contents, the autonomy of the students is a fundamental characteristic to willingly take on responsibility for learning and required awareness of this process and from the teacher's point of view, there is monitoring of learning: orchestration process (Scolari, 2016).

Prieto and Guttiérrez (2011) also defend the notion that the role of the teacher in the orchestration process should lead to the construction of knowledge, within the scope of student-centered methodologies under the teacher's supervision. Orchestrating learning therefore implies to know and understand students with different learning profiles and creating a series of differentiated approaches to support the learning process, in which technology can emerge as an ally and facilitator of knowledge acquisition. Tchounikine (2013) refers to the "orchestration" ("conducting") phase, in which students are the main actors, under the teacher's view, management and support. According to the author, the teacher should reevaluate pre-established decisions, in order to reduce constraints and guarantee the full implementation of learning objectives, being able to analyze and monitor the performance of the agents and means involved, providing support and suggestions to the students, changing schedule (if necessary), changing deadlines or even the location of students by group. In the author's perspective, as the one responsible for the orchestration process, the teacher should allow the students some flexibility, sharing with them responsibility, namely regarding technological decisions (eg. which tools to use), as well as, in some cases, contextual decisions.

According to Dillenbourg (2013), learning must therefore deal with three intrinsic constraints: the contents to be taught (what), the characteristics of the students (who) and the way the brain builds knowledge (how). In this context, orchestration assumes a prominent role in promoting the student's social and cognitive interaction and, regarding the teacher, aligning his monitoring with the students' mode of action, favorable to the construction of knowledge in environments that are motivating and structured (Dillenbourg, 2016; Tchounikine, 2013). The use of digital technologies should, therefore, favor the exchange of ideas and collaborative work between stakeholders, and particularly students, who cease to be spectators and have a more intervening role in the learning process itself (Smith et al., 2017). This knowledge should be focused on realistic goals providing the implementation of activities that will give the students an opportunity to reflect and to resort to his own reasoning, resulting in a more flexible pedagogical approach. The promotion of autonomy, mediated by the presence of the teacher, should allow a sequential structuring of contents and activities, above all by preventing situations of dispersion and providing the student with a guiding line of the sequence of contents to be worked on. During the process of promoting students' autonomy it is necessary to ensure several levels of interaction to facilitate the access and the comprehension of information or the interaction between students and the didactic content. This structuring gives the student some freedom to choose the moments in which he prefers to carry out the activities assigned as autonomous work, guaranteeing what Wedemeyer (1981) so strongly defended and mirrored in his "theory of independent study", regarding the importance of giving the student the possibility of autonomous activities, at moments chosen by him.

The teacher must, therefore, be attentive to the students' communicative capacity and, in an initial phase, should not interfere substantially with corrections in order to stimulate their natural autonomy in the teaching and learning process. It is precisely at this stage that the teacher must put direct observation into practice, making notes of good collaboration among the students or of aspects that require moderate correction afterwards, during the period of reflection on the work done among the various elements of the working group. This is the ideal moment to instill in the students the necessary awareness to overcome any doubts that they may have, acquire validation and encourage the student to start using similar strategies in a more confident and autonomous way.

In this perspective, the balance between the structure and the level of dialogue promoted is both the greatest challenge and the greatest opportunity for more student-centered pedagogical approaches. These approaches are promoters of learning by self-discovery and based on collaborative work among peers, enabling conditions more conducive to the creation of autonomy in students.

IV. Discussion and Conclusions

In this article we chose to do a literature review focused on the use of transmedia narratives to support learning, more specifically in the learning of mathematics. This subject, due to its practical characteristics, encompasses the need to establish connections with reality. This approach may help to better understand the usefulness of the subject in everyday life and motivate students to become more engaged in narrative domains while also improving students' autonomy.

Digital technology imposes challenges on society as well as on education. So, in a pedagogical sense, it's important to find appropriate methodologies that may correspond to the students interests of an educational context where environments that promote interaction and sharing are created to provide more motivating and meaningful learning for

students. The quality of learning and the benefits resulting from those environments turn the teaching and learning process more contextualized and dynamic, compatible with XXI century society skills' needs and demands.

In this sense, the production of content crucial to the development of mathematical learning through the creation of transmedia narratives that bring the subject closer to meaningful real or fictional stories can be a relevant factor to motivate learning and bring students closer to the subject. The importance of the teacher in conducting this learning process and the challenge of selecting tasks to promote mathematical reasoning is also highlighted. In view of these considerations, the role of the teacher as an orchestrator in the teaching and learning process is extremely important, trying to manage, on the one hand, the technological possibilities in learning and the favoring of autonomy and, inevitably, on the other hand, competing with the attention and multitasking that these resources can bring in this context.

Therefore, the process of orchestration should lead to knowledge building, based on methodologies centered in the student supervised by the teacher. This methodology might facilitate the establishment of productive interactions, such as question creation and discussion of opinions, leading to reflection and reasoning based on acquired knowledge. This approach is expected to improve student's performance and, consequently, helping him to reach better learning results. Thus, knowing and understanding students with different learning profiles and creating differentiated approaches are useful strategies to mathematical learning. Hence, the individual learning rhythm is respected being a self-regulated learning process. These aspects are determinant to develop students' autonomy and so that they are familiarized with the program contents.

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Narratives transmèdia en l'ensenyament i l'aprenentatge de les matemàtiques: desafiaments a la pràctica del docent com a orquestrador

Resum

L'ús de tecnologies digitals com a suport al procés d'aprenentatge pot contribuir a una forma més dinàmica i participativa de desenvolupar el coneixement. Les narratives transmèdia assumeixen característiques congruents amb això en facilitar la incorporació de metodologies educatives que fomenten habilitats daprenentatge en interacció amb dispositius digitals durant l'exploració d'una narrativa. Simultàniament, en el cas de les matemàtiques, molts estudiants interpreten la matèria sense connectar-la amb el seu context social i, per tant, no comprenen la seva aplicabilitat i utilitat al món real. Aquest article presenta una revisió de la literatura relacionada amb aquests conceptes i la seva interacció en l'aprenentatge de les matemàtiques. Es va realitzar una revisió integrativa de la literatura seguint cinc passos per recol·lectar evidència a la literatura: 1) formulació de la pregunta de revisió, 2) cerca, cribratge i selecció (mostreig) d'informació, 3) avaluació crítica de la informació seleccionada (recopilació de dades), 4a) dades extracció (anàlisi de dades), 4b) síntesi de les dades extretes i anàlisi temàtica, i 5) presentació de dades. Es va trobar que les pràctiques dels docents com a orquestradors i facilitadors de l'aprenentatge i l'impacte de les narratives transmèdia en l'intent de motivar els estudiants els apropen a les matèries matemàtiques explorades a les classes.

Paraules clau

Matemàtiques contextualitzades; aprenentatge; narratives transmèdia; professor com a orquestrador

Narrativas transmedia en la enseñanza y el aprendizaje de las matemáticas: desafíos en la práctica del docente como orquestador

Resumen

El uso de tecnologías digitales como apoyo al proceso de aprendizaje puede contribuir a una forma más dinámica y participativa de desarrollar el conocimiento. Las narrativas transmedia asumen características congruentes con esto al facilitar la incorporación de metodologías educativas que fomentan habilidades de aprendizaje en interacción con dispositivos digitales durante la exploración de una narrativa. Simultáneamente, en el caso de las matemáticas, muchos estudiantes interpretan la materia sin conectarla con su contexto social y, por tanto, no comprenden su aplicabilidad y utilidad en el mundo real. Este artículo presenta una revisión de la literatura relacionada con estos conceptos y su interacción en el aprendizaje de las matemáticas. Se realizó una revisión integrativa de la literatura siguiendo cinco pasos para recolectar evidencia en la literatura: 1) formulación de la pregunta de revisión, 2) búsqueda, cribado y selección (muestreo) de información, 3) evaluación crítica de la información seleccionada (recopilación de datos), 4a) datos extracción (análisis de datos), 4b) síntesis de los datos extraídos y análisis temático, y 5) presentación de datos. Se encontró que las prácticas de los docentes como orquestadores y facilitadores del aprendizaje y el impacto de las narrativas transmedia en el intento de motivar a los estudiantes los acercan a las materias matemáticas exploradas en las clases.

Palabras clave

Matemáticas contextualizadas; aprendizaje; narrativas transmedia; profesor como orquestador

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