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SELF-EFFICACY IN MEDICAL EDUCATION: A SYSTEMATIC REVIEW OF LITERATURE**JOSÉ DE OLIVEIRA COSTA FILHO¹**ORCID: <https://orcid.org/0000-0001-6800-8314>**CAMÉLIA SANTINA MURGO²**ORCID: <https://orcid.org/0000-0003-3932-7580>**ALINE FONSECA FRANCO³**ORCID: <https://orcid.org/0000-0003-2196-0994>

ABSTRACT: Self-efficacy is described as an important influencing factor of human behavior, linked to motivation and performance. Thus, its analysis in the educational context is relevant. The study aims to carry out a systematic review of self-efficacy in medical education, nationally and internationally, to analyze the main factors that impact the self-efficacy beliefs of medical professors and students. Therefore, we researched four databases: Virtual Health Library (BVS), Public Medline (PubMed), Brazilian Digital Library of Theses and Dissertations (BDTD), and CAPES Portal, from 2015 to 2020, in Portuguese, Spanish, and English. The descriptors used were: “self-efficacy” and “medicine”, resulting in the selection of 20 studies. Based on the main objectives of the study, we created these categories: 1) self-efficacy and emotional factors, 2) self-efficacy and use of active teaching methodologies, 3) student self-efficacy and different teaching methods, 4) self-efficacy, motivation and self-regulated learning, and 5) student self-efficacy in a specific task and its correlation with performance. We concluded that the studies were consistent in qualifying self-efficacy as an important construct for medical education, associated with good emotional state, the development of teaching/learning strategies, and performance, in addition to pointing out the impact of the feedback type on the formation of student self-efficacy. As for the teaching methodology, it was not possible to confirm, in general, which is more favorable to strengthening self-efficacy, considering that other factors may be involved in the process.

Keywords: self-efficacy, medical education, academic performance, systematic literature review.

AUTOEFICÁCIA NA EDUCAÇÃO MÉDICA: UMA REVISÃO SISTEMÁTICA DA LITERATURA

RESUMO: A autoeficácia é descrita como importante fator influenciador do comportamento humano, ligada à motivação e ao desempenho, sendo relevante sua análise no contexto educacional. Este estudo objetiva realizar uma revisão sistemática sobre a autoeficácia na educação médica nacional e internacional, com o propósito de analisar os principais fatores que impactam as crenças de autoeficácia de professores e estudantes de Medicina. Para tanto, realizou-se buscas em quatro bases: Biblioteca Virtual em Saúde

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(BVS), Public Medline (PubMed), Biblioteca Digital Brasileira de Teses e Dissertações (BDTD) e Portal CAPES, no período de 2015 a 2020, nos idiomas português, espanhol e inglês. Empregou-se os descritores: “autoeficácia” e “medicina”, resultando na seleção de 20 estudos. A partir dos principais objetivos do estudo, chegou-se à seguinte categorização: 1) autoeficácia e fatores emocionais, 2) autoeficácia e uso de metodologias ativas no ensino, 3) autoeficácia de estudantes e diferentes métodos de ensino, 4) autoeficácia, motivação e aprendizagem autorregulada e 5) autoeficácia dos estudantes em tarefa específica e sua correlação com o desempenho. Concluiu-se que os trabalhos se mostraram concordantes em qualificar a autoeficácia como importante construto para educação médica, associada ao bom estado emocional, ao desenvolvimento de estratégias de ensino/aprendizagem e ao desempenho, além de apontar o impacto do tipo de *feedback* na formação da autoeficácia de estudantes. Quanto à metodologia de ensino, não foi possível confirmar, no geral, qual o método mais favorável ao fortalecimento da autoeficácia, considerando que outros fatores podem estar implicados no processo.

Palavras-chave: autoeficácia, educação médica, desempenho acadêmico, revisão sistemática da literatura.

AUTOEFICACIA EN LA EDUCACIÓN MÉDICA: UNA REVISIÓN SISTEMÁTICA DE LA LITERATURA

RESUMEN: La autoeficacia se describe como un importante factor de influencia del comportamiento humano, vinculado a la motivación y el desempeño, y su análisis en el contexto educativo es relevante. El objetivo fue realizar una revisión sistemática sobre la autoeficacia en la educación médica nacional e internacional, con el fin de analizar los principales factores que inciden en la autoeficacia de profesores y estudiantes de medicina. Para ello, las búsquedas se realizaron en cuatro bases de datos: Biblioteca Virtual en Salud (BVS), Public Medline (PubMed), Biblioteca Digital Brasileña de Tesis y Disertaciones (BDTD) y Portal CAPES, de 2015 a 2020, en portugués, español e inglés. Se utilizaron los descriptores: “autoeficacia” y “medicina”, resultando en la selección de 20 estudios. A partir de los principales objetivos del estudio, se llegó la siguiente categorización: 1) autoeficacia y factores emocionales, 2) autoeficacia y uso de metodologías activas de enseñanza, 3) autoeficacia del estudiante y diferentes métodos de enseñanza, 4) autoeficacia, motivación y aprendizaje autorregulado, 5) autoeficacia de los estudiantes en una tarea específica y su correlación con el desempeño. Todos los estudios indicaron la autoeficacia como un constructo importante para analizar en la educación médica, relacionado al buen estado emocional, desarrollo de estrategias de aprendizaje y mejor desempeño, señalando también el impacto del tipo de *feedback* en la construcción de la autoeficacia. Con relación al método de enseñanza, no se pudo verificar, en general, cuál es más favorable al fortalecimiento de la autoeficacia, porque otros factores pueden estar involucrados en el proceso.

Palabras clave: autoeficácia, educação médica, desempenho acadêmico, revisão sistemática de la literatura.

INTRODUCTION

There is great interest from the scientific community in knowing the factors that influence human behavior capable of directing the choices of individuals and, specifically in the academic environment, discovering the motivational aspects that interfere in the quality of the teaching and learning process and their impacts on academic performance.

Thus, the Social Cognitive Theory of Albert Bandura (1986; 1997) explains, from the agentic perspective, that individuals can act proactively for their development, establishing strategies and action plans based on a system of personal beliefs, achieving future or prospective results. Within this system of personal beliefs, self-efficacy is inserted. According to Bandura (1986), it constitutes an important influencer of the control of thoughts, feelings, and actions of individuals since it is a self-judgment about the ability to act and make efforts to successfully achieve a goal (BANDURA, 1997; PAJARES; OLAZ, 2008; OLIVEIRA; SILVA; BARDAGI, 2018).

Therefore, studies in the educational environment have revealed that, despite the existence of several factors influencing academic success, self-efficacy is one of the most relevant since it controls and determines student behavior and commitment to learning (BANDURA, 1986; SCHUNK, 1995; BZUNECK, 2001b). From this perspective and evaluating the academic context, Bzuneck (2001b) explains that the students are motivated to engage in learning activities if they believe that, with their knowledge, talents, and skills, they will be able to acquire new knowledge, master content or improve their skills. Thus, these students, evaluating themselves as capable of performing a certain task, will select action strategies to achieve the result anticipated as possible to be achieved since the greater self-efficacy beliefs allow for better overcoming or coping with difficulties during the process (BANDURA, 2008; PAJARES; OLAZ, 2008).

Therefore, effective teaching does not depend only on the skills or knowledge of teachers, so an effective teaching practice needs to take into account the teacher's personal beliefs to successfully effect the learning process. Students are also required to have self-perceptions about their ability to learn a certain domain. Such perceptions will determine the student's planning, the definition of goals, and the persistence in facing eventual difficulties (BANDURA, 1993; BZUNECK, 2001a; SCHUNK, 1995; SOARES; SEABRA; GOMES, 2014).

Under this understanding, self-efficacy is considered predictive of performance, an association pointed out by Bandura (1986) and confirmed in later studies (SCHUNK, 1995; RODRIGUES; BARRERA, 2007; VALADAS 2007; VEGA et al., 2012; ORNELAS et al., 2012; GUERREIRO-CASANOVA; POLYDORO, 2011; TEIXEIRA; COSTA, 2018; LOPES, 2019), since it can influence the learning process in the cognitive, motivational and behavioral aspects, and encourage the student to transform skills psychological factors in school performance skills, from the development of the self-regulation process (ZIMMERMAN, 2008).

Based on the various studies that converge towards the influence of self-efficacy on academic success, we show the importance of this study in the context of medical education. The concern with the formation of a student with competences and abilities to work in complex contexts, for which an intense learning environment is required, facing difficulties and overcoming a series of intellectual and emotional challenges, is relevant for seeking evidence on the factors that enable an environment of greater learning.

Also in the context of medical education, we highlight the peculiarity of the teaching method to be used, with the inclusion of active methodologies that place the students as the protagonist of their learning, in line with the National Curriculum Guidelines - *Diretrizes Curriculares Nacionais* - DCN (BRASIL, 2014). Also, according to the DCN, the ideal training of the medical professional should integrally take place, encompassing humanistic, critical, reflective, and ethical training. Such competences and skills will be subject to external evaluations, in which the performance of medical students will be measured by serial assessments, for example, the Serial National Assessment of Medical Students - *Avaliação Nacional Seriada dos Estudantes de Medicina* - ANASEM (BRASIL, 2013, 2016) - and medical residency tests accredited by the National Commission for Medical Residency - *Comissão Nacional de Residência Médica* - CNRM (BRESSA; 2018).

Thus, given the importance of knowing the aspects involved in the effectiveness of the teaching and learning process, this paper aims to carry out a systematic review of the national and international literature on self-efficacy in medical education, proposing to analyze, among the scientific productions on the topic, the main factors that positively or negatively impact the self-efficacy beliefs of professors and students in the context of medical education.

METHOD

In the systematic review, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations (MOHER et al., 2009).

Search Criteria

We carried out the searches in August 2020 in the following databases: Virtual Health Library (BVS), which includes the Scientific Electronic Library Online (SCIELO) and Latin American and Caribbean Literature in Health Sciences (LILACS); Public Medline or Publisher Medline (PubMed), from the National Library of Medicine; Brazilian Digital Library of Theses and Dissertations (BDTD); and Coordination for the Improvement of Higher Education Personnel (CAPES). The guiding question was: “Can professors and students, within the context of medical education, have their self-efficacy beliefs positively or negatively impacted by some factors, generating favorable or unfavorable outcomes in the teaching and learning process”? As the search strategies, we used the combined descriptors: “self-efficacy” and “medicine”, in Portuguese, Spanish and English, and the time frame between 2015 and 2020. The selection of studies was carried out by two independent reviewers, based on the screening of titles and abstracts, and then the full texts considered relevant were evaluated according to the defined eligibility criteria. Any disagreements were resolved by consensus between the two reviewers.

Eligibility Criteria

Research reports and theoretical studies were considered eligible, encompassing peer-reviewed articles and dissertations or theses, according to the inclusion criteria: 1) Participants: studies whose population contained medical students and/or professors; 2) Intervention and comparison: studies that investigated self-efficacy in medical education, and studies that compared self-efficacy with other constructs or factors associated with the teaching and learning process in medical education; 3) Results: studies that reported the factors involved in the formation of professors or students' self-efficacy beliefs and their effects on the teaching and learning process of medicine. We excluded theses and dissertations that were also published in journals, opting for the article format.

Risk of bias and quality of evidence

The risk of bias of the studies was assessed using the Appraisal Tool for Cross-Sectional Studies (AXIS) (DOWNES et al. 2016), which has 20 items with answers Y=Yes; N=No; DK=Don't know/comment. Two independent reviewers carried out the evaluation, considering a low bias with at least 16 items of the tool, with disagreements being resolved by consensus.

The quality of the studies evaluated in this review ranged from moderate to strong, meeting 16 to 20 items in the tool (mean 18.15 ± 1.2). Of the 20 studies, four met all 20 criteria (TENZIN *et al.*, 2019; LOPES *et al.*, 2020; IBRAHIM *et al.*, 2017; CLEARY, DONG, ARTINO Jr., 2015), three met 19 criteria (SCHAUBER *et al.*, 2015; LOFTIN; WEST, 2017; DEMIRÖREN, TURAN, ÖZTUNA, 2016); seven met 18 criteria (BRESSA, 2018; SOUZA, 2020; SANTABÁRBARA; LÓPEZ-ANTÓN, 2019; BURR; DALLAGHAN, 2019; SANTABÁRBARA, 2020; SHIMIZU *et al.*, 2019; VAN de RIDDER *et al.*, 2015), two met 17 criteria (YU; CHAE; CHANG, 2016; FERREL *et al.*, 2017), two studies met 16 criteria (SPORMANN *et al.*, 2015; MARTINS; SANTOS, 2019) and, in two studies (KLASSEN; KLASSEN, 2019; PELACCIA; VIAU, 2017), some of the tool criteria were not applied because they are theoretical studies. Of the studies that lost items, most failed to justify the sample size ($n = 10$, 45.4%)

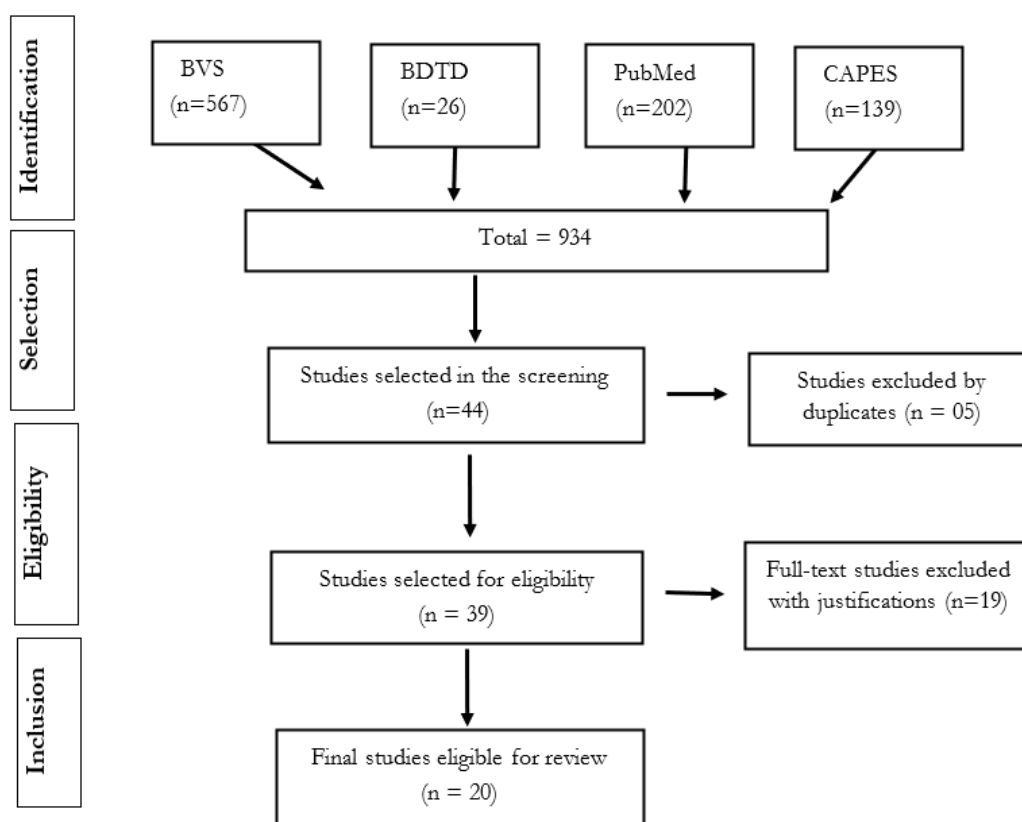
or to inform their representativeness in the target population ($n = 6$, 45.4%). Others did not take steps to address and categorize ($n = 3$, 13.6%), did not describe non-respondents ($n = 5$, 22.7%), or did not indicate study limitations ($n = 2$; 10%) or conflicts of interest/funding ($n = 2$; 10%).

Data Extraction and Analysis

Two independent researchers carried out the eligibility process, after reading the titles and abstracts of the 934 studies. Five of them were excluded due to duplicity, resulting in the selection of 44 studies. Subsequently, after full reading, we excluded 19 because, although they dealt with medical education or teaching methodologies, they did not assess the participants' self-efficacy and/or its effects on the teaching and learning process.

Based on the defined criteria, we included 20 articles to compose this review, as shown in the process flowchart of Figure 1.

Figure 1 – Flowchart of the search and selection process – PRISMA (MOHER *et al.*, 2009)



Source: The authors.

The selected studies had their information extracted and categorized in a collection instrument previously prepared by the authors, composed of the analysis categories: title; authors and year of publication; objective; type of study/methodological design; data collection instruments; local participants; and main results. Chart 1 shows the main data from the selected studies.

Chart 1 – Summary of the main characteristics of the studies

TITLE	AUTHOR	OBJECTIVE	TYPE OF STUDY	PARTICIPANT PLACE	INSTRUMENTS/DATA COLLECTION	RESULTS
1. Self-Efficacy of Medical Students in Two Schools with Different Education Methodologies (PBL x Traditional).	Lopes <i>et al.</i> (2020)	To evaluate medical students' self-efficacy regarding teaching methodology and its correlation with performance.	Cross-sectional, described and quantitative.	147 students of the 4th grade from two universities in Belo Horizonte - Brazil.	1. Self-Efficacy Scale in Higher Education; 2. Academic performance.	The use of active methodology (ABP) was related to greater self-efficacy and had a positive performance correlated with self-efficacy in academic management.
2. Academic and demographic variables related to Burnout syndrome in engineering and health sciences programs students of universidad estatal from Colombia.	Ferrel <i>et al.</i> (2017)	To compare the dimensions of Burnout Syndrome in the academic and sociodemographic variables.	Cross-sectional, described and quantitative.	254 health sciences and engineering students from Colombia.	1. Academic Burnout Inventory -MBI-SS; 2. Academic performance.	Students of Dentistry, Medicine, Environmental Engineering and Systems presented greater emotional, physical and mental exhaustion. Higher-performing students showed higher levels of self-efficacy than lower-performing students.
5. Self-efficacy of the medical teacher in the use of Objective Structured Clinical Examinatios (OSCE).	Bressa (2018)	To analyze teaching self-efficacy regarding the use of the OSCE in the assessment of students, as well as the sources of self-efficacy.	Cross-sectional, described and quantitative.	47 Medicine professors from the interior of São Paulo - Brazil.	1. Teacher Self-Efficacy Scale (EAEP); 2. Sources of Self-Efficacy Scale (EFAB).	Social Persuasion and Vicarious Learning were the most reported sources of self-efficacy. Professors with higher self-efficacy showed to be more in agreement with the OSCE method.
7. Construction and validation of a teacher self-efficacy scale for the use of active teaching and learning methodologies in higher health education.	Souza (2020)	To build and verify evidence of validity of the Teacher Self-efficacy for the Use of Active Methodologies Scale and correlations between burnout and well-being at work.	Transversal, quantitative, exploratory.	317 professors from Brazil.	1. EADOMA- Teacher Self-Efficacy Scale for the Use of Active Methodologies (<i>Escala de Autoeficácia Docente para o Uso de Metodologias Ativas</i>); 2. MBI-Maslach Burnout Inventory; 3. EBET - Scale of Well-Being at Work.	Positive correlations of EADOMA with positive affects, achievement/expressiveness and professional fulfillment and negative correlations with negative affects and exhaustion. High self-efficacy was related to greater satisfaction and well-being at work.
9. Preliminary validation of the scale of statistics self-efficacy in Spanish medical students: confirmatory factor analysis.	Santabárbara e López-Antón (2019)	To translate and validate the Self-Efficacy Scale in Statistics for Medical Students.	Quantitative, transversal, analytical.	40 students of the 1st year of Medicine Course at the University of Zaragoza - Spain.	Statistical self-efficacy scale 1 (CSSE).	Appropriate psychometric properties of the instrument were identified that allow the assessment of self-efficacy in statistics in Spanish university students who attend the Medicine Course.
15- The Relationship of Emotions and Burnout to Medical Students' Academic Performance.	Burr e Dallaghan (2019)	To identify students' emotional states about the curriculum and possible correlations with academic performance.	Descriptive, quantitative, correlational.	47 students of the 1st and 2nd year from US medical schools.	1. AEQ - <i>Achievement Emotions Questionnaire</i> ; 2. <i>Maslach Burnout Inventory</i> ; 3. Academic achievement.	Positive emotions strengthen self-efficacy, allowing the use of strategies to achieve academic goals. Although the importance of emotions is recognized, self-efficacy was the most significant predictor of performance.
16- Predictors and correlations of emotional intelligence among medical students at King Abdulaziz University, Jeddah.	Ibrahim <i>et al.</i> (2017)	To determine predictors of Emotional Intelligence and its relationship with performance, leadership ability, self-efficacy and perceived stress.	Descriptive, quantitative, correlational.	540 students from King Abdulaziz University (KAU), Saudi Arabia.	1. Scale of Schutte Self-Emotional Intelligence (SSRED); 2. Authentic Leadership Self-Assessment Questionnaire; 3. General Self-Efficacy Scale; 4. The short version of Perceived Stress Scale; 5. Performance.	Emotional Intelligence was positively associated with better academic performance, leadership ability and self-efficacy and negatively correlated with perceived stress.

TITLE	AUTHOR	OBJECTIVE	TYPE OF STUDY	PARTICIPANT PLACE	INSTRUMENTS/DATA COLLECTION	RESULTS
17 Evaluating Self-Efficacy After a Team-Based Learning Activity.	Loftin; West (2017)	To assess student self-efficacy to learn end-of-life care (EOL) after a team learning activity (TBL).	Intervention.	87 students (TBL and non-TBL groups at the University of Texas in the USA.	General self-efficacy (GSE) modified.	Results indicated a statistically significant increase in student self-efficacy in learning to care for EOL and student critical thinking skills in the TBL group.
21-Statistics self-efficacy in undergraduate medicine students.	Santabárbara (2020)	To analyze statistical self-efficacy in students and its relationship with performance in biostatistics.	Cross-sectional, observational analytical.	40 medical students from the University of Zaragoza in Spain.	1.Current Statistics Self-Efficacy (CSSE) (Spanish). 2. Performance in Biostatistics.	Performance in biostatistics is increased in students with higher self-efficacy beliefs.
22- Impact of faculty development programme on self-efficacy: competency and attitude towards medical education in Bhutan: a mixed-methods study	Tenzin <i>et al.</i> (2019)	To study the impact of the Development Program on the self-efficacy of a medical education university in Bhutan.	Quantitative, quasi-experimental and qualitative.	11 professors of Medicine from a university in Bhutan.	1. Self-efficacy test, 2. Assessment of teaching skills and 3. Scale to assess their attitudes towards teaching and assessment methods.	The Teacher Training Program (TTP) raised self-efficacy and the perception of teaching competence among those who were trained.
23- Does blended problem-based learning make Asian medical students active learners?: a prospective comparative study.	Shimizu <i>et al.</i> (2019)	To investigate the effects of bPBL on self-efficacy, self-directed learning, active participation and perceived tutor authority.	Quantitative, quasi-experimental.	96 students, 2 groups: PBL and bPBL from the 4th year of Medicine in Japan.	1. Questionnaire on motivation, self-directed learning, self-efficacy, active participation, authority of tutors; 2. Test on the level of knowledge; 3. bPBL acceptance questionnaire.	Self-efficacy and motivation improved with e-learning. The more students are self-directed learners, the greater the acceptance of technology in bPBL. With the bPBL, there was a stimulus to the construction of knowledge by the student, an increase in self-efficacy and self-directed learning.
24- Learning strategies and academic self-efficacy in university students: a correlational study.	Martins e Santos (2019)	To evaluate the use of learning strategies and self-efficacy in new university students.	Cross-sectional, quantitative, descriptive.	109 students from universities in Brazil.	1. Scale of Learning Strategies for University Students (EEA-U - <i>Escala de Estratégias de Aprendizagem para Estudantes Universitário</i>) and 2. Scale of Self-Efficacy in Higher Education (AEFS- <i>Escala de Autoeficácia na Formação Superior</i>)	Moderate correlation between learning strategies and academic self-efficacy. Students with greater use of learning strategies revealed greater self-efficacy in performing academic tasks. The two constructs are closely related to performance.
30- Self-efficacy beliefs of medical students: a critical review	Klassen e Klassen (2019)	To critically review the work on medical students' self-efficacy, examine the conceptualization and measurement of the construct.	Literary review, descriptive.	74 articles on medical students' self-efficacy. New York University - USA.	Articles in English in the bases: PsycINFO, MEDLINE and Embase, from 1989 to May/2016.	Studies need to explore the dynamic nature of self-efficacy in various medical school contexts and their sources. Half of the self-efficacy measures were incongruent with conceptual theoretical guidelines.
33- Motivation in medical education	Pelaccia e Viau (2017)	State of the Art on Motivation, Self-Efficacy in Medical Education, from the perspective of Social Cognitive Theory	State of art.	University of Strasbourg in France and University of Sherbrooke in Canada.	-	Motivation and self-efficacy are determining factors for learning. The study provides a guide to strategies for teachers to act positively on the motivation and self-efficacy of medical students.
36-Predictores afectivos y académicos del aprendizaje autodirigido en estudiantes de medicina / Factors associated with self-directed learning among medical students	Spormann <i>et al.</i> (2015)	To analyze the association between self-directed learning, self-esteem, self-efficacy, time management and academic commitment.	Cross-sectional, quantitative, correlational.	297 students of the 1st year of medical school at the Universidad de Concepción in Chile.	1. Self-Directed Learning Scale. 2. Self-esteem Scale. 3. Overall Self-Efficacy Scale. 4. Time Management Scale. 5. Student Engagement Scale.	Positive association between self-efficacy, time management and academic commitment to self-directed learning. Those who plan better have greater self-efficacy, manage their time better and are more involved in their studies. The "desire to learn" factor was associated with greater self-efficacy, time planning and involvement in studies.

TITLE	AUTHOR	OBJECTIVE	TYPE OF STUDY	PARTICIPANT PLACE	INSTRUMENTS/DATA COLLECTION	RESULTS
38- The role of environmental and individual characteristics in the development of student achievement: a comparison between a traditional and a problem-based-learning curriculum	Schauber et. al (2015)	To examine relationships between learning behavior, study effort and achievement, with emotions at school, self-efficacy, performance and social support, according to traditional methodology and PBL.	Quantitative, qualitative longitudinal.	1,646 students from the 6th to 10th semester at the Charité University of Medicine in Berlin, Germany.	1. Assessment Interpersonal Support adapted. 2. General self-efficacy Scale adapted 3. Items on students' perception of the learning environment. 4. Positive affect questionnaires. 5. Performance on Medicine Progress Tests. 6. Questionnaire on Motivated Learning Strategies. 7. Self-reports of study effort.	There are no substantial differences between traditional and PBL curricula regarding psychosocial variables and performance. In both contexts, performance gains are related to self-regulated study effort. Engagement in collaborative study showed associations with perceived social support and is related to greater self-efficacy and greater positive perception of the learning environment.
40- Examining shifts in medical students' microanalytic motivation beliefs and regulatory processes during a diagnostic reasoning task	Cleary, Dong e Artino Jr.(2015)	To examine changes in self-efficacy and regulatory processes in response to corrective feedback received during a specific diagnostic reasoning task.	Intervention, qualitative and quantitative.	71 2nd year medical students at the F. Edward Hébert School of Medicine in the USA.	1. Single-item questionnaire to measure self-efficacy, administered at 3 time points. 2. Single-item questionnaire on strategic planning. 3. Single-item microanalytical question to measure metacognitive monitoring.	There was a linear decline in self-efficacy and a simultaneous decline in strategic thinking after providing results-oriented feedback on student underperformance.
41- The relationship among self-efficacy, perfectionism and academic burnout in medical school students. (assunto autoeficácia perfeccionismo e burnout)	Yu; Chae e Chang (2016)	To examine the relationship between self-efficacy, socially prescribed perfectionism, and academic burnout.	Cross-sectional, quantitative.	224 1st to 4th year medical students at Ajou University School of Medicine in South Korea.	1) Multidimensional Perfectionism Scale. 2) Academic Self-Efficacy Scale. 3) Maslach Burnout Inventory-Student Survey.	Correlation between academic burnout and socially prescribed perfectionism, negative correlation between academic burnout and academic self-efficacy, demonstrating a close relationship between socially prescribed perfectionism and academic burnout or academic self-efficacy in the medical field.
42- Framing of feedback impacts student's satisfaction, self-efficacy and performance	Van de Ridder <i>et al.</i> (2015)	To investigate the effect of positive and negative feedback on satisfaction, self-efficacy and performance	Randomized clinical trial.	59 students of the 1st year of medical course from the University Medical Center Utrecht - Netherlands.	1. Self-efficacy: measured by visual analogue scale (VAS) to perform the task; 2. Satisfaction: a 5-item scale was used. 3. Performance.	Positive or negative feedback affects satisfaction and self-efficacy soon after it is provided, and these effects seem to disappear over time. Performance can be increased by positive feedback. The group that received positive feedback showed greater satisfaction and self-efficacy right after the feedback and better performance two weeks later when compared to the group that received negative feedback.
44. Medical students' self-efficacy in problem-based learning and its relationship with self-regulated learning.	Demirören, Turan; Öztuna (2016)	To examine the relationship between self-reported ability in medical students' self-regulated learning and their self-efficacy in PBL.	Quantitative, cross-sectional.	561 students of the 2nd and 3rd year at Ankara University School of Medicine (AUSM) in Turkey.	1. Self-regulated learning perception scale (SRLP); 2. Self-efficacy for problem-based learning scale (SPBL). 3. Questionnaire on the benefits of PBL.	Students used self-regulation skills and believed in their ability to learn effectively in the PBL context. There was a relationship between self-regulated learning skills and self-efficacy. Monitoring students' development and providing them with feedback can be beneficial for the cognitive performance of students with learning difficulties and insufficient study skills.

Source: The authors.

To expand the possibilities of analysis of the selected articles, seeking to achieve greater methodological rigor in the analysis of the results and to present the correlations between the studies, we used the textual analysis software IRaMuTeQ - *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*. (RATINAUD, 2009), which is anchored in the statistical software R.

The abstracts of the selected studies were included with identifier numbering (Chart 1), in English, as a textual corpus in IRaMuTeQ. The choice of the English standard (abstract) was due to the existence of articles in English and Spanish that did not contain the abstract in Portuguese, avoiding any non-original translation without ratification by the authors. The studies were identified by numbers according to their allocation in the initial pre-selected list (01 to 44), with the missing numbers corresponding to the 24 studies excluded from the initial list of the 44 pre-selected, according to the indicated criteria.

To form the textual corpus, the compound terms (“self_efficacy”, “self_regulated”, “active_methodologies”, “traditional_methodology” and “teacher_self_efficacy”) and the acronym-forming words were adapted, linking them for joint reading of the software (CAMARGO; FAIR, 2013). Regarding the choice of word classes, for the presentation of data in the analysis of similitude and word cloud, nouns and verbs were selected, leaving the other grammatical classes as complementary.

RESULTS

We selected twenty studies between 2015 and 2020, based on the results obtained in the four databases, as described in Cart 2.

Chart 2 – Database of identified/selected studies

DATABASE	IDENTIFIED		SELECTED	
	STUDIES	%	STUDIES	%
BVS	567	60.71	14	70
CAPES	139	14.88	1	5
BDTD	26	2.78	2	10
PubMed	202	21.63	3	15
Total	934	100	20	100

Source: The authors.

Regarding the year of publication, there was no linear pattern of increase/reduction of publications on the subject in the researched period, since periods of a greater number of published studies were interspersed, in 2019 (30%), 2015 (25%), and 2017 (20%), by periods of decrease, in 2016 (5%), 2018 (5%) and 2020 (15%). Regarding the place where the studies were carried out, there was a wide availability worldwide, with distribution in three continents: Europe, Asia and America; and in 13 countries, with greater concentration in Brazil (20%), USA (20%), and Spain (10%).

Among the selected studies, 90% were research reports, and 10% were theoretical studies. Chart 3 shows the general characterization of the studies.

Chart 3 – General characterization of studies

PUBLICATION YEAR	TOTAL OF STUDIES	%
2020	3	15
2019	6	30
2018	1	5
2017	4	20
2016	1	5
2015	5	25
Total	20	100

COUNTRY OF THE STUDY	TOTAL OF STUDIES	%
Brazil	4	20
USA	4	20
Spain	2	10
Colombia	1	5
Saudi Arabia	1	5
Bhutan	1	5
Japan	1	5
Canada	1	5
Chile	1	5
Germany	1	5
South Korea	1	5
Holland	1	5
Turkey	1	5
Total	20	100

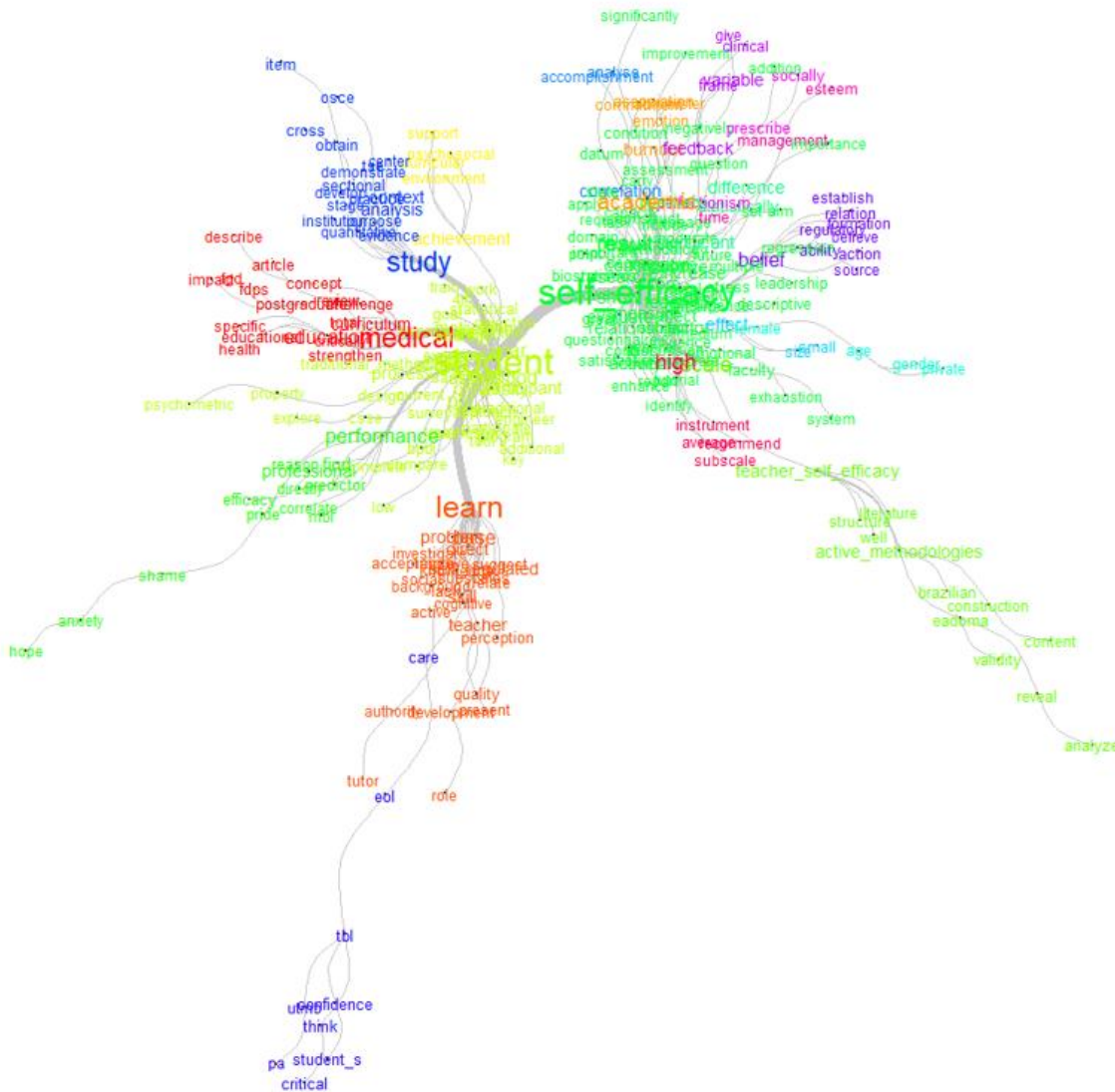
TYPE OF PUBLICATION	TOTAL OF STUDIES	%
Articles	18	90
Dissertations	2	10
Theses	0	0
Total	20	

STUDY CATEGORY	TOTAL OF STUDIES	%
Research report	18	90
Theoretical report	2	10
Total	20	

Source: The authors.

The studies mainly sought to assess self-efficacy in medical education, verifying variables related to emotional factors, teaching methodologies, academic performance, and mechanisms involved in self-regulated learning, as well as analysis of self-efficacy in specific domains/tasks. In this sense, the categorization was made according to the main objectives of the studies (Chart 4):

Figure 3 – Similarity analysis (minimum frequency 20)



Source: The authors.

Regarding the verification of correlation between the studies, carried out through the lexical analysis of the segments, the texts were classified into five classes, as shown in Figures 4, 5, and 6. The most correlated studies, according to IRaMuTeQ, are grouped into classes defined by the colors green, red, purple, blue, and gray. From the positioning of each group in the graph, it is possible to identify the approximations and correspondences between classes (RAMOS; LIMA; AMARAL-ROSA, 2018).

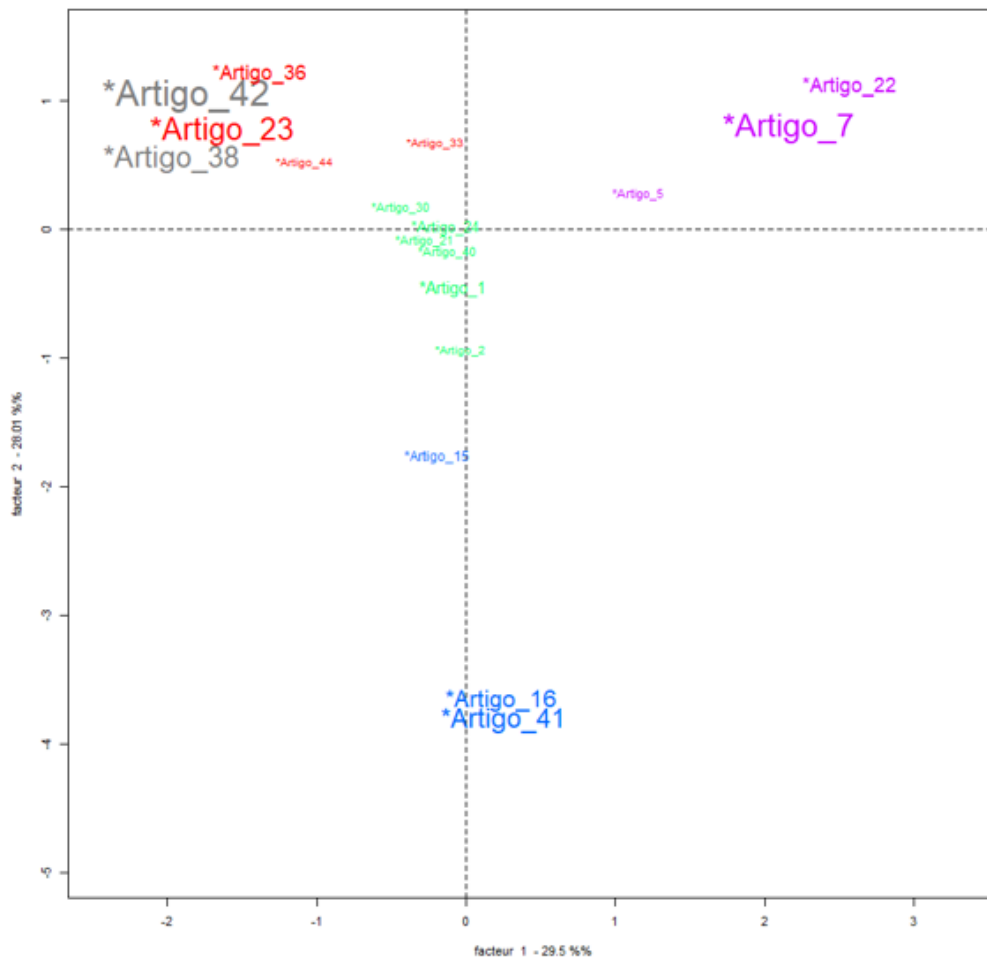
As shown in Figure 4, the group of articles from the green class was the most homogeneous in terms of the lexical set of words, positioned in the center of the two Cartesian axes, with approximations to the other classes. The grouping of studies Article_5, Article_7, and Article_22 in the purple class is justified by the fact that they addressed the influence of teacher self-efficacy in the use of active methodologies, and Article_7 also included an analysis of self-efficacy on emotional factors (burnout) in the teaching profession.

Regarding the blue class (Article_15, Article_16, and Article_41), the proximity between such studies is due to the focus on students' self-efficacy and its correlation with emotional factors (burnout, emotional intelligence, perfectionism).

The gray class, represented by Article_42 and Article_38, are groups of studies that deal with student self-efficacy in different teaching methodologies and its correlation with academic performance, and Article_42 also researched the impact of feedback on students' self-efficacy. The articles of the red class (Article_23 and Article_44) also addressed the use of active methodologies in teaching, which is why they are shown next to each other in the graph.

The allocation of Article_36, Article_33, and Article_44 in the same class (red) and their proximity to Article_30 and Article_24, in the green class, is explained by the approach to the influence of self-efficacy on self-regulation, teaching strategies, and/or motivation of medical students.

Figure 4 – Specifics of text groups

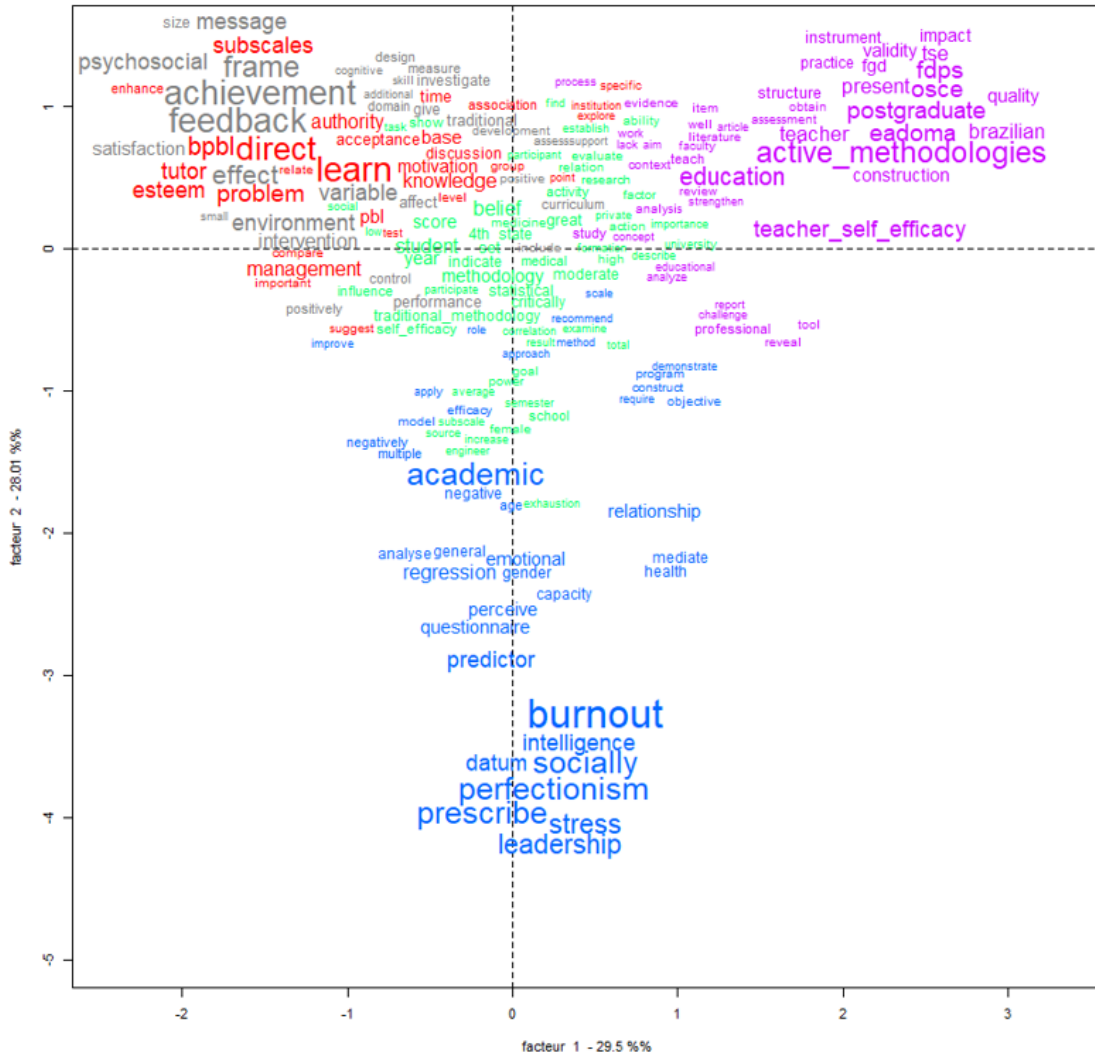


Source: The authors.

Regarding the Correspondence Factor Analysis (CFA), in which words are crossed (word incidence frequency) and classes (green, red, purple, blue, and gray), we found (Figure 5) that the words that are more present in the textual corpus, which is presented in a smaller size and close to the center of the two Cartesian axes, are the following: “medical”, “student”, self_efficacy”, “belief” (green class) and “performance” (gray class). Therefore, these words make up the main axis of the studies, linking to the other classes, which can be distanced according to the focus given to each specific group.

From this perspective, we also perceived (Figure 5) which are the main words that characterize each class and represent the peculiarities of each group. For example, in the purple class, the studies addressed teacher self-efficacy and the use of active methodologies, given the emphasis on the terms “teacher_self_efficacy” and “active_methodologies”. In the same sense, “burnout”, “perfectionism”, “stress” and “emotional” identify the blue class. The gray and red classes are presented with very close and intertwined words, highlighting, in the first, the words “feedback”, “achievement”, “frame” and “performance”, for grouping studies that analyzed the performance of students, emphasizing that Article_38 also included the comparison of students' performance in different teaching methodologies (traditional and with the use of active methodologies). In the red class, “bpbl”, “problem” and “motivation” stood out, as they involved studies that analyzed self-efficacy in circumstances of use of active methodologies and its influence on self-regulation and motivation.

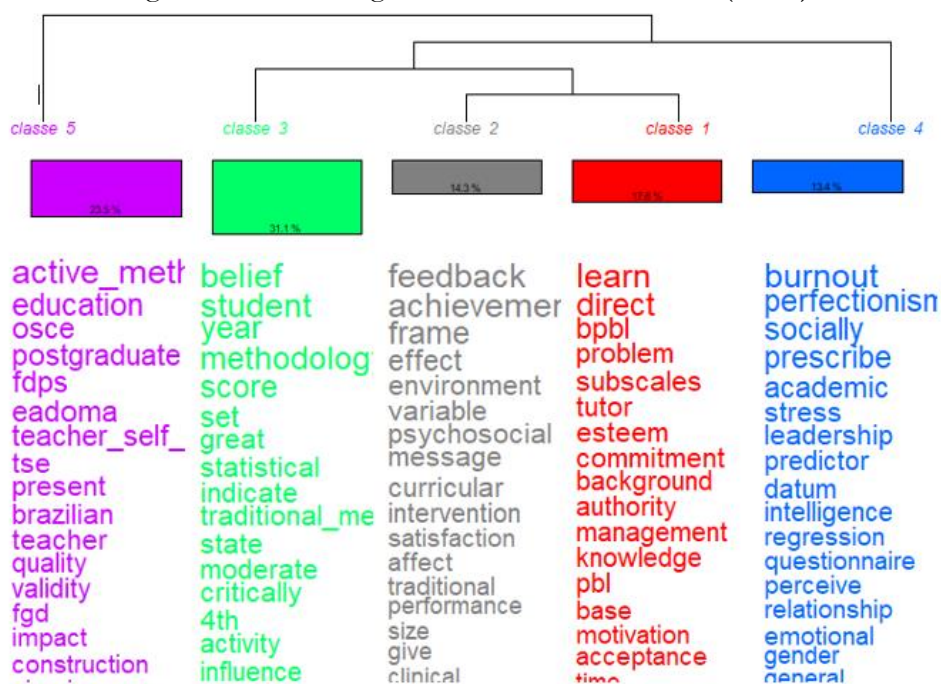
Figure 5 - Correspondence Factor Analysis (CFA) of texts



Source: The authors.

From the analysis of the Descending Hierarchical Classification, we identified the volume and representativeness of each class in the textual corpus and the relevance of the words in each class, as well as the correlations between them (Figure 6).

Figure 6. Descending Hierarchical Classification (DHC)



Source: The authors.

DISCUSSION

From the results, we verified that, in the last five years, studies have been developed around the world, in the continents: Europe, Asia, and America, all indicating correlations between self-efficacy beliefs (professors and/or students) and its impact on the teaching and learning process. The works aimed to discuss, adopting the foundations of the Social Cognitive Theory (BANDURA, 1986), the importance of the self-efficacy beliefs of the medical student/professor and their correlation with emotional factors, self-regulated learning, use of methodologies or different teaching methods, in addition to analyzing the impact of feedback on students' self-efficacy and performance.

Next, we will detail the studies in a categorized way, in line with the main approach addressed by the researchers and its relationship with self-efficacy, according to the description in Chart 4. As we can see in the textual analysis carried out by IRaMuTeQ from the abstracts of the studies and following the descriptions in Figures 4, 5, and 6, some studies, although identified in specific classes, are similar to other classes, so that, based on the full analysis of the studies (details in Chart 2), it was grouped, in the same way, into five categories, listed below.

Self-efficacy and Emotional Factors

The analysis of the emotional aspects of individuals is relevant when focusing on one of the sources of self-efficacy described by Bandura (1993, 2008): physiological and emotional aspects that encompass the feeling of joy, satisfaction with life, stress, or anxiety. In this sense, the well-being of students and professors or their levels of illness are shown to be factors capable of influencing the self-efficacy profile in the academic context (SOUZA, 2020; FERREIRA; AZZI, 2010; DIAS-VIANA, 2019).

In this context, the study carried out in Colombia by Ferrel et al. (2017) (Article_2), with 254 students in the area of Health Sciences, including Medicine students, aimed to correlate the dimensions of Burnout Syndrome and the academic variables (weighted average in the semester) showed greater exhaustion and a high level of self-efficacy, despite not being verified the presence of Burnout Syndrome in the participants, as it requires high levels of emotional exhaustion and cynicism and low levels of self-efficacy, which Health Sciences students, especially those of Medicine and Dentistry. As for self-efficacy, they pointed out that students with higher performance have higher levels, with students from more

advanced semesters showing greater beliefs. They also highlighted the importance of promoting achievements in the initial semesters of the course to increase experiences capable of strengthening self-efficacy, since feelings of failure and the consequent low self-efficacy can act as risk factors for the development of burnout.

Aiming also to assess emotional factors of students facing the implementation of a new curriculum in medical schools in the United States, Burr and Dallaghan (2019) (Article_15) reported the growing concern, in the last decade, with the well-being of medical students, considering that recent studies have shown that they have high rates of burnout. They highlighted the importance of modifying an eventual illness situation, since these emotions can negatively affect students' learning achievements and performance, precisely at the moment when they are learning to care for others. The authors surveyed 1st and 2nd-year medical students and also used the Maslach Burnout Inventory (MBI) for students, in addition to the participants' performance data for the semester. They obtained results that indicate that positive emotions strengthen self-efficacy, allowing students to identify strategies to achieve academic goals. However, although it was important to recognize the emotions that students experience, self-efficacy was the most significant predictor of academic performance, suggesting the need for strategies to increase self-efficacy, such as the use of flipped classrooms or problem-based learning, which, according to the authors, offer opportunities for cognitive assessment to promote self-efficacy. Finally, they evaluated that, to generalize the results obtained, it would be interesting to expand the study to other medical schools.

The study carried out by Ibrahim et al. (2017) (Article_16), with 540 medical students from Saudi Arabia, aimed to determine the predictors of emotional intelligence, academic performance, leadership ability, self-efficacy beliefs, and perceived stress. They justified the analysis of emotional intelligence in previous studies that reported an important role in the training of medical professionals, associated with the ability to perceive, access, generate and understand emotions and, reflexively, regulate them to promote emotional and intellectual growth. The results obtained identified a positive correlation of self-efficacy with emotional intelligence and its correlation with better academic performance and leadership capacity. The women had higher scores standing out significantly, being negatively associated with perceived stress. They concluded the need to offer training through curricular and extracurricular activities to students, to improve self-efficacy.

Also analyzing emotional aspects of 1st to 4th year of medical students at a University in Korea, Yu, Chae, and Chang (2016) (Article_41) proposed a study to examine the relationship between academic self-efficacy, academic burnout, and socially prescribed perfectionism, which is described by the authors as the recognition of unrealistic and impractical academic goals, not by the students, but by others or the fear of negative judgment by people.

The results obtained showed a significant negative correlation between academic self-efficacy and burnout and a close relationship between perfectionism, self-efficacy, and burnout, pointing out that when the inclination to perfectionism is high and academic self-efficacy is low, there is an increased risk of academic burnout. They concluded that self-efficacy can reduce the chances of academic burnout and that socially prescribed perfectionism harmed self-efficacy, triggering academic burnout.

About exhaustion in the academic environment, now related to teaching self-efficacy, Souza (2020) (Article_7) demonstrated, in a study with 317 professors in the health area, including Medicine, and in the Administration and Pedagogy courses of public and private institutions in Brazil that use active teaching methodologies, that high teaching self-efficacy beliefs produce higher levels of satisfaction and well-being at work, especially regarding the affective component of well-being, which, in turn, is inversely proportional to the development of symptoms characteristics of Burnout Syndrome. Given the significant presence of Burnout in professors with high self-efficacy, the author suggested that future studies include other variables that may interfere with professor self-efficacy, evaluating the sources of professor self-efficacy.

Self-efficacy and Use of Active Methodologies in Teaching

Two other studies also evaluated professors' self-efficacy beliefs (BRESSA, 2018; TENZIN et al., 2019), correlating them with the use of active methodologies. According to Moran (2018), they

require planning, critical reflection, continuous and procedural evaluation by the professor, as well as skills to supervise, guide, and provide feedback to students in the construction of problematized solutions.

Bressa (2018) (Article_5) analyzed the self-efficacy of 47 professors regarding the use of the Objective Structured Clinical Examination (OSCE) in the evaluation of medical students at a Brazilian college and the sources of self-efficacy of these professors. Such a tool, according to the author, deals with an objective clinical evaluation that uses simulation in controlled environments and requires the professor to have teamwork skills for planning, design, training, as well as the adoption of several steps and procedures that, in the end, with the examiner's feedback on the student's performance, focusing on the knowledge acquired and the means used to achieve the outlined goals. After collecting data with a scale of professor self-efficacy and a scale of sources of self-efficacy, the results showed that professors who agreed with the use of the OSCE assessment method also showed higher levels of self-efficacy. Regarding the sources of self-efficacy, the author observed that the factors social persuasion and vicarious learning were the most endorsed by the participants, indicating persuasion as the source of greatest interference in the formation of professors' self-efficacy. He emphasized that such findings are consistent with the sample, since, in the group, there was a high percentage of professors with no experience in the professional activity (42.6% with less than 10 years and, among them, 21.3% had less than 5 years of experience). This inference is in line with the findings of Bandura (1997) when he exposes that social persuasion is one of the most prevalent sources in beginning professors. Finally, Bressa (2018) emphasized that high levels of self-efficacy of professors are important for training a professional with more confidence, perseverance, and resilience to use the method.

Also seeking to analyze professor self-efficacy, Tenzin et al. (2019) (Article_22) carried out a quantitative-qualitative study at a college in Bhutan (Asia) to examine the impact of the Professor Development Program on the self-efficacy of medical education professors. In the aforementioned study, faculty members participated in the program for 12 months, to develop knowledge through experience, observation, reflection, peer coaching, student feedback, online learning, experiences related to the use of active methodologies in the teaching, including approaches to lesson planning, the role of mentoring and assessment tools (question construction and skills assessment by the OSCE).

To measure the impact on teacher self-efficacy, a pre- and post-test were applied, using a scale to measure self-efficacy in four areas: work performance, skills development, social interactions with students and colleagues, and ability to deal with stress at work. Another scale is also used to assess teaching skills, covering communication skills, involvement, creating an effective learning environment, understanding and organizing the subject, planning and designing learning experiences, assessing student learning and development as a professional educator. Regarding the qualitative component, eleven professors participated in a focus group and, after a joint analysis of the data, they concluded that the professor training program had a positive effect on the professor's professional development, verified by the improvement of their self-efficacy and their perception of competences/ capabilities to deliver the medical education curriculum.

Student Self-Efficacy and Different Teaching Methods

Another group of studies analyzed the self-efficacy of students regarding the use of different or new teaching methods adopted by medical schools (LOPES et al., 2020; SHIMIZU et al., 2019; SCHAUBER et al., 2015; DEMIRÖREN; TURAN; ÖZTUNA; 2016).

In their study, carried out in Brazil, with students from two medical schools in Minas Gerais, which used different teaching methodologies (traditional and problem-based learning - PBL), Lopes et al. (2020) (Article_1) compared the self-efficacy profile of the institutions' students and correlated it with academic performance. The participants were 147 4th grade students, 73 from the school that uses PBL, and 74 students from the institution with traditional teaching methodology, applying the Self-Efficacy Scale in Higher Education (GUERREIRO-CASANOVA; POLYDORO, 2010). The results showed that students from the school with the PBL methodology had a higher general average of self-efficacy ($p < 0.01$) and also in each domain of the scale when compared to the school with the traditional methodology. The variables female gender, older age, living alone, not using medication for chronic

disease, and exercising extracurricular activities had a positive influence on the average self-efficacy in the different domains of the scale. Regarding academic performance, a positive correlation was identified with self-efficacy in academic management. They concluded that the use of active teaching methodology can be related to a higher degree of academic self-efficacy, with the highest performance being identified in those students with a high perception of self-efficacy. They explained that greater beliefs generate greater effort by the students and lead to the development of self-regulation in learning. However, they highlighted that a longitudinal study may contribute to understanding how beliefs evolve during the course and in the use of different methodologies.

Within this comparative approach of traditional teaching methodologies and PBL, Schaubert et al. (2015) conducted a longitudinal design study (Article_38), who evaluated the self-efficacy of 1,646 students, from the 6th to the 10th semester, in a traditional curriculum or focused on problem-based learning, at the Charité University of Medicine in Berlin, Germany. In addition to self-efficacy, they evaluated emotional aspects (positive affects related to the study), adoption of learning strategies and study effort, as well as aspects of the environment (social support in the educational environment). To evaluate the correlation with academic performance, they used the results of the Medical Progress Test (MPT). Over five consecutive occasions over two years, the results of the progress tests were obtained, which were carried out in each semester. For data analysis, the researchers evaluated the relationships between the domains, using a structural equation model, applying a linear model of mixed-effects or a multilevel regression model, in which the variance components were estimated for three facets: student, time, and student-time interaction. As for student performance on progress tests, scores were specified as a latent growth model, used to statistically separate differences between performance gains and inter-individual differences throughout the study.

After analyzing the data, Schaubert et al. (2015) verified the inexistence of substantial differences between the traditional curriculum and the PBL in the psychosocial variables and performance. They reported that, in both contexts, performance gains were related to self-reported study effort. They also pointed out that involvement in collaborative study, in addition to having benefits for learning, also shows associations with perceived social support among students and is related to higher levels of self-efficacy and positive perception of the learning environment. In conclusion, they cited that curriculum reforms do not seem to necessarily deliver the intended benefits compared to more traditional learning environments, as students make substantial efforts to achieve their goals and succeed in their studies anyway, depending on the context of the study carried out. However, they emphasized that such inference does not mean that any change or curricular reform is inevitably unnecessary, indicating to focus on the following questions: “how”, “why”, “which” and “when” a specific content needs to be acquired by students to choose and allocate resources that facilitate the acquisition of specific knowledge, skills and competences adequately and efficiently.

Regarding the relationship between the self-efficacy of medical students in a Problem Based Learning (PBL) curriculum with self-regulated learning, Demiören, Turan, and Öztuna (2016) (Article_44) carried out a study with 561 students from the 2nd and 3rd year at Ankara University School of Medicine, Turkey, in which they measured students' perceptions of self-regulated learning, self-efficacy and perceptions of PBL. The results showed a direct relationship between self-efficacy and self-regulated learning skills, also noting that self-efficacy beliefs and self-regulation skills improved among students who perceived PBL benefits.

Also adopting the focus on the teaching methodology and its correlation with students' self-efficacy, the work carried out by Shimizu et al. (2019) (Article_23) compared the effects of PBL and bPBL (blended PBL) in 4th-year students of a medical university in Japan, who were divided into two groups (PBL). A pre- and post-test were used to measure students' knowledge, before and after the tutorial group started, and a Likert scale was applied to assess the tutorial group's functioning in terms of self-efficacy, self-directed learning, active participation, and tutor authority. In the bPBL group, instructions were replaced by online materials and short tests.

After analyzing the results, they concluded that the self-efficacy and motivation for learning triggered by group discussions were significantly higher for students in bPBL and that the knowledge gain in test scores was also significantly better in the bPBL condition, recommending the use of bPBL (e-learning) as an effective strategy in the Asian context, characterized by a culture with a greater focus

on learning oriented towards traditional exams/assessments and with students with greater difficulty in interacting.

Self-Efficacy, Motivation and Self-Regulated or Self-Directed Learning

The object of studies carried out by Martins and Santos (2019) (Article_24) and by Spormann et al. (2015) (Article_36) aimed at the association of student self-efficacy with self-regulated learning.

The study carried out by Martins and Santos (2019) (Article_24), to evaluate the use of learning strategies, according to the self-efficacy beliefs of 109 students from the 1st period of courses in the area of health and Production Engineering of a university in the south of Minas Gerais, Brazil, demonstrated the existence of a moderate correlation between learning strategies and academic self-efficacy, and students who reported greater use of learning strategies were those who showed greater self-efficacy in performing academic tasks. The study also showed that the two constructs are closely related to academic performance and that the average found for “Self-efficacy in Proactive Actions” may be related to the fact that students entering higher education think they are less able to take advantage of training opportunities, claim and participate in extracurricular activities and seek to update knowledge, such results being congruent with previous findings.

The results obtained by Spormann et al. (2015) (Article_36), regarding the verification of a significant association between self-efficacy and self-directed learning, were along the same lines. The study was carried out with 297 first-year medical students at the Universidad de Concepción in Chile, using scales to measure self-efficacy, self-directed learning, time management, academic engagement, and self-esteem. The results showed that students who better plan their studies have greater self-efficacy beliefs, manage their time better, and are more involved in their studies. Students with higher self-efficacy beliefs showed higher rates of the desire to learn factor, time planning, involvement in studies, and higher self-esteem. Higher self-efficacy scores were associated with higher levels in the self-management factor. It was identified that those who trust their abilities the most (self-confidence) have higher self-efficacy beliefs and greater self-direction in learning. As a limitation, they cited the sample composed only of first-year students, suggesting other assessments in a more heterogeneous group, despite having verified results that represented more than 50% of self-directed learning with the predictors used.

The studies carried out by Klassen and Klassen (2019) (Article_30) and Pelaccia and Viau, (2017) (Article_33) deal with theoretical studies on self-efficacy beliefs and their implication in motivational mechanisms in the academic environment of the Medicine course.

Pelaccia and Viau (2017) (Article_33) discussed aspects related to motivation to learn, based on the Social Cognitive Theory, which refer to three perceptions: (i) The perception of the value of an educational activity (“subjective value of the task”), defined as the student's judgment about the interest and usefulness of completing a proposed activity based on the goals he is pursuing; (ii) Perceived self-efficacy (judgment about their ability to succeed adequately with the proposed educational activity, related to setting high/challenging goals); (iii) Perceived controllability (“perceived control”), representing the degree of control a student believes he or she has over the progress of an activity. In this sense, according to the authors, a “motivated student” considers the proposed educational activities useful or interesting (perception of the value of educational activity), feels able to complete the activities to his/her satisfaction (perceived self-efficacy), and has the impression to be responsible for the progress of their learning exercises (perception of controllability). Given this perspective, the authors propose strategies to be adopted by Medicine professors aimed at positively impacting these three perceptions, specifically to increase self-efficacy. Therefore, they suggest the following: transforming a learning task into a problem; emphasizing successful results and providing support in the event of failure, always clarifying the evaluation criteria; taking into account the consequences of the vicarious experience (managing situations that can generate negative consequences for someone, considering the observers of the situation); provide motivating/constructive feedback, focusing not only on mistakes but emphasizing/persuading about the direction to be followed in the next stages of learning; allow students to perform teaching tasks, allowing them to share and explain the knowledge acquired with their colleagues. They also highlighted that motivation and self-efficacy beliefs cannot, by themselves, guarantee success, and the proposed strategies must be applied combined with other approaches,

methods, techniques, and tools arising from active teaching methods and cognitivist and constructivist learning theories.

Following the same perspective that considers self-efficacy as an important construct to impact learning in medical education, researchers Klassen and Klassen (2019) (Article_30) carried out a study to verify the state of research on self-efficacy of medical students and the validity of tools for measurement used. They critically reviewed the literature, analyzing 74 studies published in English since 1989 (the year of publication of the Social Cognitive Theory). They observed that research on the self-efficacy of medical students is increasing, starting from one article published from 1994 to 1996 to reach 30 articles published from 2015 to 2017, with a growing increase in researchers in international contexts and exploration of the association of self-efficacy with student learning and performance. Most studies (92%) used a quantitative method and 85% of them used a cross-sectional design. Regarding the measurement of self-efficacy, the authors pointed out problems in 46% of the studies, verifying the use of measures incongruent with the theory, for example, including questions not oriented to actions in the future; use of questioning to measure expectations of results and not the perception of capabilities; measurement of alternative constructs (self-esteem and anxiety); measurement of external barriers (environmental difficulties and not personal capabilities); and questions lacking domain specificity (not directed at a specific task), such as the following question: “I can always solve difficult problems if I try hard”.

Overall, of the 68 (out of 74) studies that provided a clear description of the content of the questionnaires/scales, 37 (54%) used self-efficacy with conceptually congruent measures and 31 studies (46%) used questions that are not congruent with guidelines from the theory of self-efficacy, eventually covering other conceptually diverse constructs. Such findings, according to Klassen and Klassen (2019), can generate uncertainty about the results and failure to progress in understanding the role that self-efficacy impacts on motivation and academic performance, emphasizing that research involving measures of other motivational constructs and personal beliefs (for example self-concept, self-esteem, expectations of results) should be encouraged, but with the use of valid measures for a better understanding of the phenomena. They also pointed out the need for self-efficacy research in a longitudinal model, using three or more moments (waves), to measure more reliably the patterns of changes in self-efficacy. They further highlighted the need for research to explore the dynamic nature of self-efficacy in a variety of medical school contexts and aimed at examining sources of self-efficacy, stressing that there is no doubt that further research on motivational beliefs, especially self-efficacy of medical students. They indicated as a limitation of the study the use of only articles in English, excluding theses and dissertations.

Students' Self-efficacy in a Specific Task and its Correlation with Performance

Self-efficacy can change as a consequence of the result achieved and the interpretation of the conditions that influenced it, impacting the constitution of new beliefs through the reformulation of initial perceptions, in a feedback mechanism (BANDURA, 1997). Thus, studying the sources of self-efficacy and its formation is relevant to providing subsidies for intervention in this process. Following this perspective, four studies evaluated the impact on self-efficacy beliefs after performing specific tasks and the feedback received by students about the performance/result. One study addressed the validation of the Statistical Self-Efficacy Scale of medical students.

The study carried out by Loftin and West (2017) (Article_17) with medical students at the University of Texas, in the United States, evaluated self-efficacy before and after carrying out an activity, using Team-based learning (TBL). It deals with an active learning teaching method that uses a group approach and requires students to do prior reading tasks in preparation for individual assessment, group assessment, and application exercise. The object of learning was “care at the end of life”, and all 87 students participating in the study completed the five online reading modules that addressed the topic. After the readings, they responded to a pre-intervention survey of self-efficacy and an individual topic comprehension assessment test (iRAT). Subsequently, the students were then randomly distributed into two groups: “TBL” (n=43) and “non-TBL” group (n=44). The “non-TBL” group went on to complete post-intervention surveys regarding self-efficacy, while the “TBL group” participated in TBL activities

(approximately 2 hours) and took the team comprehension test (tRAT), the application exercise (presentation of a clinical case of a patient in an advanced stage of cancer, with the team having to answer some questions about planning and evolution of the case) and, in the end, they also answered the post-intervention survey.

In addition to measuring self-efficacy in both pre- and post-intervention groups, the levels of confidence in (1) managing patients with end-of-life care problems were also assessed in the questionnaires; (2) communicating with patients; (3) making end-of-life medical care decisions; (4) use critical thinking skills; (5) find solutions to problems; (6) practice individual learning; and (7) practice group learning. After analyzing the data, the researchers found that both the “TBL” group and the “non-TBL” group had higher scores on the individual test (iRAT), but in the “TBL” group there was a significant increase in self-efficacy in learning care of the end-of-life skills, critical thinking skills, problem-solving and group learning.

A similar methodological proposal, with an assessment of self-efficacy during the performance of a specific task, was used in the study by Cleary, Dong, and Artino Jr., (2015) (Article 40), at the Edward Hébert School of Medicine, United States. The study examined the change in self-efficacy beliefs and regulatory processes of second-year medical students in response to corrective feedback while performing a diagnostic-specific reasoning task. To assess self-regulation processes, a microanalytical interview was used at different times during the task, and, to measure self-efficacy, strategic planning, and metacognitive monitoring, a single-item questionnaire was used at three different times. This study model was proposed based on the Social Cognitive Theory, in which the self-regulated learning process is described in terms of a three-phase cyclical feedback loop, involving premeditation (before the task), performance (during the task), and self-reflection (after the task).

Following the cycle, the processes of the forethought phase, which include setting personal goals and strategic plans, as well as how the influencing motivating beliefs such as self-efficacy, occur before starting a learning or performance activity. In the performance phase of the feedback, which occurs during a learning task, highly self-regulated individuals will often employ self-control tactics to manage their behaviors, affect, and cognition (attentional focus, self-instructional statements) and will proactively attempt to track their progress in learning, the types of actions and thoughts, forming a process called metacognitive monitoring. They also explain, based on the theoretical framework of Bandura (1986; 1997), that, during the performance phase, individuals will implement their strategic plan and try to collect information on aspects of their results that should be improved.

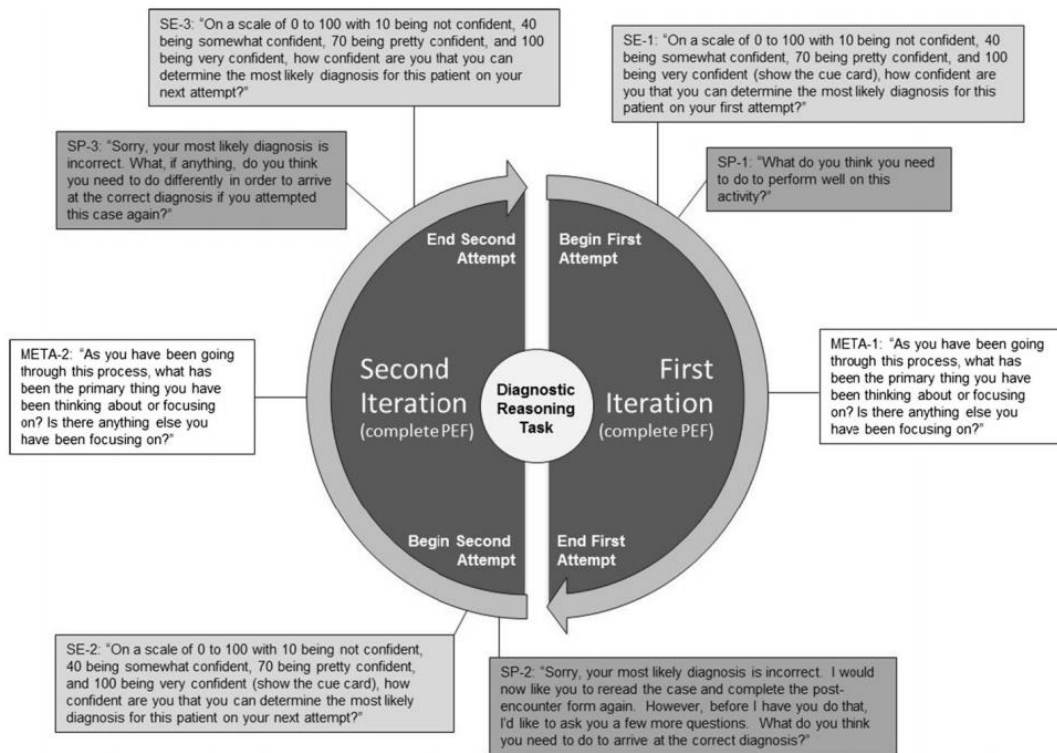
The final phase of this cycle (self-reflection) begins after subjects participate in a learning activity, in which, using feedback self-generated by the student or provided externally by peers or the professor, highly self-regulated individuals will assess whether their performances matched their personal goals (self-assessment), will identify the reasons for this level of performance (attributions) and generate conclusions about how to adapt before future learning attempts (adaptive inferences). An iteration of the three-phase feedback loop is completed when the processes of the self-reflection phase impact students' forethought processes before a subsequent learning or performance activity.

Based on the aforementioned theoretical basis, the authors individually administered, during a 25 to 30-minute session, a diagnostic reasoning task to the 71 participating students, who were instructed to read a description of a paper case, depicting diabetes mellitus. The case was framed as challenging and chosen to allow the measurement of changes in self-efficacy and self-regulation after receiving corrective feedback resulting from failure experiences. All participants used a post-meeting form (PMF) as a guide to develop and generate an accurate diagnosis. After the initial attempt to provide the correct diagnosis by each student, the examiner provided simple corrective feedback: “Sorry, your most likely diagnosis is incorrect”. Participants were then allowed to complete another form (PMF) and present the probable diagnosis after starting the second iteration of the same activity. At the end of the second attempt, they received another similar corrective feedback again (Figure 7).

To assess changes in students' self-efficacy and self-regulation processes during the multiple iteration activity, the authors applied a microanalytical interview at three points: before starting the task, before starting the second iteration of the task, and before a third prospective iteration. Regarding metacognitive monitoring, the researchers explained that, as it is a process inserted in the performance phase, it was measured during the first and second iterations of the task.

As it is considered relevant for a faithful interpretation of the procedure performed by the authors, Figure 7 is presented below, which translates the methodology used in the study:

Figure 7 – Reproduction of the study methodology



Source: Cleary; Dong e Artino Jr. (2015, p. 616).

The results revealed a significant linear trend of a general decrease in students' self-efficacy during the clinical reasoning task, an effect considered quite large by the authors since, in pair comparisons, there was a statistically significant drop ($p < 0.001$) in self-efficacy observed in both time points: Time 1 to Time 2 and a further reduction from Time 2 to Time 3. They highlighted the impressive speed and size of the drop in self-efficacy, considering that within 30 minutes of the clinical activity, the self-efficacy of the participants dropped from an average of approximately 53 (baseline of a scale ranging from 0 to 100) to an average of 22 after the second round of feedback, so that, at the end of the practice session, participants had a minimum of confidence to perform of the task successfully.

They also described, regarding the self-regulation mechanisms, that the declines in strategic thinking were parallel to the large drops in self-efficacy during the task, which proved to be an important point for observation by professors, considering how quickly the motivation and thinking of the students without extensive experience may experience change after providing results-oriented feedback on poor performance, with the potential to push some students down a maladaptive path and potentially lead to withdrawal or give up. However, they cited that while much more research is needed on the links between feedback and patterns of motivation and self-efficacy exhibited by medical students, medical educators need to be aware of the dynamic and fluid nature of these self-regulatory mechanisms and perceptions.

Also evaluating the influence of the type of feedback (positive and negative) on the self-efficacy, satisfaction, and performance of medical students, Van de Ridder et al. (2015) (Article_42) performed a randomized double-blind clinical trial with 59 first-year students at the University Medical Center Utrecht, the Netherlands. They applied a hearing impairment assessment task ("WR" - Weber and Rinne) to students who should, after receiving theoretical instructions, in cases of confirmation of impairment, diagnose whether the cause was sensorineural or conductive. They clarified that these participants were not familiar with/experienced with the topic. To carry out the study, the researchers divided the participants into two groups ("Positive Feedback" and "Negative Feedback") and each student was asked to assess their self-efficacy (E1) in performing the "WR" task at a time "T1" and, then

the student watched an instructional video on the procedure of the “WR” task. At T2, each student performed the “WR” task (Performance - D1) while being observed by the feedback provider and was again asked to assess their self-efficacy (E2). Soon after that, the student would receive feedback with negative or positive framing from the supervisor, according to their group, and then, at T3, they would have to perform the tests for the second time (Performance - D2) and classify their self-efficacy for the third time. (E3), as well as filling out the satisfaction scale (SAT). Two weeks later, at T4, the student was evaluated for self-efficacy for the fourth time (E4) and would perform the “WR” task for the third and last time (Performance - D3).

With the collected data, Van de Ridder et al. (2015) evaluated the correlation between satisfaction (SAT), performance (D1, D2, D3), and self-efficacy (E1, E2, E3, and E4) and observed that the feedback group with positive framing was more satisfied, had greater self-efficacy immediately after receiving feedback and perform better two weeks after receiving feedback (D3) than the group in the negative feedback condition. Changes over time in self-efficacy scores were explained, according to the authors, both by the influence of test performance and by the feedback received. They detail that, before T1, because they had not yet watched the video or performed the task, self-efficacy was lower, so that the explanation in the video about performing the task and its actual performance gave students the impression of the difficulty of the task on their ability, explaining the increase in self-efficacy (E2) after watching the video. Regarding the impact of feedback, the authors concluded that it seems to have affected the feeling of competence in the task, which explained the further increase in self-efficacy in the positive feedback condition and decrease in the negative feedback condition.

This conclusion of the authors was justified by the fact that, about performance, there was no significant correlation between the self-efficacy measured after performing the task for the second time (E3) and the performance obtained (D2), leading them to conclude that self-efficacy (E3) was more influenced by the feedback than by task performance. The self-efficacy measured after two weeks (E4) was significantly reduced and lower than the initial one (E1), with the authors explaining that the students were no longer ignorant and knew what to expect in the difficulty of the task so that the lack of practice in that time interval ended up negatively affecting students' self-efficacy. Given the results obtained, the researchers recommended the use of feedback with positive framing in assessments of clinical skills. As a limitation of the study, they mentioned that framing and communicating an oral feedback message (positive or negative) in daily life cannot be detached from the evaluator's tone of voice, facial expressions, and body posture. They suggest, then, that additional studies in other contexts and content areas are important for generalizing the findings.

Within this proposal to assess self-efficacy in a specific domain, the studies by Santabárbara and Lopez-Antón (2019) (Article_9) aimed to translate and validate the Statistical Self-Efficacy Scale of medical students at a college in Spain, considering that, according to the authors, knowledge of biostatistics is essential in evidence-based medicine. The scale to be translated and validated was the CSSE (Current Statistics Self-Efficacy), by Finney and Schraw (2003), in its English version, which has produced satisfactory results and has been applied internationally, mainly in Psychology students, and, in the field of Medicine, there were still no studies, according to the researchers.

The scale was translated from English to Spanish and vice versa, which has a unidimensional construction and assesses statistical self-efficacy in a self-reported way, consisting of 14 items that assess the current belief to complete 14 specific tasks related to statistics, using a response scale from 1 (no confidence) to 6 (complete confidence), so that the higher the total score on the CSSE, the greater the self-efficacy in statistics. After applying the scale to students of the Statistics subject, the authors indicated acceptably high levels of reliability with $\alpha = 0.898$ in the 14 items of the inventory, this value being very similar to that reported in its original version ($\alpha = 0.917$) and the total-item was, in all cases, equally high ($r \geq 0.45$) and statistically significant ($p < 0.001$), maintaining the internal consistency characteristics of the original version. As for the analysis of validity in the internal structure, they used confirmatory factor analysis, obtaining reasonable levels, concluding that the instrument has adequate psychometric properties that allow the evaluation of self-efficacy in statistics in medical students, presenting as an important tool for training plans in medicine, suggesting its use to improve the quality of teaching and learning in this domain. The authors reported as a limitation the use of non-probabilistic sampling, for convenience, in a single institution, which makes it impossible to generalize the findings.

Following the validation of the scale, the author Santabárbara (2019) (Article_21) carried out the study to assess the self-efficacy in Statistics of first-year medical students at the University of Zaragoza, Spain, using the Current Statistics Self-Efficacy (CSSE) scale in the Spanish version, seeking to verify correlation with students' performance in Biostatistics tests. Therefore, immediately after performing the test in Biostatistics, the researcher applied the self-efficacy scale to 40 students of the course and, then, the data were submitted to statistical tests, evaluating the normality of the variables using the Shapiro-Wilk for small samples. Comparison and nonparametric correlation analyzes were also performed to assess the association between students' final grades and total self-efficacy scores.

After the statistical analyses, the researcher reports that the results showed that the medical students participating in the study had high self-efficacy in statistics and that the performance in the Biostatistics test is better in those who showed greater self-efficacy. No gender differences were identified in terms of statistical self-efficacy. The author explained that the interviewees were familiar with concepts such as “p-value” and with the application of different types of statistical procedures. However, he found that students had problems in interpreting the power of a test, being proposed, based on other works, the use of other teaching methodologies, such as problem-based learning with the use of real examples and studies with own data, workshops with specific biostatistics programs, among other teaching methods.

The authors also mentioned that, in previous work, carried out by him with medical students from the same university, those who presented a higher level of anxiety obtained worse results in Biostatistics, so that increasing the students' self-efficacy levels may help in overcoming “fear” in the face of biostatistics and in obtaining better results. According to Bandura (1993), high levels of self-efficacy are related to low levels of anxiety and better coping with stressful situations. Santabárbara (2019) suggests that future studies analyze the modification of statistical self-efficacy through the implementation of teaching methods different from traditional ones and their potential effect on performance in Statistics.

FINAL CONSIDERATIONS

The initial purpose of this study was achieved with the presentation of the current state of national and international research on factors related to the self-efficacy of students and professors capable of influencing the teaching and learning process in medical education. Although few studies on the subject were identified, we believed that the review carried out allowed the systematization of the most recent studies, making it possible to verify the international concern with the impact of self-efficacy in the teaching and learning of medicine, among them the influence on aspects emotional aspects such as satisfaction, motivation or illness (Burnout Syndrome), teaching methodologies, in addition to the implication of beliefs in self-regulation mechanisms and academic performance, as well as the presentation of factors that can impact students' sources of self-efficacy, such as feedback framing to be provided to the student.

Given the details of the selected studies, we verified that the results of all the studies and the researchers' conclusions are in agreement of qualifying self-efficacy as an important construct to be analyzed in the academic environment of medical education, considering its positive relationship with several factors that can directly impact people's emotional state, favoring levels of greater satisfaction and less illness. Such implications had also been reported by Bandura (1986) when discussing the Social Cognitive Theory, when self-efficacy beliefs influence practically all aspects of people's lives, how much they motivate and persevere in the face of adversity, their vulnerability to stress and depression, and the choices they make, with much empirical evidence supporting these claims (PAJARES; OLAZ, 2008; DIAS-VIANA 2019).

The results of the studies presented about the influence of medical students' self-efficacy beliefs on the development of learning strategies and their implication on academic performance were also relevant. These results confirmed previous work in the sense that psychological competences can influence learning in cognitive, motivational, and behavioral aspects, since the processes of self-perceptions drive the student to transform psychological competences into school performance

competences, developing the process of self-regulation (ZIMMERMAN, 2008; POLYDORO; GUERREIRO-CASANOVA, 2010; TEIXEIRA; COSTA, 2018; LOPES et al., 2019).

Another important point highlighted in the studies was the analysis regarding the use of different teaching methodologies with the greater or lesser protagonism of students in learning, and, from the combination of the results of the selected studies, we could confirm, in general, which method is more favorable to the development of self-efficacy and performance, considering that other factors may be involved in the process, including self-regulation, as mentioned by Schaubert et al. (2015), which can influence academic performance regardless of the teaching methodology.

We also found relevant the confirmation of the importance of the development of faculty self-efficacy beliefs, since a teaching practice to be effective, needs a professor's personal belief about his ability to use his knowledge and skills to teach (BANDURA, 1993; BZUNECK, 2001b). Thus, it is important, as studies have shown, to be careful with providing feedback to students, which can consist of negative or positive information for the formation of new sources of self-efficacy in specific domains or tasks, as well as impact student performance.

Given the results presented, there is still much to study about self-efficacy in medical education, since the studies suggested expanding research to the teaching of other medical domains and in different contexts, also considering the importance of identifying elements that influence the sources of self-efficacy, since all studies are unanimous in concluding that increasing self-efficacy is important for good academic performance.

In this sense, stimulating self-efficacy beliefs in medical education, whether of professors or students, can be configured as a good strategy for managing the academic environment, seeking a better development of the skills and abilities of the medical student, the objective is challenging. to intervene in the increment of these beliefs.

As a limitation of the study, we indicate the restriction of the sample by the languages and the researched period, and the inclusion of other databases may also be suggested for the mining of a greater number of studies, given the detected lack of research that provides reliable evidence with representative samples and randomized controlled designs with comparative analyses.

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José de Oliveira Costa Filho: contributed substantially to the construction of the entire work, methodological development, data analysis, writing and final review.

Camélia Santana Murgu: contributed substantially to the construction of the entire work, methodological development, data analysis, writing and final review.

Aline Fonseca Franco: contributed substantially to the construction of the entire work, methodological development, data analysis, writing and final review.

DECLARATION OF NO CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with this article.

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