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Formative Assessment and Self-regulated Learning in Higher Education

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ABSTRACT

In higher education, the assessment of learning is an activity that challenges teachers from different areas of knowledge. This fact was evidenced in the recent experience of migration to online teaching with the use of contemporary digital technologies as mediators in the pedagogical process, as a result of the COVID-19 pandemic. Considering the possibility of these technologies being definitively incorporated into university education, this new scenario would require, more than ever, the adoption of principles and practices that encourage students' autonomy, related to their own learning and pedagogical practices that promote self-regulation. The present work aims to present an overview of the research and considerations on the relationship between formative assessment and self-regulation of learning in the last two decades (2003 to 2021), with an emphasis on international literature and focusing on higher education. The methodology adopted is a narrative review of the literature. The findings of this review point to a growing integration between the theoretical fields of formative assessment and self-regulation of learning, as well as the necessity to improve feedback practices, both in teacher-led assessments and in self-assessments and peer reviews.

KEY WORDS

Formative assessment. Learning. Higher education.

Avaliação Formativa e Autorregulação da Aprendizagem no Ensino Superior

RESUMO

No Ensino Superior, a avaliação da aprendizagem é uma atividade que desafia professores de diferentes áreas de conhecimento. Tal fato foi evidenciado na recente experiência de migração para o ensino *online* com utilização das tecnologias digitais contemporâneas como mediadoras no processo pedagógico, em consequência da pandemia de COVID-19. Dada a possibilidade dessas tecnologias serem definitivamente incorporadas ao ensino universitário, esse novo cenário demandaria, mais que nunca, a adoção de princípios e práticas que estimulem a autonomia discente em relação à sua própria aprendizagem e práticas pedagógicas promotoras da autorregulação. O presente trabalho objetiva apresentar um panorama das pesquisas e reflexões sobre as relações entre avaliação formativa e autorregulação da aprendizagem nas duas últimas décadas (2003 a 2021), com ênfase na literatura internacional e com foco no Ensino Superior. A metodologia adotada é uma revisão narrativa da literatura. Os achados desta revisão apontam para uma crescente integração entre os campos teóricos da avaliação formativa e autorregulação da aprendizagem, bem como para a necessidade de melhorarmos as práticas de *feedback*, tanto nas atividades avaliativas conduzidas pelos docentes quanto nas autoavaliações e avaliações por pares.

PALAVRAS-CHAVE

Avaliação formativa. Aprendizagem. Educação superior.

Evaluación Formativa y Autorregulación del Aprendizaje en Educación Superior

RESUMEN

En la Educación Superior, la evaluación del aprendizaje es una actividad que desafía a los docentes de distintas áreas del conocimiento. Este hecho se evidenció en la experiencia reciente de migración a la enseñanza en línea con el uso de tecnologías digitales contemporáneas como mediadoras en el proceso pedagógico, como resultado de la pandemia del COVID-19. Ante la posibilidad de que estas tecnologías se incorporen definitivamente a la enseñanza universitaria, este nuevo escenario exigiría, más que nunca, la adopción de principios y prácticas que favorezcan la autonomía de los estudiantes en relación con sus propios aprendizajes y prácticas pedagógicas que promuevan la autorregulación. El presente trabajo tiene como objetivo presentar un panorama de investigaciones y reflexiones sobre la relación entre evaluación formativa y autorregulación del aprendizaje en las dos últimas décadas (2003 a 2021), con énfasis en la literatura internacional y focalizando en la Educación Superior. La metodología adoptada es una revisión narrativa de la literatura. Los hallazgos de esta revisión apuntan a una creciente integración entre los campos teóricos de la evaluación formativa y la autorregulación del aprendizaje, así como a la necesidad de mejorar las prácticas de retroalimentación, tanto en las evaluaciones dirigidas por docentes como en las autoevaluaciones y evaluación entre iguales.

PALABRAS CLAVE

Evaluación formativa. Aprendizaje. Educación superior.

INTRODUCTION

In the different stages of education, there has been a growing concern with improving the pedagogical practices of teachers, motivated both by the demands of agents and educational institutions, as well as by the scientific field (FRANCO, 2015; CUNHA, 2006). It also generates new action guidelines for educational policymakers, managers and teachers, without, often, having solved historical problems related to working conditions and training to teach, mainly at the university (VASCONCELLOS; DE SORDI, 2016). The global scenario of accelerated technological, socioeconomic and cultural changes also requires responses from the teaching and learning processes so that they respond to the desires of societies that increasingly rely on education as a preparation instrument to deal with the uncertainties of the future.

The recent experience of facing the new coronavirus pandemic demanded rapid changes in all stages of school education. The social isolation measures promoted the migration from face-to-face to remote teaching, implying new ways of teaching and learning, not to mention the challenges to guarantee broad access to equipment and internet connection, in a country that is extremely socially and economically unequal, as Brazil (NASCIMENTO *et al.*, 2020; CASIONI *et al.*, 2021). Even in Higher Education, the stage of education that receives more mature students, many were the adverse situations experienced by teachers and students.

As a way of dealing with the demands imposed by the pandemic on the field of education, especially those resulting from social isolation measures, new arrangements emerged to maintain or resume teaching activities. To respond to such challenges, Emergency Remote Teaching was implemented, and according to Silveira (2020, p.3),

made possible by an amalgamation of formerly underused virtual environments, videoconferencing tools unknown to many and a whole myriad of software appropriated in a just-in-time manner by teachers and students. However, more than a “buffer modality” of teaching, this appears not only to be a rehearsal of what can emerge on a very close horizon, but rather a materialization of the acceleration of the transition process to scenarios in which the Blended Learning becomes the de facto reality (SILVEIRA, 2020, p. 3).

Silveira (2020) understands Blended Learning as a modality that would combine face-to-face teaching and Distance Learning, enhancing the advantages offered by each and reducing their respective disadvantages. This same author, supported by recent literature, points to Blended Learning “as a strong trend for Higher Education in a post-pandemic world” (p. 4).

When focusing specifically on learning assessment processes, it is clear that the changes necessary to meet both emergency and perennial demands are much more expressive, since the assessment practice in Higher Education still predominantly uses the individual written test (IRALA; MENA, 2021, SOUZA, 2012, OLIVEIRA; SANTOS, 2005) which is hardly consistent with the best practices of online education (MORAN, 2009). For Santos and Silva (2009), online education is characterized by promoting interactive practices, as well as the

authorship of learners, mediated by the resources offered by contemporary digital network technologies.

Aiming to assess the digital skills of university professors in six areas of teaching (professional involvement; technologies and digital resources; teaching and learning; assessment; student empowerment and promotion of students' digital skills), two national studies (OTA; DIAS-TRINDADE, 2020, TRINDADE; SANTO, 2021) used the DigCompEdu questionnaire to obtain the data. This instrument was developed by researchers from the European Union (REDECKER, 2017) to assist in the development of digital skills of educators in that region and, later, adapted to the Brazilian context. In both surveys, the area of Assessment was one of those that obtained the lowest scores, especially in the item that measured the ability to promote self-regulation of learning.

This context reinforces the idea that a substantial change in the way of teaching cannot be considered without modifying the corresponding assessment practices, since the way students learn depends significantly on the way their teachers assess them (MARGALEF GARCÍA, 2014). And in order to transform the way of evaluating, it is necessary to appropriate concepts that effectively guide decision-making by those who evaluate.

The research developed by Ibarra-Sáiz, Rodríguez-Gómez and Boud (2021) reinforces the idea that changes in assessment practices carried out in Higher Education can affect student learning. According to the authors, the main elements that indicate the quality of evaluative tasks are feedback¹, participation, empowerment and self-regulation.

Although there is a significant growth of scientific interest in the relationship between formative assessment and self-regulated learning in other countries, Brazilian studies on this topic are still rare. For the present study, an initial search was carried out in the Scielo, Pepsic and Google Scholar databases, using a combination of the descriptors “assessment”, “learning”, “formative assessment”, “self-regulated learning” and “self-regulation of learning”. As a result of this search, only four works were found that address the relationship between the two concepts mentioned in the context of Higher Education (FRISON, 2009; SOUZA; BORUCHOVITCH, 2010, GALVÃO; CÂMARA; JORDÃO, 2012; MORAES, 2014).

In the first of them (FRISON, 2009), in chronological order, the author develops a conceptual discussion on the relationship between assessment and self-regulation of learning, presenting some possible strategies for learning, as well as the assessment meanings within the framework of self-regulation. In the second work (SOUZA; BORUCHOVITCH, 2010), the authors carried out a literature review that integrates formative assessment, meaningful learning and self-regulation of learning through the use of concept maps.

¹ The word “feedback” can be translated generically in Brazilian Portuguese as “back-feeding”. In the field of learning assessment, it can be replaced by “devolutive”. We chose to keep the term in English, as it is widely used both in international literature and in national production.

In the following article (GALVÃO; CÂMARA; JORDÃO, 2012, p. 637), the authors carried out a review on undergraduate student learning, which encompassed the following themes: deliberate study, superficial and deep learning, learning strategies and the influence of assessment in studies. Finally, the work of Moraes (2014) carries out a conceptual and methodological discussion about the possibilities of using the test as a contextualized assessment instrument, capable of offering qualified feedback that goes beyond the classificatory character. He argues that it is capable of offering rich information for the diagnosis of learning, reflection on errors, changes in the conception of assessment and self-assessment.

This limited number of national publications justifies an incursion into the international literature in order to collaborate with reflections and investigations on the subject in our country, inserting these concepts in the context of online teaching.

Given this scenario, the present work aims to present an overview of research and reflections on the relationship between formative assessment and self-regulation of learning in the last two decades (2003 to 2021), with an emphasis on international literature and focusing on Higher Education. It is hoped that this review can add relevant elements to the still incipient debate on the topics at hand in Brazil, collaborating with future research and didactic interventions.

METHOD

This is a bibliographic work, in the form of a narrative literature review. This methodology aims to know and discuss the development of a given subject from a theoretical and contextual point of view, but without exhausting the quantity produced, nor meeting all the formal requirements of systematic reviews, such as chronological and territorial delimitation, as well as the methods and criteria adopted for the selection of works (FERRARI, 2015). Rother (2007) points out that narrative reviews are “basically an analysis of the literature published in books, printed and/or electronic magazine articles in the interpretation and personal critical analysis of the author” (ROTHER, 2007, p.v).

Articles published in journals and chapters of collections, of theoretical character, non-systematic reviews, systematic reviews and meta-analyses were included, as it is understood that this type of literature synthesizes research efforts in their respective fields and guides future research and interventions. Furthermore, according to Ferrari (2015) “unlike the original research articles, literature reviews do not present new data, but intend to evaluate what has already been published and provide the best evidence currently available”. The consulted texts, written by authors from different countries, were written in Portuguese, Spanish and, predominantly, in English.

The search for the texts that integrated the review was carried out through Google Scholar, due to its global scope, in which the terms formative assessment and self-regulated learning were introduced, separately or in combination. Based on the results found, the scope was expanded and deepened based on the terms higher education and online, as well as the corresponding terms in Portuguese and Spanish. At the end of this search, 37 works were reviewed. The text is then structured around the topics: Formative Assessment, Self-Regulated Learning, The Role of Feedback in Formative Assessment, Peer Assessment and Self-Assessment.

FORMATIVE ASSESSMENT

Proposals that aim to transform learning assessment practices in Higher Education must take into account the various obstacles inherent to this training. Some are practical, such as the need for teachers to dedicate time to evaluative practices in a scenario of overvaluation of research to the detriment of teaching; the large number of students per class, as well as the precarious pedagogical training of university professors (LÓPEZ-PASTOR; SICILIA-CAMACHO, 2017; MARGALEF GARCÍA, 2014).

A second category of obstacles would be of a more conceptual nature, since the notion of formative assessment is marked by a polysemy and a diversity of approaches (ARAÚJO; DINIZ, 2015, HORTIGÜELA; PÉREZ-PUEYO; GONZÁLEZ-CALVO, 2019). In this context, it is necessary to explain what is thought about formative assessment, the subject of the present work, since, according to Dolin *et al.* (2018, p. 60), “a clearer definition of formative assessment and a description of what it involves in practice are necessary to establish a solid formative practice”.

Several authors (LÓPEZ-PASTOR; SICILIA-CAMACHO, 2017; CHEN; BONNER, 2020) attribute to Michael Scriven the first proposition of the expression “formative assessment”, published in 1967. In the present work, however, another definition will be used, more current and more widely accepted by the academic community

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited (BLACK; WILIAM, 2009, p. 09).

Summative assessment, on the other hand, is one whose “general objective is to report the student's level of learning at a given time, rather than impacting their continuous learning, as in the case of formative assessment” (DOLIN *et al.*, 2018, p. 61). This concept is almost always paired with that of formative assessment, and it is not uncommon for them to be interpreted dichotomously. Nevertheless, some authors argue that there is no need for a radical separation between these two ways of evaluating and advocate that the formative and

summative uses of learning evaluation be integrated into pedagogical practice (BLACK; WILIAM, 2018; DOLIN *et al.*, 2018).

According to Wiliam (2011), despite the growing number of research on formative assessment since the 1990s, this term has not yet had a precise definition. As a result, some researchers have proposed the expression “assessment for learning”, which would contrast with “assessment of learning”, the latter concept being closer to summative assessment.

Although Wiliam (2011) states that the change in terms has not brought greater conceptual precision to the field of assessment, authors such as Araújo and Diniz (2015) sought to make the conceptual differentiation between “learning assessment” and “assessment for learning”. Summarizing the idea of previous works, the aforementioned authors state that the assessment of learning seeks to “take stock of the learning achieved, classify or inform the school community of the results obtained” (ARAÚJO; DINIZ, 2015, p. 44). This conception of evaluation would coincide with the summative purposes of evaluation, as classified in the literature on the subject, while “assessment for learning” is used by teachers, “[...] when they want to highlight their training purposes, teaching guidance or learning regulation” (ARAÚJO, DINIZ, 2015, p. 44).

For Hortigüela, Pérez-Pueyo and González-Calvo (2019, p. 15) “the pure concept of evaluation must be associated with that of learning. Without an open, clear, participatory and democratic assessment, learning will never reach its highest level”. These authors list a series of recurring mistakes made by those who intend to develop formative assessment: confusing formative assessment with continuous qualification (assessment “for grades” or summative); not to involve students in the assessment process; not explaining the evaluation criteria in advance; not allowing the review of learning tasks; qualify (in this context, understood as giving grades) without taking into account the pedagogical agreements established in class; not to associate the evaluation procedures with their respective instruments and to limit the evaluation to its purely academic purposes, underestimating its consequences in the established social relations. Thus, it is possible to perceive the distinction between practices that aim to assign a grade - which Trigueros Cervantes, Rivera García and De la Torre Navarro (2012), among others, call examination - and evaluative processes that accompany, dialogue, observe, intervene and resize their practices through feedback. The latter are characteristic of formative assessment.

It is worth noting that the transition from the field of concepts to the pedagogical practice guided by the authors does not happen automatically. According to Yan et al. (2021), both the intentions to develop formative assessment and the effective practice on the part of teachers are influenced by personal and contextual factors. Among all the factors, the most decisive is teacher training, which is considered by the authors as a personal factor, which even has an impact on other personal factors.

Black and William (2009) sought to fill what they considered a gap in the literature on formative assessment – including their earlier writings (BLACK; WILIAM, 1998), by

integrating ideas on this topic into a broader pedagogical theory. In this challenge, the authors establish relationships with different fields of research such as self-regulated learning and studies on feedback.

Following this reasoning, the authors propose three key processes in the context of the teaching and learning relationship, namely: establishing where learners are in relation to their learning; establish where they are going; establish what needs to be done to get them there, that is, to the previously defined learning objectives (BLACK; WILIAM, 2009). By involving the different agents of the process, which would be teachers and students, we would have five relevant strategies: Clarify and share learning intentions and success criteria; Plan effective classroom discussions and other learning tasks that elicit evidence of student understanding; Provide feedback that promotes student advancement; Enable students as instructional resources for each other; and activate students as holders of their own learning.

Fernandes and Fialho (2012) analyzed 30 (thirty) empirical works on the assessment of learning in Higher Education, published between 2000 and 2009, from different countries and written in English and Portuguese. Several of these articles resulted from interventions in evaluative practices. According to the authors, in the researched contexts, teachers used different evaluative activities, which led to the conclusion that it is possible to teach, learn and evaluate in many ways, with the active participation of students in the process, through group dynamics, definition of criteria and self and hetero-evaluation and practices.

A relevant and recurring aspect among the works analyzed was the practice of feedback from teachers to students. As the authors found (FERNANDES; FIALHO, 2012), the feedbacks were based on criteria, were provided both orally and in writing and served not only to inform about the value of a given result, but also to guide and regulate learning processes.

Fernandes and Fialho (2012) conclude this work optimistically, affirming the possibility of improving assessment practices in Higher Education, providing students, through active participation in the learning and assessment processes, with results that are more consistent with what is proposed in the disciplines and the development of more complex modes of thinking.

López-Pastor and Sicilia-Camacho (2017) add the adjective “shared” to the expression “formative assessment”. For these authors, formative assessment, in general, consists of the “process by which the teacher provides information to students during the learning process to modify their understanding and self-regulation” (LÓPEZ-PASTOR; SICILIA-CAMACHO, 2017, p. 77). When thought of in a participatory way,

shared assessment refers to student involvement in the assessment and learning practice, a process of dialogue and collaboration between teacher and students aimed at improving the learning process, both individually and collectively (LÓPEZ-PASTOR; SICILIA-CAMACHO, 2017, p. 77).

These authors present what they call “lessons” about the practice of formative and shared assessment in Higher Education, learned over the last few decades, as a result of research carried out in this period. The first of these lessons that would favor learning through formative and shared assessment is that teachers must set understandable learning objectives that their students can achieve. The second says that teachers should offer feedback to their students, to guide them in their learning. The third has to do with student involvement in the learning process, through self-assessment. The fourth concerns the promotion of feedback as a means of dialogue. Finally, the last lesson recommends finding a balance between the ideal time devoted to formative assessment and the conditions under which the course is developed.

The work of López-Pastor and Sicilia-Camacho (2017) also presents some challenges for the field of formative assessment in higher education. The first of these challenges is to provide the field of formative assessment with more conceptual precision. The second challenge concerns the need for more research to show the impact of formative assessment on the learning process. The third challenge is to promote an assessment that is consistent with educational theory and not a reproduction of what teachers experienced when they were students.

The fourth challenge is the recognition of intersubjectivity in the learning process and its evaluation. The fifth challenge involves the acceptance of divergent learning during assessments, that is, situations of solving tasks different from those pre-established in the curricula. The sixth challenge is related to ethical principles in formative assessment, while the seventh and final challenge concerns the expansion of learning objectives and goals beyond those strictly academic, aiming at the development of citizenship.

López-Pastor and Sicilia-Camacho (2017) summarize, therefore, the argument developed in this section, which sought to highlight the different fronts of action that are presented so that formative assessment can become a recurrent and consistent practice in the university environment. These “action fronts”, called “challenges” by the authors, range from conceptual development (BLACK; WILIAM, 2018) to characteristics of teachers and the contexts in which they work (YAN et al., 2021; YORKE, 2003) .

These and many other challenges were intensified with the unexpected COVID-19 pandemic, which imposed the suspension of face-to-face activities in educational spaces and called on teachers to restructure their pedagogical practices, including evaluation processes. Gikandi, Morrow and Davis (2011), however, based on a systematic review of eighteen empirical articles, present an encouraging perspective regarding the practice of online formative assessment, among other aspects, due to its ability to develop self-regulation of learning in students.

SELF-REGULATED LEARNING

Currently, there is a diversity of concepts, models and theories about the self-regulation of learning (PANADERO; ALONSO-TAPIA, 2014). For the present work, the definition of Barry Zimmerman will be adopted, whose theoretical model is considered by some authors as the most used (PANADERO; ALONSO-TAPIA, 2014; PANADERO et al., 2019), so that “self-regulation (or self-regulated learning) refers to learning that results from self-generated thoughts and behaviors by students that are systematically oriented toward achieving their learning goals” (SCHUNK; ZIMMERMAN, 2003, p. 59).

According to Schunk and Zimmerman (2003), the concept of self-regulation of learning is in line with the idea of an active learner, who is able to exercise control over their learning processes. Furthermore, the authors draw attention to the fact that there is a mutual influence between students and their respective learning contexts, which opens space for pedagogical interventions that help to develop self-regulated learning.

Self-regulation, according to the aforementioned authors, involves three sub-processes that interact with each other: self-observation, self-judgment and self-reaction. These subprocesses also do not operate independently of the learning environment. Self-observation can be performed based on criteria shared by teachers. Self-judgment can take place through the comparison between current performance and the learning objectives proposed in the classes, while self-reaction depends on how students perceive the results and this perception, in turn, is influenced by the way these results are communicated. “Instructions for people to evaluate their performance can affect motivation. People who believe they can perform better persist longer and work harder” (SCHUNK; ZIMMERMAN, 2003, p. 68). Hence the importance of both feedback practices and self-assessment, which will be discussed later.

Zimmerman's self-regulation model is considered cyclical and is composed of three phases: anticipation (forethought), performance control and self-reflection. The self-regulated student, when carrying out his academic tasks, previously, makes an analysis of them, projecting the necessary actions in the future, evaluating the personal and environmental resources available to achieve the objectives. Then, he goes to the phase of carrying out the activity, which involves self-control and self-observation in each step of the task and, finally, the self-reflection phase, in which the student makes a judgment of the results achieved and reacts to the process that was performing the task. Thus, the self-regulation of learning consists of the metacognitive, motivational and behavioral control of the learning itself and makes use of learning strategies (SCHUNK; ZIMMERMAN, 2003).

The following excerpt from the chapter written by Schunk and Zimmerman (2003) summarizes the themes that will be addressed later in this work, in addition to highlighting the close relationship between self-regulated learning and formative assessment.:

During periods of self-reflection, learners can evaluate their progress on tasks having clear criteria; however, on many tasks it is difficult to determine goal progress, especially when standards are not clear or progress is slow. Feedback indicating progress can substantiate self-efficacy and motivation. As learners become more skillful, they become better at self-evaluating progress (p. 71-2).

Broadbent and Poon (2015) systematically reviewed articles available in international databases and published between 2004 and 2014, in which university students involved in online courses participated and evaluated the relationship between self-regulated learning and academic performance. The authors concluded that time management, metacognition, critical thinking, and effort regulation strategies correlated significantly with academic success, albeit to a lesser extent than in face-to-face contexts. One element that the authors highlighted as being significant in student performance was peer learning, which, according to them, should be prioritized in online education.

Panadero, Andrade and Brookhart (2018) carried out a historical review of the development of the relationships between the concepts of formative assessment and self-regulated learning, based on publications in English, considered by them to have a great impact on this field of study. The analysis scope defined by the authors had as main inclusion criterion reviews on the topics in focus. These authors divide the thirty-year period that begins at the end of the eighties of the last century into three stages, described below.

The first stage would comprise the works published between the years 1988 and 2000. The first publications of this period introduced the ideas about self-regulated learning in the midst of studies on formative assessment. At this stage, however, a work of great relevance appears, the review by Black and Wiliam (1998), which, according to Panadero, Andrade and Brookhart (2018), triggered the popularization of the conceptual junction between formative assessment and self-regulated learning.

The second stage would encompass publications carried out between 2001 and 2012. For the authors (PANADERO; ANDRADE; BROOKHART, 2018), it is in this period that the perception that evaluative practices affect the regulation of learning begins to strengthen in publications in English language, and the fields of self-regulated learning and formative assessment are being established in educational research. Researchers of self-regulated learning begin to incorporate the theme of formative assessment in their investigations and relevant topics are consolidated, such as feedback, self-assessment and peer assessment.

The third and final stage, which runs from 2013 to 2018, is the most fruitful of all, with more publications selected than the sum of placements from the two previous stages (17 against 16). The works included here, both theoretical and empirical, encompass reviews and meta-analyses, reinforce the mutual influence between formative assessment and self-regulated learning from different theoretical perspectives, especially in relation to self-regulation (PANADERO; ANDRADE; BROOKHART, 2018).

Clark (2012) draws attention to the advantages of combining formative assessment and self-regulated learning in pedagogical practice. For him, research has shown that students who are evaluated in a formative way actively participate in learning progress, consciously monitoring and regulating them, towards objectives. This would happen because the formative assessment would encompass self-regulated learning, there being a mutual influence between the objectives pursued by the formative assessment and the strategies employed by the students involved in such processes.

Three works more explicitly and in detail connect the cyclical aspects of self-regulation models to proposals for formative assessment (PANADERO et al., 2019, ANDRADE; BROOKHART, 2020, CHEN; BONNER, 2020), but a detailed description of these publications would be outside the scope of this text. Given, however, the orientation nature of these works, a brief summary of each one will be presented.

Panadero *et al.* (2019) start from the concept of “evaluative judgment”, which is “the ability to make decisions about the quality of one's own work and that of others” (TAI *et al.*, *apud* PANADERO *et al.*, 2019, p. 536). For these authors, promoting the evaluation of the results of the actions themselves – a crucial self-regulatory skill – should be a central objective of the curricula. Based on this theoretical contribution, the authors seek to relate aspects of formative assessment to each stage of two cyclic models: that of Barry Zimmerman and that of Philip H. Winne.

Andrade and Brookhart (2020) prefer to use the term “classroom assessment” rather than formative assessment. Despite the different terminology, the concepts are equivalent, as can be seen in this passage:

Effective classroom assessment is used by teachers and students to articulate the learning targets, collect feedback about where students are in relation to those targets, and prompt adjustments to instruction by teachers as well as changes to learning processes and revision of work products by students (ANDRADE; BROOKHART, 2020, p. 351).

The authors use the phases and areas model for self-regulated learning by Pintrich and Zusho, which combines four stages of self-regulation, with four aspects to be regulated. The steps or phases of self-regulation would be: 1- anticipation, planning and activation; 2- monitoring; 3- control and 4- reaction and reflection. The areas to be regulated would be: 1- cognition; 2- motivation and affection; 3- behavior and 4- context. For each possible intersection between the elements of the phase and area, the authors demonstrate the relationship with co-regulation, based on the evaluation.

Chen and Bonner (2020) also opted for the expression “classroom evaluation”, considering that the term “evaluation for learning” - as pointed out by Araújo and Diniz (2015) - does not encompass proposals that encompass the registration and communication of the academic performance of students at the end of an educational cycle or program of study. According to

the authors, these proposals are more related to the summative aspects of assessment, which are often treated as opposed to assessment for learning.

Chen and Bonner (2020) also start from the model of self-regulation of learning proposed by Barry Zimmerman to propose the classroom assessment and self-regulated learning (CA:SRL) model. To the three stages of Zimmerman's model (anticipation, performance and self-reflection), however, the authors add a fourth. The result, then, would be a cycle composed of: 1- pre-assessment and anticipation; 2- informal performances and interactive evaluation; 3- formal evaluation and performance; 4- synthesis of evidence and formal reflection.

The stages or phases of self-regulation can and should be implemented in remote teaching, through formative assessment that will help bring students among themselves, and students and teachers closer together, as well as intensify the development of a conscious, autonomous learning process and effective internalization of the concepts necessary for the formation (GIKANDI; MORROW; DAVIS, 2011).

THE ROLE OF FEEDBACK IN FORMATIVE ASSESSMENT

An element considered central both in the formative assessment process and in the consequent development of learning self-regulation is feedback (NICOL; MACFARLANE-DICK, 2006). In two complementary review articles, Lipnevich and Panadero (LIPNEVICH; PANADERO, 2021; PANADERO; LIPNEVICH, 2021) sought to map the main theoretical models on evaluative feedback, tracing the increasing scope and complexity of this field of study. The authors also propose not only a more complete definition (LIPNEVICH; PANADERO, 2021), but also present a proposal for a theoretical model that integrates the contributions of the preceding models (PANADERO; LIPNEVICH, 2021).

Feedback is thus defined by Lipnevich and Panadero (2021, p. 25):

Feedback is information that includes all or several components: students' current state, information about where they are, where they are headed and how to get there, and can be presented by different agents (i.e., peer, teacher, self, task itself, computer). This information is expected to have a stronger effect on performance and learning if it encourages students to engage in active processing.

In this definition, the authors incorporate the contribution of the theoretical model which they claim to be the most cited among those reviewed, namely: Hattie and Timperley (2007). These last authors consider that the objective of teaching is not only to teach or create conditions for learning, but also to assess the extent to which these learnings have been achieved. At this stage, feedback comes into play, which, according to the theoretical model proposed by them, must answer three questions considered decisive: Where am I going?; How am I going?; What to do next?

Regarding the first question, “where am I going?”, Hattie and Timperley (2007) consider the information received by teachers and students about the objectives to be achieved related to tasks or courses crucial. For them, the success criteria (success criteria) must be very explicit for all the agents involved in the teaching and learning process. The answer to the question “how am I doing?” should reveal how close or far the students are from the pre-established goals. The question “what to do next?” must be followed by a set of information that helps the learners reduce the distance between the level where they are and the one they want. These three questions operate at four distinct levels: the task, the process, the self-regulation and the personal level.

Task-related feedback, also called corrective, is, according to the authors, the most practiced. It aims to inform students how well a given task is being performed, its successes and mistakes or adequacy to the criteria to achieve the learning objectives, a fact that has an impact on learning and self-regulation processes. Feedback directed at this level is more potent when the student errs due to a misinterpretation of what should be learned and not due to a lack of information.

When feedback acts on the relationships that the learner establishes between the information available in the environment and the information related to the task, and not just on the latter, it is acting on the cognitive processes underlying learning. A representative example is when this feedback is related to the strategies used by students to identify their own mistakes, which can lead them to make better use of available information and use cognitive strategies.

Another situation in which feedback impacts student learning is when it is directed at the level of self-regulation. This includes, for example,

The capability to create internal feedback and to self-assess, the willingness to invest effort into seeking and dealing with feedback information, the degree of confidence or certainty in the correctness of the response, the attributions about success or failure, and the level of proficiency at seeking help (HATTIE; TIMPERLEY, 2007, p. 94).

The fourth and final level of feedback action is the one that least responds to the learning objectives, although it is widely used: the one that acts on a personal level. This category of information, whose main representative is praise, rarely contributes to student learning because it provides little information about what should be learned, how one is learning, and the most appropriate means to learn it.

According to Lipnevich and Panadero (2021), Nicol and Macfarlane-Dick (2006) are among the first authors to connect formative assessment and self-regulation of learning. According to the latter, formative assessment and feedback at the university should be used to develop students' self-regulated learning. Based on this, they propose seven principles for good feedback practices that facilitate self-regulation.

First, one must explain what a good performance is, that is, what are the objectives and expected standards, because, according to the authors, students can only achieve the proposed learning objectives if they understand them. Second, there must be opportunities for the development of self-assessment and teachers must create opportunities for students to monitor and judge their own progress towards the objectives. Third, high-quality information about student learning must be provided. “Good quality external feedback is information that helps students troubleshoot their own performance and perform self-correction: that is, it helps students take action to reduce the discrepancy between their intentions and the resulting effects” (NICOL; MACFARLANE-DICK, 2006, p. 208).

The fourth principle encourages dialogue with teachers and peers about learning. Discussions with teachers help to understand standards and expectations, correct misunderstandings and overcome difficulties, while dialogue with peers promotes a sense of self-control over learning. The fifth, encourages positive motivational beliefs and self-esteem. It is important for students to understand that feedback results from an assessment of their learning process and not of them as a person. Sixth, it provides opportunities to bridge the gap between current and expected performance, and this includes the opportunity to redo assessment activities.

Finally, it provides information to teachers that helps to adjust pedagogical practices, as teachers also need quality information on the performance of their students. The authors conclude by stating that:

While students have been given more responsibility for learning in recent years there has been far greater reluctance to give them increased responsibility for assessment processes (even low stakes formative processes). Yet, if students are to be prepared for learning throughout life they must be provided with opportunities to develop the capacity to regulate their own learning as they progress through higher education (NICOL; MACFARLANE-DICK, 2006, p. 215).

Following the line of reasoning mentioned above, the integrative theoretical model proposed by Panadero and Lipnevich (2021) places the student at the center of the assessment process. In addition to it, the message, the implementation, the context and the agents are elements that make up the model. The student stands out as the main element in this model because, according to its proponents (PANADERO; LIPNEVICH, 2021), it is the individual characteristics of those who receive the feedback that will determine how it will be interpreted and what will be done with it. These individual characteristics would be: “motivational beliefs, prior knowledge, gender, cultural differences, self-efficacy, personality traits, among others” (p. 14).

The message, the second element of the integrative model, is the information that students receive about the result of their learning effort. Although the message can take different forms and be conveyed by different means, the authors agree with Hattie and Timperley (2007), when they state that good feedback must answer the three questions presented above: where is the student going? (goals); How is the student doing? (current performance); What to do next? (how to close the gap between current performance and goals). Panadero and Lipnevich

(2021) reinforce that the information must be of good quality. This means that it must be “clear, accessible, and usable by the learner” (p. 14).

The third element of the integrative model is implementation, which concerns the understanding of the teaching and learning proposal adopted. For the authors, it is essential to assume the idea that the function of feedback is to help improve the student as a learner and not just the quality of their tasks. This also means that feedback should influence not only cognitive processes, but also emotional ones and the self-regulation of learning.

The instructional context is presented as the fourth element of the theoretical model proposed by Panadero and Lipnevich (2021). According to the authors, it is the teacher's responsibility to promote the conditions for effective feedback. This implies acting on three fronts: instructional design, which must include the way in which feedback is presented, the opportunity to implement it and openness to dialogue; the classroom climate, which affects how students receive and interpret feedback; and aspects of the course, such as level of education, educational system and characteristics of the curriculum components.

The fifth, and last, element of the model are the agents, that is, those who provide feedback. According to the authors themselves, “Educational feedback is generated in a context with at least three main agents: the teacher, peers and the student, although technology or the task itself can serve as a source of feedback” (PANADERO; LIPNEVICH, 2021, p. 15).

As for aspects related to contemporary digital technologies, interfaces, programs, applications and virtual environments can be used, in order to evaluate and provide feedback that contribute to learning. According to Tuah and Naing (2021), online assessment allows for constant and appropriate feedback for teachers and students. Despite these possibilities, Jensen, Bearman and Boud (2021) state that, in online teaching, the main challenge to be overcome is the low quality, little or inappropriate information that students receive. Also according to these authors, this scenario is influenced by both implicit and explicit conceptions that researchers maintain and recommend about the role of feedback in online learning.

Seeking to know the concepts about feedback in online learning, Jensen, Bearman and Boud (2021) carried out a critical review of the literature and grouped the results into six “conceptual metaphors,” which are structures borrowed from simpler concepts to help understand more abstract concepts. These six conceptual metaphors were grouped into two categories, which will be briefly described below: teacher-centered and student-centered.

Among the four conceptual metaphors classified as teacher-centered, the most frequent is the one that conceives of “feedback as treatment”. According to this understanding, students are exposed to interventions planned and carried out - feedback - by teachers, and learning would result from exposure to these interventions. A second conceptual metaphor from this group is the one that sees feedback as an “expensive commodity”. According to this perception,

feedback is an action that, although necessary, costs a lot of time and effort for the faculty and even for the students, when they carry out peer evaluation.

The third teacher-centered metaphor is that which understands feedback as “coaching”. This perspective emphasizes the motivational and emotional aspects of students, which can be activated through feedback. “This conceptual metaphor considers feedback to be the instructor's responsibility, but it is linked to a hope or expectation that the online learner will be motivated to continue striving to learn” (JENSEN; BEARMAN; BOUD, 2021, p. 7). The fourth, and The last conceptual metaphor centered on teachers is the one that understands feedback as “command”, and places emphasis on the corrective nature of this action and perceives it as controlling and directive, mainly, the modalities of automated online feedback, which diminish the student's control over the learning process itself and, therefore, makes engagement difficult.

The two metaphors described below represent a paradigm shift in conceptions about feedback, as they place the student at the center of the process, stating that if students do nothing with the feedback received, there will be no impact on learning. The first student-centered conceptual metaphor is the one that conceives of feedback as a “learner's tool”. The main argument of this perspective is that the student, who must be active in the process, uses the feedback to learn. Although it advances in relation to teacher-centered metaphors, this way of understanding feedback still perceives learning as an individual activity, which makes more collaborative actions difficult. This limitation is overcome by the following metaphor.

The last conceptual metaphor identified by Jensen, Bearman and Boud (2021) is the one that sees feedback as a “dialogue” that must take place between the student and the teacher or the colleagues themselves. In this perspective, the student would be “co-responsible for the direction and content of the dialogue” (JENSEN; BEARMAN; BOUD, 2021, p. 5) and learning would take place through the individual and collective participation of the student. Student participation in the evaluation process is, therefore, an issue that deserves greater attention.

PEER EVALUATION AND SELF-EVALUATION

Another aspect that has characterized the field of formative assessment in recent decades, as previously announced, is an expansion of student participation, both in terms of the assessment of learning itself and that of their colleagues. Some of the reasons that have led many teachers to share their role with students, according to Wanner and Palmer (2018), are evidence from research that both self-assessment and peer assessment not only improve learning, but also help develop responsibility and critical thinking skills.

Despite all these advantages, which are highly valued socially, the same authors warn, based on the literature, that implementing self-assessment and peer assessment in classrooms is not a simple task. For Wanner and Palmer (2018), one of the reasons that can hinder, or even prevent, the implementation of these practices is the idea that the teacher is the only holder of knowledge and only he should have the power to evaluate.

According to Panadero and Alonso-Tapia (2013), there are two theoretical approaches to self-assessment that must be differentiated before defining this term. The first approach understands self-assessment as a teaching process, an educational resource used by teachers. The second approach sees self-assessment as a process that promotes self-regulated learning. When authors take the first approach, they do not tend to focus on the internal processes that lead to self-regulation. The authors of the second approach, on the other hand, tend to focus on these processes.

Assuming a perspective that seeks to integrate both approaches, Panadero and Alonso-Tapia (2013, p. 556) define self-assessment as “the qualitative assessment of the learning process and its final product, carried out based on pre-established criteria”. The authors also emphasize the central aspect of self-assessment for the self-regulation process of learning, stating that students with more developed self-regulation skills also assess themselves more frequently and efficiently.

Andrade’s proposal (2019) is interesting for the present discussion because it establishes a close relationship between self-assessment and the provision of feedback, including stating that “the purpose of self-assessment is to generate feedback that promotes learning and performance improvements” (p. 2). In other words, it highlights its formative role, much more than summative, and should provide opportunities for students to analyze and adjust not only what they produced, but mainly the way they produced it.

The theoretical framework presented by Yan and Carless (2021) fits perfectly with the previous contributions, starting with the definition of self-assessment: “it is a substantive process in which students seek and use feedback from various sources, reflect on it, and then , judge their learning performance against selected criteria” (YAN; CARLESS, 2021, p. 3). The authors also agree that self-assessment is essential for self-regulation of learning and propose three steps for its development.

The first step would be to “determine and apply evaluation criteria”. This step would consist in appropriating the criteria from which the learning task will be evaluated and using them in the course of its elaboration. The process will be more meaningful if the students participate in the construction of the evaluation criteria. The second step was called “self-reflection” and its main objective is to lead students to “generate internal feedback on the strengths and weaknesses of their responses to the task” (YAN; CARLESS, 2021, p. 7). To make this action more effective, students can compare their own work with the work of others. The third and final step is the “judgment and calibration of self-assessment”, in which students must

compare the feedback generated by the self-assessment with feedback from other sources, such as teachers, peers, rubrics, etc.

Panadero, Jonsson and Strijbos (2016) summarize a series of recommendations for the implementation of self-assessment in the classroom, found in the literature on the subject and also propose the following guidelines: Define the criteria by which students will evaluate their work; Teach students to apply the defined criteria; Give feedback to students on their self-assessments; Help students use self-assessment data to improve their performance; Allow sufficient time for the review after the self-assessment; Do not turn self-assessment into grades.

According to Double, McGrane and Hopfenbeck (2020), there has been a clear growth in research on peer review in recent years. The volume of publications on the topic allowed the authors to carry out a meta-analysis based on 54 experimental and quasi-experimental studies that evaluated the impact of peer review at the levels of Basic Education and Higher Education. The findings suggest that there is a positive effect of the practice of peer assessment on the performance of students at different educational levels, even being superior to the results obtained by assessments conducted by teachers (DOUBLE; MCGRANE; HOPFENBECK, 2020).

In another meta-analysis, including 58 studies, Li *et al.* (2020) also found significant positive effects on the relationship between peer assessment and learning, specifically in Higher Education. According to these authors, students who participated in a peer assessment process performed better in their learning when compared to others who did not participate. In this study, the effect size was evaluated under three comparison conditions: no assessment, teacher assessment and self-assessment. Peer evaluation led to better learning compared to the first two situations (without evaluation and evaluation by the professor), but it did not present a statistically significant difference when compared to self-evaluation.

The difference, however, was more relevant when student preparation came into play: “our findings, in relation to evaluator training, have clear implications for how peer evaluation should be implemented, i.e., students should be provided with training in terms of how to conduct the assessment” (LI *et al.*, 2020, p. 11). Like any other behavior, it is necessary to practice the act of evaluating, in order to perform it properly.

Another factor that improved the learning of students who were involved in peer assessment activities, when compared to those who were not assessed in this way, concerns the way in which the assessment was carried out. The use of digital technological resources was more efficient to promote learning than paper-based assessment. According to the authors, this advantage is justified because digital technologies allow greater efficiency, flexibility and easy access, as well as the random distribution of works between evaluators and evaluated and the guarantee of anonymity (LI *et al.*, 2020).

Panadero, Jonsson and Strijbos (2016) also summarized recommendations regarding the implementation of peer review, namely: Clarify to students the purpose of peer review, its justification and expectations; Involve students in the development and clarification of assessment criteria; Group participants (eg individuals, groups) in a way that encourages productive peer review; Determine the format of the peer review (eg, rating with or without comments) and the mode of interaction (eg, face-to-face or online); Provide quality training, followed by examples and practice (including feedback); Provide rubrics, roadmaps, checklists or other tangible scaffolding; Specify activities and timescale; Monitor the process and train students.

The purpose of formative and shared assessment, as proposed by López-Pastor and Sicilia-Camacho (2017), is to engage students in activities that increase motivation, improve learning, develop critical thinking, responsibility and autonomy, etc. According to the qualitative review undertaken by Gikandi, Morrow and Davis (2011), these objectives can also be achieved through good online formative assessment practices, offering students:

opportunities for enhanced interactivity and formative feedback, which in turn, engage them with valuable learning experiences including active, contextual, interactive, collaborative, multidimensional, reflective and self regulated aspects of meaningful learning (GIKANDI; MORROW; DAVIS, 2011, p. 2347).

The work of García-Jiménez (2015), in addition to presenting a very well articulated synthesis of all the concepts discussed so far (formative assessment, self-regulation of learning, feedback, self-assessment and peer assessment) and how they can be developed through the contemporary digital technologies, makes an important alert to the role of learning assessment policies adopted by universities in the development of student participation. For this author, it is not just a matter of regulating the number of evaluations and averages for approval/failure. It is a matter of guiding, through official documents, and supporting active student participation in learning assessment processes, as already carried out by universities in countries such as Scotland, England, Canada, Australia and the United States.

CONCLUSION

The present work aimed to present, in a systematic way, the theoretical and methodological advances in two convergent fields of investigation: that of formative assessment and that of self-regulation of learning, mediated by contemporary digital technologies. The scope of the literature review was limited to Higher Education, on which there are predictions of an accelerated incorporation of these technologies in the post-pandemic period (SILVEIRA, 2020, ASTUDILLO; LEGUÍZAMO-LEÓN; CALLEJA, 2022).

It was found that the number of Brazilian publications that articulate formative assessment and self-regulation of learning is still small to support a synthesis on the subject based on national academic production. Therefore, an incursion into the international literature was

chosen without disregarding Sordi's (2019) warning about the need for local adaptation of pedagogical solutions for teacher training developed in exogenous contexts.

The present review, therefore, is not intended to present models ready to be executed uncritically, but rather to bring together conceptual and procedural elements that can contribute to research and teaching, resignifying them so that they are best suited to the most different contexts. in which Brazilian universities are inserted.

The productions that have questioned the teaching-learning models consolidated in the face-to-face formats of university classrooms are not recent. The current experiences of migration to remote teaching (re) raised the tensions experienced by the agents that build the educational processes (students, teachers, families and managers), involving not only issues such as internet access, but also the mastery of technologies information and communication, teaching strategies, forms of assessment, student engagement, relationships of autonomy and trust, among others (RIGO; DIAS-TRINDADE; MOREIRA, 2020).

The past demands and challenges of curriculum innovation and the use of more active learning methodologies are updated, but require careful and prudent reflection, as Dias-Trindade and Moreira (2017) point out, so that changes are built on solid and structuring pedagogical bases, which should precede the debate on the modalities of technologies to be adopted.

In this sense, by emphasizing the importance of pedagogical intentionality, the processes of formative assessment and the self-regulation of learning in higher education gain prominence. The review developed here identifies that, within the scope of formative assessment, the set of works analyzed points to a consolidation of the field of investigations, although it suggests not only the need for the studies to present the concepts in question more clearly, but also that its transposition to the field of practices does not occur automatically.

The analyzed works also show the existence of consistent systematizations on productions in the field of formative assessment and self-regulation of learning, from which it is possible to extract more general propositions for the transposition of theoretical concepts and models for an effective transformation of pedagogical practices in higher education, provided they are mediated by elements such as feedback and student involvement in self-assessment and co-assessment, for example, highlighted in the promising results of the investigations analyzed.

For a long time, educational theorists in general and evaluation in particular have argued for the need for radical changes in the ways of teaching, evaluating and learning, at all levels of formal education. During this entire period, we had the opportunity to implement these changes in a planned way, in the medium or long term, with peace of mind to discuss the pros and cons of each step and learn from each advance and setback. Perhaps, with the need imposed by the Covid-19 pandemic to learn today to put into practice tomorrow, with all the risks that this urgency imposes, we will be able to perceive that “advanced” technological resources need equally “advanced” pedagogical knowledge to produce good learning results.

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