ARTICLES

Flow theory and learning in the Brazilian context: a systematic literature review

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Abstract

Flow theory derives from Positive Psychology and addresses an individual's optimal state of conscience Flow state provides the individual high concentration, relaxation, control over anxiety, and satisfaction while performing a certain task, originating from the optimal state of conscience that is experienced when achieving the proposed objective. Thus, this study aims to conduct a systematic literature review to understand how flow theory is being used in the context of education and learning in Brazil. We conducted a search for publications in the databases SciELO, Index Psi, LILACS, PePSIC, PsycINFO, BDTD, and the Capes platform. Two hundred and sixty studies were found, however, only 5 met the inclusion criteria of this study, that is, to present flow theory as the main theme, to be linked to education, and to be a study conducted in Brazil. From the selected articles, it was possible to identify that, in Brazil, flow theory is being used within music, physical education, language and computer engineering teaching. Thus, aiding the motivational process, promoting cooperation, participation and engagement of teachers and students in teaching and learning environments. Despite this, the scenario of publications in this field is still reduced.

Keywords

Flow theory - Learning - Education – Psychology.

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Introduction

Flow theory was elaborated by Mihaly Csikszentmihalyi during the 1970s. Deriving from Positive Psychology, it explains the flow state or *flow feeling* phenomena, which is an optimal psychological state of conscience (MIRANDA JÚNIOR *et al.*, 2012). It is an intrinsically engaging state in which there is a balance between the difficulty presented by an activity and the individual's ability to perform it (GOMES *et al.*, 2012). In this state, the individual finds himself highly involved in the activity, focusing specifically on it and pushing away any thought that may interfere with the process (GOMES *et al.*, 2012). Hence, canceling out experiences of apprehension and worry and optimizing performance (MIRANDA JÚNIOR *et al.*, 2012).

For Csikszentmihalyi (1999), flow state is, most of the time, more easily achieved by people with an autotelic personality. That is, people who execute a task simply for the pleasure provided by the experience and not for any external reward. When in a flow state, the individual has complete attention to the activity in order to achieve his objective, which will then provide satisfaction (CSIKSZENTMIHALYI, 1990). The author states that the more frequently an individual organizes his conscience and has flow experiences, the better his quality of life (CSIKSZENTMIHALYI, 1990).

Csikszentmihalyi (1999) points out that, generally, the time individuals have available is limited to three domains or functions: productive (work), maintenance, or leisure. Such domains or functions take place in various environments and circumstances and absorb our psychic energy. Within these three domains, the content and quality of experiences depend on how time is allocated and profited, as well as on how the individual feels while performing a given task. These tasks involve information that when absorbed by people generate certain feelings. For the task to be considered pleasurable and satisfactory, it must generate positive feelings (CSIKSZENTMIHALYI, 1999).

Csikszentmihalyi (1990) described traits that may characterize an individual in a flow state: clear notion and understanding of what must be done at each moment; immediate performance *feedback*; balance between capacities and/or abilities and the task's difficulty; profound concentration; dismissal of irrelevant content; a sense of control over the activity; losing track of time; a feeling of gratification or pleasure.

Internationally, researchers have a great interest in flow theory. After its conception in the 1970s, many studies and instruments focusing on flow theory designed for various contexts have been developed. Csikszentmihalyi (2014) conducted studies on the future of flow theory, ideal experiences, application of flow theory in human development and education, among other works. Other authors have used the theory for purposes such as: comparing flow results of American students, obtained by Kleiber, Larson, and Csikszentmihalyi (1986), with a sample of Italian students (CARLI; FAVE; MASSIMINI, 1988); understanding the effects of flow experience in the learning process, which was found to provide positive results (ERHEL; JAMET, 2019). Also, flow theory has been used as a model to increase students' resilience (PARR; MONTGOMERY; DEBELL, 1998); for human-computer interaction (GHANI; DESHPANDE, 1994); to assess the impact of certain

activities on motivation (CHAN; AHERN, 1999); and to understand the state of conscience during sports activities (YOUNG; PAIN, 1999).

In the sports domain, studies progressed due to the development of scales to measure flow experience (JACKSON; MARSH, 1996). Regarding the education context, flow theory is internationally consolidated. Also, many scientific works on human development and educational and cultural processes are available (CSIKSZENTMIHALYI, 2014). In 2014, a scale to measure flow experience in the educational setting was developed, being used from primary school to university (HEUTTE *et al.*, 2016).

However, in Brazil, the literature is still scarce, mainly comprising studies on sports, more specifically volleyball (GOMES *et al.*, 2012); consumer behavior (FARIAS; KOVACS; SILVA, 2008); *flow* experiences in adventure tourism (STRASSBURGER; MACKE, 2012); and the educational context (ARAÚJO, 2013; CHALLCO *et al.*, 2016; LOUREIRO, 2009; QUADROS, 2016; VAGHETTI, 2013). Nevertheless, a significant increase in the use of flow theory has been observed in Brazil since 2009. Still, the studies are mostly gray literature, that is, consisting of theses and dissertations, which were not necessarily published in journals or peer-reviewed.

Considering this, are there advancements in the use of flow theory? What is the scale of flow theory in the Brazilian education context? What educational strategies are used based on it? Identifying and understanding how this theoretical approach is being used in education allows us to perceive new forms of knowledge production. Once this analysis is carried out, it will be possible to understand how and to what extent the theory is being used in Brazil, which will then allow the elaboration of new study objectives. Thus, this study aims to conduct a systematic literature review to understand how flow theory is being used in the Brazilian educational and/or learning context, considering all studies done until 2019.

Methodology

Research and analysis of the material

A search in the databases Scientific Electronic Library Online (SciELO), PePSIC, Index Psi, LILACS, PsycINFO – of the American Psychological Association (APA) –, BDTD, and Capes platform was performed, using the search string "flow theory" AND "education" OR "flow theory" AND "learning" OR "flow theory" AND "psychology". The descriptors and boolean operators were established after reading the material that addressed the theme.

Since this study has an interest on knowing how flow theory is used in education and/or learning in Brazil in a wide sense, a time period for the search was not delineated, therefore, avoiding the exclusion of articles relevant to this review. To understand the scale of the scientific literature on flow theory in education, we started from the following research question: how is flow theory being used in the Brazilian educational and/or learning scenario? We intend to understand how this relationship occurs, what educational approaches use this theory, and what are the future perspectives of this field (Table 1).

Table 1 – Research questions

Questions	Description
Q1. What methodologies are used in the studies?	This research questions is aimed at understanding what methodologies are being used in the studies, whether they are qualitative and/or quantitative, empirical or theoretical.
Q2. What are the studies' publication trajectories?	This question is aimed at identifying what is the publication trajectory of studies that use flow theory in the educational and/or learning scenario in Brazil.
Q3. What are the fields of interest of flow theory in Brazil?	This question is aimed at knowing what are the fields of interest of flow theory in Brazil.

Source: Research data.

To meet the inclusion criteria of this review, the studies had to present flow theory as the main theme or theoretical approach, be associated with the educational and/or learning field, be conducted in Brazil, and be fully available for access. The exclusion criteria regarded duplicated studies among the databases, and studies not available for access.

Categorization and data assessment

To verify the inclusion criteria, we read the titles, abstracts and keywords of studies. When the term "flow theory" was not found in any of these items, we proceeded to reading the introduction and methodology of studies, in order to identify the theoretical approach of the studies. The journal's title and scope and the institutions in which the studies were made available were also examined in order to verify their fields of action. After this analysis, we considered all articles published in Brazilian education, Psychology, and multi-thematic journals, as well as theses and dissertations that met the parameters, except regarding publication in a journal. Upon completing the application of these criteria, the complete articles were retrieved for posterior analysis.

In total, 260 studies were found, two were from SciELO, five from BDTD, 10 from Capes, 14 from LILACS, and 229 from PsycInfo (Figure 1).

Thirty duplicated studies were removed and 225 studies remained after the titles, keywords, and abstracts were analyzed. Out of these, 220 were removed because they were not performed in the Brazilian educational and/or learning scenario, and because they did not present flow theory as a theme or main theoretical approach, merely citing it along the article. The final *corpus* was composed by five studies, which will be descriptively presented, addressing their nature, publication date, methodology, themes, fields of knowledge, and future perspectives.

Figure 1 – Analysis of studies flowchart
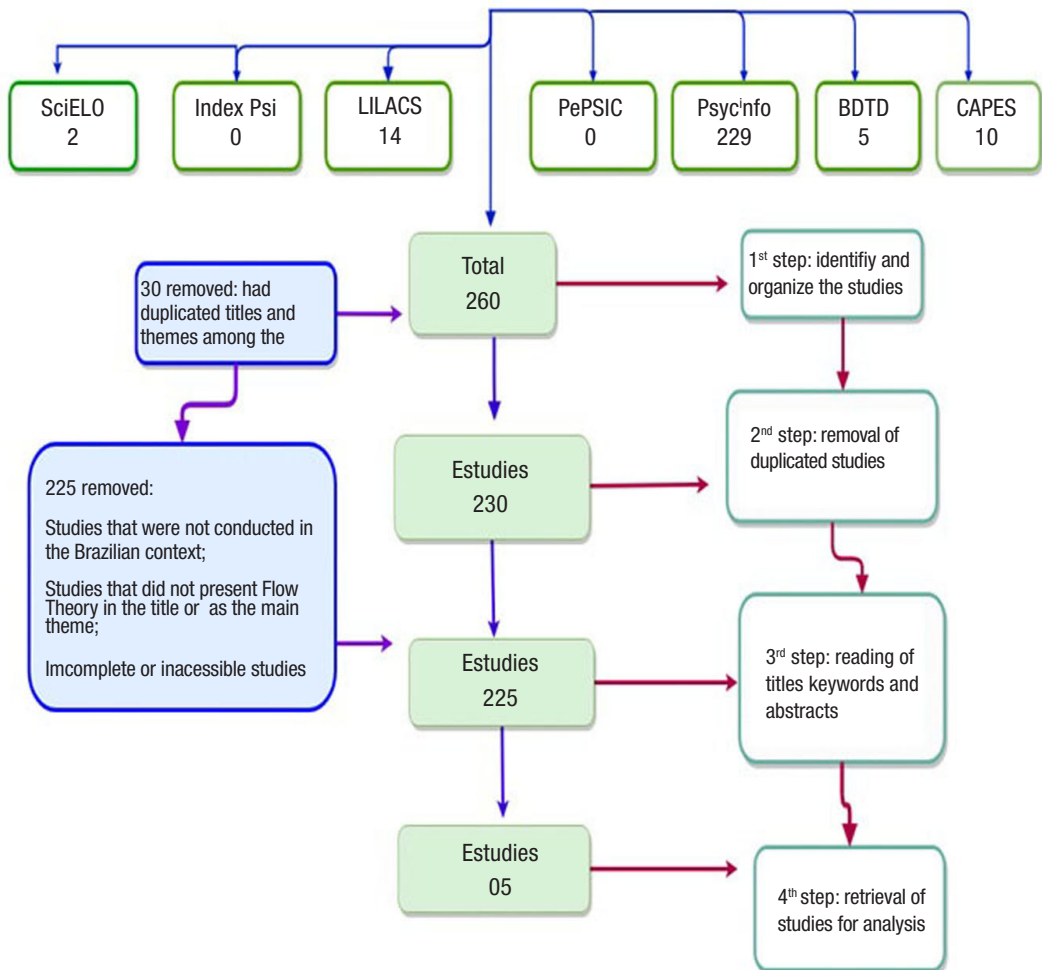
Source: Research data.

Results

The results demonstrated that the works concerning specifically education, learning and flow theory started in 2009, with the study of Loureiro (2009). This article assessed the internal cohesion of virtual learning communities. Thus, it addresses flow theory associated with computer-mediated technologies, which is studied internationally since 1998 (NOVAK; HOFFMAN; YOUNG, 1998). Afterward, in 2013, two more studies that used flow theory were published, this time associated with music teaching (ARAÚJO, 2013) and human-machine interaction, specifically the use of *exergames* in physical education teaching (VAGHETTI, 2013).

Flow theory is scarcely seen in publications until 2016, when two studies were published, which used the theory associated with gamification for language learning (QUADROS, 2016) and gamification for the development of abilities and knowledge acquisition (CHALLCO *et al.*, 2016). These studies were likely influenced by international research in the field, considering that articles addressing these themes exist since 1999 (CHAN; AHERN, 1999), within the scenario of adaptation of the theory to pedagogical *design*.

In the years 2018 and 2019, no publications regarding the investigated themes were found. However, it is worth highlighting that this search was performed until October 2019. On the other hand, in the international scenario, studies on these themes were more expressive and aimed to understand the impact of flow and the benefits of flow stages for educational processes (ERHEL; JAMET, 2019). As seen by the small number of remaining publications for this study, the evidence available in the national literature is incipient. Out of the five works analyzed here, three are doctoral theses and only two are articles. The two articles were published in the *Percepta* journal and the *Journal of Educational Technology & Society*. The studies were published in 2012 and 1999, respectively. The first journal specializes in music and cognition related to musical practice. The second comprises a collection of interdisciplinary studies in the fields of science, technologies, and society (CTS). In the 2013-2016 triennium, these journals were classified as B2 by Capes.

The final material for this study was produced and/or published by Brazilian authors. Regarding the doctoral theses, two were from federal higher education institutions (IFESs), namely, Loureiro (2009) and Vaghetti (2013), from the Federal University of Ceará (UFC) and the Federal University of Rio Grande (FURG), respectively. According to the evaluation of the Ministry of Education (MEC), in 2017, UFC obtained grade 5, while FURG obtained, in 2016, grade 4. In its turn, the thesis of Quadros (2016) was from the Catholic University of Pelotas (UCPel), which is a private institution that obtained, in 2016, grade 3 in MEC's evaluation. This information is relevant because it indicates the institutional quality of each university, considering, specially, research and teaching, which have a direct impact in the quality of the work developed within these institutions, such as the ones analyzed in this study.

Regarding the studies' nature, we adopted the notions of empirical, theoretical and mixed-nature studies. Empirical studies are understood as those that address reality itself and produce data for further analyses (BAFFI, 2002). Theoretical studies are defined as those that seek to reconstruct theoretical and conceptual data to subsequently explain a given reality (BAFFI, 2002). Mixed studies are those that associate those two methods. The three doctoral theses found consisted of empirical mixed-nature studies, that is, both quantitative and qualitative. Quantitative studies use research hypotheses, statistics, and present the opinions and information from the environment in numbers (RODRIGUES, 2007). Qualitative studies describe reality subjectively, without quantification, and data analysis is done through interpretation and by assigning meaning to the phenomenon (RODRIGUES, 2007).

The studies published in journals have a theoretical/qualitative (ARAÚJO, 2013), and qualitative/conceptual character (CHALLCO *et al.*, 2016). The study of Loureiro (2009) is a mixed-method study and briefly describes the methodology. The researcher conducted a longitudinal study and examined social interaction occurring in virtual higher education environments that possessed technological elements (Models of Internal Cohesion of Learning Communities - ACICVA) needed to become a virtual learning community. The data were collected through observation, semi-structured interviews conducted in person, and questionnaires with objective answers to measure the interaction between individuals and the system. After this step, the researcher identified interactions that generated virtual learning communities and measured the cohesion levels through the quantitative data.

Araújo (2013) conducted a bibliographical study based on flow theory and the self-efficacy beliefs theory, interspersing the processes of these two theories with the teaching-learning process of music, considering the implications of these in cognition and musical education. However, the methodological information was not clearly described, such as the study selection criteria, search string, and databases. Thus, this information had to be inferred by readers. The empirical studies of Vaghetti (2013) and Quadros (2016) described information such as participants, instruments and procedures. The study of Vaghetti (2013) was performed in two educational institutions, one of private and another of public initiative, with individuals at school and university levels. The research was conducted during physical education classes and three complementary instruments were used: *exergames* (Xbox 360, Kinect Sports, multimedia projects, and stereos) and one measuring instrument, the questionnaire *Long flow state physical – FSS2*.

The work of Quadros (2016) is a mixed study and was done by assessing the motivational experiences of students within the English learning process using the *Ensino de Língua Online* (ELO) (Online Language Teaching) system, through the *English Marathon+* activity. To achieve the objective proposed, field notes, semi-structured interviews, a logbook, and the Flow State Scale-2 (FSS-2) were used. The study was conducted with groups of students from different courses and age ranges, both in-person and *online*. Challco *et al.* (2016) performed a conceptual study, aiming to integrate a model of learner growth improved by flow theory (Learner's Growth Model Improved by Flow Theory – GMIF). With this purpose, the researchers presented a pseudo algorithm that performs this junction, showing the step-by-step for joining these two theories into one educational system.

Concerning the settings, the researches of Loureiro (2009), Vaghetti (2013), Quadros (2016), and Challco *et al.* (2016) were conducted in learning environments. The investigation of Araújo (2013) was done through a review of the data contained in the literature, aiming to contribute to the music learning field. The study differentiates from the others because it was not performed in an *online* learning setting, even though it also focused on the learning process (Table 2).

Educ. Pesqui., São Paulo, v. 48, e237870, 2022.

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Table 2 – Studies' description

Title	Type of product	Year	Authors	Purpose
Proposal of a theoretical model to assess internal cohesion of virtual learning communities (CVA) in higher education.	Empirical/quantitative and qualitative	2009	Robson Carlos Loureiro	Propose a model to assess the internal cohesion of virtual learning environments and provide a path for interventions that improve the quality of the learning community. A model based on flow theory was developed.
Self-efficacy beliefs and flow theory in the practice, teaching and learning of music.	Theoretical/qualitative	2013	Rosane Cardoso de Araújo	To address two distinct theories that, as concluded by the author, possess relevant elements for the teaching, learning and practice of music.
Exergames in networks: Physical Education in cyberspace	Empirical/quantitative and qualitative	2013	César Augusto Otero Vaghetti	Explore the use of exergame in Physical Education teaching in cyberspace with school children and university students, using flow theory and self-determination theory to assess the motivational aspects of participants.
Gamification in online language teaching	Empirical/quantitative and qualitative	2016	Gerson Bruno Forgiarini de Quadros	Explain how gamified elements may offer conditions for learners to get closer to a flow state during the process of learning a foreign language, using an online educational resource authoring tool.
Toward a unified modeling of learner's growth process and flow theory	Theoretical/qualitative	2016	Geiser C. Challco *et al.*	Propose a framework to integrate the growth process of students with flow theory, and provide adequate support for the instructional design of learning settings that induce and maintain students in a flow state.

Source: Study data.

The presented descriptions answer research questions 1 and 2, explaining the nature of the studies that used flow theory associated with education and/or learning in Brazil and, consequently, the publication trajectory of these researches. Upon completion of this step, we initiated the analysis of research question 3, which will be presented in a qualitative form, oriented by the titles of the studies that compose this review.

Proposal of a theoretical model to assess internal cohesion of virtual learning communities (CVAs) in higher education

The study of Loureiro (2009) proposed a model to assess interpersonal cohesion in virtual learning communities (CVAs) of higher education, considering how pedagogical approaches are implemented in these settings to facilitate the learning process. The same theoretical framework used to analyze in-person learning communities was used, with the intent of assessing aspects such as cooperation and interaction, which are characteristic of collective spaces.

To create this model, the author was inspired by concepts and categories of flow theory. The use of the theory to substantiate his evaluation model is justified by the fact that, taking into account the principle that well-being can be produced and experienced in human activity itself and not only through the satisfaction or achievement of a goal, it is possible to improve the quality of education in collective learning environments. Thus, establishing new directions for more effective relationships and interactions among individuals, improving the activities performed, the engagement of individuals involved and the relationships that permeate these settings.

In the study, postmodernity is presented as a factor for various psychosocio-anthropological changes associated with human interaction in all its dimensions. One of these dimensions would be learning communities, in which interactions are modified by aspects such as the environment, with the transition of real environments to virtual platforms (LAGUARDIA; PORTELA; VASCONCELLOS, 2007; LOUREIRO, 2009). These systems, according to Roberts (2009), contribute to the integration of individuals from different social settings for various periods of time, promoting experiences with a unique impact on education.

Loureiro (2009) focuses on e-learning, more specifically higher education e-learning, since it is a setting that uses various types of media. The study perceived the principles of ubiquity, accessibility, and intuitiveness in the virtual setting. However, such principles were achieved from a technological point of view and the same did not occur from a humane point of view. Thus, despite having the structures needed to improve personal relationships, there was no interaction and engagement among individuals during the proposed activities.

The lack of internal cohesion seen in the study of Loureiro (2009) is justified by the fact that some teachers were not familiar with the use of the internet and did not have a clear methodology, as well as the fact that some students had only been using e-learning for a short period of time and did not engage with the group. The results were different when the study was conducted with individuals who had been using the system for a longer period of time, which corroborates with the evidence found in the literature that states that e-learning requires technological literacy, so that the individual can search for additional material over the internet, install applications, send e-mails and perform other activities (PATTO, 2013; RAMOS *et al.*, 2014). The absence of such abilities can become a struggle for the student or even the teacher, reducing performance and desire to continue using the environment (RAMOS *et al.*, 2014).

Exergames in networks: Physical Education in *cyberspace*

This research of Vaghetti was conducted four years after the study of Loureiro (2009), which is considered a pioneering study using flow theory in the educational context. Vaghetti (2013) analyzed the use of a new category of *videogames*, the *exergames*, in physical education classes for students of elementary school and higher education. Flow theory and self-determination theory were used as the theoretical framework of the study because the author aimed to identify the motivational elements within the use of

these *games* in physical education classes. All the *games* presented a sport as the main activity, such as table tennis.

The author noticed that the use of virtual environments such as *games* induces learning strategies that can be applied to sports practice and physical activities in the real world, promoting them among elementary school and higher education students. It is deemed that game elements exert positive and/or negative influence on gamers, immersing the individuals in the activity, making them experience a high intake of information, an increase in logical thinking, reading capacity, concentration and memory accumulation (AVANÇO; LIMA, 2020; GHENSEV, 2010).

Since *games* possess elements that trigger all these benefits, the author states that, when practiced in a network, the *exergames* promote competition among players and elevate motivation. Hence, in these experiences, a high occurrence of flow state was seen. Thus, mechanisms used within game settings arouse the interest of individuals, leading them to be immersed in the activity and promoting an optimal consciousness experience (SCHEEL, 2019).

The study of Vaghetti (2013) used flow theory with the objective of boosting learning motivation, such as the study of Loureiro (2009). However, the latter did not obtain satisfactory results, differently from Vaghetti (2013) who, by using *game* mechanisms, was able to increase the motivation level of participants and, as a consequence, induce a flow state. Such result led the author to realize the importance of providing classrooms with an updated methodology, aligned with the digital era we live in, which can lead to benefits if used correctly in daily activities.

Moreover, the study showcased the relevance of immediate *feedback* for participants' game strategies, since it contributed to an increase in motivation with the use of *exergames* in *networked* modality, in comparison to *multiplayer* and *singleplayer models*. In the *networked* modality, more players were distributed within the groups, promoting the establishment of more relationships and interaction between individuals through cooperation and competition. Due to these factors, flow experience was more observed in this type of game. Therefore, the results proved the hypothesis that network *exergames can be used as social exergames*, that is, as a social network for the practice of physical activities. In this manner, even without obtaining the same motivation level in the three game modalities, the author was able to prove his research hypothesis. Thus, validating the use of *exergames* in physical education.

Gamification of *online* language teaching

In 2016, another study using a virtual environment in the teaching-learning process was developed, this time by Gerson Bruno Forgiarini de Quadros, encompassing the teaching of foreign languages in *online* platforms. Flow theory was used as a basis and the study aimed to explain how gamified elements can lead the individual to have a flow experience while learning a foreign language. Since the elaboration of the concept of gamification by Deterding (2011), this notion is being used with the intent of improving learning, efficiency and motivation of students (KAPP, 2012). Also, as cited before, the

use of game elements can lead individuals to have satisfactory flow experiences. In his work, Quadros (2016) points out that being in a flow state during the learning process may stimulate better performance, promoting the development of linguistic abilities and, consequently, the acquisition of a new language.

The author states that by measuring flow levels generated during learning activities of a new language, it is possible to improve the student's performance by promoting the development linguistic abilities with the *online* activities. Nonetheless, learning depends on the abilities and the difficulty degree of the activities mediated by educational resources made on the internet. These aspects are directly related to what is described by flow theory, since according to Mihaly Csikszentmihalyi (1999), profound engagement in a task and the balance between individual abilities and the task's difficulty are traits that characterize flow experience.

Although Quadros (2016) counted on flow theory as the core of his reasoning, we noticed that his work did not present the theory itself as the main focus, but rather gamification and how flow state may occur in individuals while using gamified platforms. His work, as well as the work of Vaghetti (2013), focused on the element of motivation within flow theory. Upon finishing the work, the author concluded that the use of flow theory for foreign language teaching is effective for promoting students' interest on learning, stimulating their motivation and improving their participation in the process.

Toward a unified modeling of learner's growth process and flow theory

In the same year the study of Quadros (2016) was developed, another work using flow theory was produced by Challco *et al.* (2016). The study uses the student growth model along with flow theory to develop a computer model that is able to connect these two theories. That is, associate flow theory with the student growth process. This methodology allows identifying an appropriate balance between the individual's abilities and the challenges proposed according to the student's development stages. Furthermore, the authors presented a pseudo algorithm that allows learning platforms *design* customization, which expands the possibility for students to enter flow state and remain in it (CHALLCO *et al.*, 2016).

To integrate student growth process and flow theory, the authors used a model called GMIF, which presents a difficulty scale divided into five points, ranging from easy to very difficult. Considering that to maintain an individual in a flow state it is necessary to focus on each shift of abilities development stage and then increase the difficulty of activities.

As well as showcasing the GMIF, Challco *et al.* (2016) present a pseudo algorithm for GMIF scales, which optimizes the process described before. With this it is possible to insert the model in online systems and expand teaching modalities, allowing the creation of GMIFs with different difficulty levels. The pseudo algorithm is defined by the authors as capable of calculating the number of levels that must be distributed in each activity, or rather, in each stage shift of the student.

The model presented by Challco *et al.* (2016) beneficiates the teaching-learning process by implementing collaborative teaching systems that promote flow experience, aiding students to achieve educational objectives, developing abilities, and, most importantly, promoting knowledge acquisition. Moreover, the authors propose that in future studies empirical research should be done to assess the model.

Self-efficacy beliefs and flow theory in the practice, teaching and learning of music

The study of Araújo (2013) presents motivational elements related to the practice and learning of music. For this, the author recurs to a literature review and researches that used both flow theory and self-efficacy theory. The authors searched for works done both nationally and internationally to explain the aspects related to motivation while practicing music. This would aid teachers, researchers and musicians themselves.

To discuss self-efficacy beliefs and music, Araújo (2013) analyzed the national studies conducted by Cavalcanti (2009) and Cereser (2011). Cavalcanti (2009) investigated the self-regulation process and autotelic beliefs in instrument practice of students who studied music at a University in Curitiba. Cereser (2011), in his turn, elaborated a scale to verify the self-efficacy beliefs of music educators. From the results of these two studies, Araújo (2013) understood the motivational aspects present within the music teaching-learning process. Considering the importance of self-regulation processes to focus on and manage the study of music in order to consolidate self-efficacy beliefs, there is a link between self-efficacy beliefs increase and the quality of music practice for students and teachers. Furthermore, it is important to reinforce that strengthening teachers' self-efficacy beliefs helps motivate themselves and their students.

To discuss the use of flow theory, the author examines the international works of Griffin (2008) and Troum (2008). With the use of flow theory as a theoretical foundation, Griffin (2008) perceived the adaptation of music students' difficulties to the activity, along with the establishment of clear goals. This significantly favored the learning progress of over half of the students who participated in the study. Troum (2008) established guidelines and strategies for music teachers to boost their students' learning with the observation of intrinsic necessities and adaptation to individual practice requirements. The author also points out flow experience elements within music practice, such as intrinsic motivation, the establishment of goals, and concentration.

After analyzing these studies, the author points similarities between the two theories, highlighting their contributions to the music teaching-learning process and self-regulation for teaching and studying music. Still, it is highlighted that the incentive for significant and rewarding musical practices, as well as the importance of subjective cognitive processes, such as attention, concentration, and positive emotions, allow the individual to act based on his subjective and social reality (BUENO; COSTA; BUENO, 2013).

Thus, it is noticed that, despite the reduced scientific Brazilian literature that uses flow theory, the studies that were conducted have an innovative character and use new technologies. For example, the study of Loureiro (2009), who used virtual teaching

communities to motivate individuals, not obtaining, however, an increase in interpersonal exchanges or changes in the quality of relationships established in the environment. Despite the evolution of pedagogical processes, regarding technological enhancement and availability of material, human change is still of great importance for adhering to these mechanisms. Virtual learning communities depend on the actions of individuals concerning the *modus operandi*. That is, there is adhesion to the system but there is no interaction or deep bond between the users, which contributed to the low levels of internal cohesion of the virtual community.

Vaghetti (2013) used *game* elements and strategies to promote individuals' motivation and, consequently, lead them to a flow state. Thus, what occurred was an implementation of technologies, compared to the study of Loureiro (2009), given that Brazilian educational technologies had a higher reach, seen with the use of these technologies by the sample of students from private institutions.

Quadros (2016) presents a study based on motivation, with the use of flow theory and gamified elements, which is an innovative methodology for the national scenario, considering that the term "gamification" was coined by Deterding (2011). The study showed satisfactory results, such as those of Vaghetti (2013), who shows the positive advances in the use of flow theory linked to motivational elements. The study of Araújo (2013), even considering it is a bibliographic review, articulates theoretical processes with the teaching-learning process in the music field. Lastly, Challco *et al.* (2016) propose an algorithm able to promote flow stages through individuals' abilities, which seems to optimize the process sought by other authors in the previous studies.

The studies present various constructs of flow theory. Nevertheless, the main focus lies on motivation (ARAÚJO, 2013; QUADROS, 2016; VAGHETTI, 2013), as a strategy to modify the learning process (LOUREIRO, 2009) and balance individuals' abilities with the challenges proposed in the activities (CHALLCO *et al.*, 2016). Furthermore, the empirical studies conducted in Brazil have well-established methodological frameworks, their research strategies are innovative and of great relevance to the educational and/ or learning context. Also, we noticed the authors' concern to perform studies using flow theory associated with the learning process in order to produce tools that are able to aid Brazilian education. Thus, all studies articulated theory and practice, either in the traditional school environment or in any other setting that involves learning.

In addition, the objective and research questions of this study were answered: flow theory associated with education and/or learning in Brazil is being used to optimize teaching-learning processes, making them increasingly lighter, cultivating motivation, pleasurable moments, promoting cooperation, competition, and participation in educational environments. (Q1) Regarding the methodological aspects, the prevalence of empirical qualitative-quantitative studies was identified; (Q2) The production of scientific literature that uses this theoretical approach in Brazil may be considered as slow, being stagnant since 2016 and presenting the years of 2013 and 2016 as those with the most publications, with two for each year; (Q3) As fields of action of the studies that use flow theory associated with education and/or learning, we identified pedagogy, musical education, physical education, computer engineering, and languages.

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Final considerations

We verified that the scientific literature using flow theory associated with education and/or learning in the Brazilian context does not have great expression, taking into account that a considerable time interval between publications was noticed. The studies stand out for presenting important and favorable results for the educational and/or learning scenario, clear and consistent methodologies, various target audiences and research environments, and innovative instruments for the fields of knowledge. However, the Brazilian results significantly differ from those found in the international scenario, as seen in a review conducted by Aleksic (2017), in which 854 articles that presented flow theory as the theoretical framework were gathered and distributed into four domains: psychology, sports psychology, marketing, and human-computer interaction.

In fact, since the elaboration of flow theory in the 1970s, various studies were developed, which made the theory become of interest to many researchers from various academic disciplines (NAKAMURA; CSIKSZENTMIHALYI, 2009; SANTOS *et al.*, 2018). In this review, it was not possible to find data approximate to this reality.

Despite presenting an overview of the publications that relate flow theory to education and/or learning in Brazil and demonstrating that the level of published evidence in this field is low, it is important to highlight that the search in this study comprised only *online* databases, with products of free and complete access, considering articles and doctoral theses. Likely, a higher number of publications would be found if books, programs implemented by workgroups interested in the theme, and projects in development were considered.

Therefore, we consider two questions as relevant to expand the research on flow theory in the Brazilian scenario: in what settings and in which form is flow theory being used in Brazil, considering that this review focused exclusively on the education and/or learning field and that studies that conducted a general mapping of its use were not found? What are the impacts of the use of flow theory associated with the educational and/or learning Brazilian field, considering that the studies analyzed only showcase proposals for the implementation of systems?

In addition, we expect that the findings in this review can be used for the elaboration of new research objectives, for the development of intervention proposals, and to stimulate the interest on providing more quantitative evidence on the use of flow theory in education.

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