
ADEPT LEARNING CYCLE AND ACADEMIC PERFORMANCE IN COST ACCOUNTING

José Augusto Sousa de Melo ¹
Joyce Menezes da Fonseca Tonin ²
Nilson Facci ³

▪ Received: 07/24/2020 ▪ Approved: 06/11/2020 ▪▪ Second Approved Version: 09/11/2020

ABSTRACT

The Analysis of Diagnostic Exam Prompted Teaching (ADEPT) Learning Cycle is a teaching and classroom management methodology developed by Shoulders and Hicks (2008). This approach consists in the application of diagnostic assessments that identify the students' level of knowledge in a given topic before being examined in a summative assessment. This study aimed to verify the relationship between the application of the ADEPT Learning Cycle and the academic performance of students enrolled in the discipline of Cost Accounting at a State Public University. To identify the relationship between the application of diagnostic tests and academic performance, a quasi-experimental approach was adopted in two classes in the discipline of Cost Accounting. The treatment and control groups were defined, in which the main difference between them was the participation or not in a diagnostic examination one week in advance to the test that would determine the grade of the period. For analysis of the collected data, tests of means (t-tests) and multiple regression were used. The results indicate a positive relationship between the application of diagnostic assessments and the performance of students. The evidence found collaborates with the research by Shoulders and Hicks (2008) and by Thomas, Bell and Shoulders (2013), and expands the literature by indicating that the application of the ADEPT Learning Cycle is effective in improving academic performance even when applied in classroom, collectively.

Keywords: Accounting Education. Cost Accounting. Diagnostic Evaluation. ADEPT Learning Cycle. Academic Performance.

¹ Master's student in Accounting from the State University of Maringá. Address: UEM, Bloco C23, Av. Colombo, 5790, Zona 7, Maringá - PR -Brasil. Phone: (42) 99826-8814, e-mail: j.a_melo97@hotmail.com.

<https://orcid.org/0000-0002-9011-484X>

² PhD in Accounting from the Federal University of Paraná. Adjunct Professor at State University of Maringá. Address: UEM, Bloco C23, Av. Colombo, 5790, Zona 7, Maringá - PR -Brasil. Phone: (44) 3011-4972, e-mail: jmftonin@uem.br

<https://orcid.org/0000-0003-1371-1314>

³ Master in Accounting from the Federal University of Paraná. Full Professor at State University of Maringá. Address: UEM, Bloco C23, Av. Colombo, 5790, Zona 7, Maringá - PR -Brasil. Phone: (44) 3261-4910, e-mail: nfacci2@uem.br.

<https://orcid.org/0000-0003-2992-6029>

CICLO DE APRENDIZAGEM ADEPT E O DESEMPENHO ACADÊMICO EM CONTABILIDADE DE CUSTOS

RESUMO

O Ciclo de Aprendizagem *Analysis of Diagnostic Exam Prompted Teaching* (ADEPT) é uma metodologia de ensino e gestão de sala de aula desenvolvida por Shoulders e Hicks (2008). Esta abordagem implica na aplicação de avaliações diagnósticas que identificam o nível de conhecimento dos estudantes em um determinado tópico antes de serem examinados em uma avaliação somativa. O objetivo deste estudo foi verificar a relação entre a aplicação do Ciclo de Aprendizagem ADEPT e o desempenho acadêmico dos estudantes matriculados na disciplina de Contabilidade e Análise de Custos em uma Universidade Pública Estadual Paranaense. Para identificar a relação entre a aplicação dos exames diagnósticos e o desempenho acadêmico foi adotada uma abordagem quase-experimental em duas turmas da disciplina de Contabilidade e Análise de Custos. Foram definidos os grupos de tratamento e controle, em que a diferença principal entre eles foi a participação ou não em um exame diagnóstico do conhecimento com antecedência de uma semana em relação à prova que determinaria a nota do bimestre. Para análise dos dados coletados foi utilizado testes de médias (*t de student*) e regressão múltipla. Os resultados indicam uma relação positiva entre a aplicação de avaliações diagnósticas e o desempenho dos discentes. As evidências encontradas colaboram com as pesquisas de Shoulders e Hicks (2008) e de Thomas, Bell e Shoulders (2013), e amplia a literatura ao indicar que a aplicação do Ciclo de Aprendizagem ADEPT é efetiva na melhoria do desempenho acadêmico, mesmo quando aplicada em sala de aula, de maneira coletiva.

Palavras-chave: Educação Contábil. Contabilidade de Custos. Avaliação Diagnóstica. Ciclo de Aprendizagem ADEPT. Desempenho Acadêmico.

1 INTRODUCTION

Recent publications have studied the failure rate in subjects related to the teaching of Accounting (Shoulders & Hicks, 2008; Sargent, 2013; Borges, Santos, Abbas, Marques, & Tonin, 2014; Severino, Leal & Borges, 2017). In Brazil, this issue is reinforced by the low performance of academics in the professional entry exam of the Federal Accounting Council (CFC) and in the National Student Performance Exam (ENADE), which has concerned some researchers and professors in the area and has been the object of study (Rodrigues, Pinho, Bugarim, Craig, & Machado, 2017; Miranda, Leal, Gama, & Miranda, 2019). These problems, among others, lead to discussions about the current teaching practices used in Accounting courses and encourage the search for new forms and teaching tools aimed at improving the quality of the learning process.

As part of the teaching and learning process, a critical and controversial point to be examined is how to assess students' learning. Luckesi (2000) and Almeida and Coimbra (2018) point out that, in many cases, assessments, usually test, are used as a disciplinary mechanism, and not as a tool to plan and adjust, when necessary, the teaching and learning process. Higher education assessments not only determine whether a student will fail or not but have the

potential to influence the way students plan and use their study time, it also affects factors such as self-esteem, motivation for studies, reinforce interest in dropping out of the course, guide future academic and professional choices etc. (Garcia, 2009; Gil, 2012; Kickert et al., 2019). Thus, it is important to note that the student's experiences with assessments influence the way they approach learning (Struyven, Dochy & Janssens, 2005).

Despite the various points of criticism presented in the literature, the feedback given by the evaluations is one of the most important components of the teaching and learning process (Henderson, Ryan & Phillips, 2019). Literature in the area of education shows that assessments have the functions of providing data necessary for the improvement of learning and teaching, identifying difficulties and obstacles in learning, providing information for planning, providing feedback to the professor, guiding decision making regarding activities teaching methods, among other functions (Sant'Anna, 2011; Gil, 2012; Libâneo, 2013; Silva, Theiss & Rausch, 2013). With that in mind, we can see that performance assessments are not (or at least should not be) just a classification tool, which determines whether or not a student will move on to the next phase of the academic cycle, but that they can and should be used to improve the teaching process and be a tool to aid learning (Luckesi, 2000; Almeida & Coimbra, 2018).

In turn, Shoulders and Hicks (2008) and Thomas, Bell, and Shoulders (2013) explored a teaching approach called Analysis of Diagnostic Exam Prompted Teaching - ADEPT. This teaching technique or approach explores assessments not only as a classifying tool but as a useful tool for the learning process. These assessments offer important information, both for students and professors, on what is the real level of knowledge about a subject, indicating flaws in the learning process in time to be corrected, without the student being punished.

Considering the relevance of the evaluation process in student learning and the positive results regarding the application of diagnostic exams in the subjects of Intermediate Accounting I and II (Shoulders & Hicks, 2008) and Introductory Accounting (Thomas et al., 2013) the present study aims to investigate the effect of applying diagnostic tests on the performance of students in the discipline of Cost Accounting in the context of a State Public University in Parana – Brazil. Given the above, the guiding question of the research is: What is the relationship between the application of the ADEPT Learning Cycle and the performance of students enrolled in the discipline of Cost Accounting?

In order to answer the research question, the objective outlined was to verify the relationship between the application of the ADEPT Learning Cycle and the academic performance of students enrolled in the discipline of Cost Accounting. The intention is to explore the possibilities for improvement in the teaching and learning process and the consequent improvement in academic performance. According to Shoulders and Hicks (2008), diagnostic assessments have the potential to improve students' learning by pointing out misunderstandings, even before these failures in the learning process reflect on a low grade in the discipline or failure.

In the studies conducted by Shoulders and Hicks (2008) and by Thomas et al. (2013) the diagnostic evaluations and subsequent orientations were applied individually to the students. However, the reality of the course in which the research was carried out, as well as the reality of most accounting courses in Brazil, does not

allow this individualized diagnostic approach. Taking this into account, the present study differs from the previous ones in exploring the application of diagnostic assessments in the classroom, collectively, seeking to identify the main mistakes made by students. Such approach is more consistent with the reality of the Course and the University where the research was conducted.

The success of the application of diagnostic tests depends on their quality in identifying the points that need correction and the students' effort to correct the flaws in the learning process and deepen their studies in the areas identified by the diagnostic evaluation. In addition to exploring a different way of applying diagnostic tests, the present study also advances the analysis of previous studies by using a multiple regression model to verify the influence of diagnostic assessments on academic performance, controlling factors such as past performance and class attendance.

The Cost Accounting discipline has been the subject of study in several studies in recent years (Gandía & Montagud, 2011; Tibola, Silveira & Mais, 2012; Borges et al., 2014; Muller, Schuster & Zonatto, 2017; Severino et al., 2017), showing the importance of this discipline within the set of accounting knowledge, as well as indicating a growing interest of accounting education researchers in this area of study. One of the gaps presented by these researches is the evaluation process and its effects on academic performance and students' perception of the effectiveness and contribution of evaluations in learning.

Furthermore, Garcia (2009) stresses the need to expand the debate on the evaluation of learning in higher education in Brazil. Taking this observation into account, the present study expands the literature regarding the assessment of learning in higher education, exploring its implications for the performance of students in the Accounting Sciences Course, more specifically students in the discipline of Cost Accounting. In this sense, the present study is justified by the relevance of the evaluation process in teaching and learning, as well as by the possible influence of this process on students' performance, motivation, self-esteem, and may even be a potential determinant in the student's continuity in the undergraduate course.

Thus, it is expected that the application of diagnostic assessments will contribute to improving the teaching and learning process of academics enrolled in the discipline of Cost Accounting. Such an approach can partially contribute to the solution of difficulties found in the literature on the teaching of Cost Accounting, such as low content retention, student disinterest, high failure rate, among others. The results of this research can collaborate with the strengthening of the ADEPT technique and the use of evaluations as a teaching tool, by exploring its application collectively, and by applying it in a different context from the original studies. Among other contributions, this research aims to expand the discussion on the use of assessments in higher education as a teaching and learning tool, and not just as a classification tool among those who have failed and those who have passed.

2 LITERATURE REVIEW

2.1 Assessment in Higher Education

The literature on higher education points to the evaluation process as a complex activity, which often becomes an unpleasant function and causes anguish in professors, coordinators, and managers who face difficulties to effectively understand how to carry out the process of evaluating the learning of students (Gil, 2012; Almeida & Coimbra, 2018). Part of the problems encountered with students' learning assessment is the confusion between what to examine and what to evaluate.

According to Almeida and Coimbra (2018) examining is an action that keeps the object in the same way it was before the exam. Examining or testing is intended to identify the absorption of content and classify students as pass or fail. The tests used to examine fulfill the function of "photographing" the state of knowledge, but they do not point out the way to learning. The act of evaluating, according to the same authors, helps the object to achieve an expected direction, achieve objectives, or promote changes that enable success in achieving them. When assessing, the professor identifies the points that the students need to improve and provides guidance on how to achieve the learning objectives.

It is clear then that the act of assessing requires professors to make a diagnosis of students' learning in order to guide and assist them in improving the results of the teaching and learning process. Evaluating is essentially part of the teaching process (Harlen & James, 1997). Thus, as highlighted by Shoulders and Hicks (2008), the ADEPT Learning Cycle fulfills the function of assessing, that is, diagnosing the level of knowledge, identifying possible errors or misunderstandings in the teaching and learning process, and pointing out the possible paths for correction of these errors, without the need for punishment with a low grade or even failing grade.

Garcia (2009) points out that evaluation strategies in higher education generally focus on summative assessments, applied at the end of a given period or teaching unit. In the same sense, Almeida and Coimbra (2018) state that evaluation is often seen as an isolated act in the pedagogical process. In line with the arguments of these authors, the empirical evidence from the research by Bolzan, Fernandes, and Antunes (2019), which investigated two Brazilian and two Portuguese Business courses, indicates that evaluations in these courses are strongly oriented towards a classification function.

Almeida and Coimbra (2018) declare that the pedagogical act consists of three components: planning, execution, and evaluation, and state that for this process to be effective, there must be an integration between these components. In a complementary way, Gil (2012) declares that the evaluation must be seen as a process that develops along a didactic cycle. The author points out in his book three types of evaluation: diagnostic, formative, and summative. Table 1 presents the definitions for each type of assessment.

Table 1
Types of evaluation

Types of evaluation	Definition
Diagnostic	It constitutes a survey of the students' capacities in relation to the contents to be addressed. It seeks to determine the presence or absence of knowledge and skills, identify initial skills, needs, interests of students, and detect prerequisites for new learning experiences, in order to determine the most appropriate content and teaching strategies. In the diagnostic function, the evaluation "will have to be the instrument for the identification of new directions" (Luckesi, 2000, p. 43)
Formative	Formative assessment aims to provide information about the development of the teaching and learning process. This type of assessment finds deficiencies in the teaching-learning process, allowing for reformulations in it, in order to increase the probability of achieving the objectives. Formative assessment is geared towards promoting learning. Its functions are to guide, support, reinforce, and correct. It is a non-selective evaluation that allows both students and professors to redefine priorities and adjust strategies.
Summative	The summative assessment is applied at certain time intervals when the achievement or not of an objective must be reported. It is a punctual assessment, which usually occurs at the end of the course, which aims to verify the achievement of previously established objectives, that is, to assess the level of achievement presented by the student. It has the purpose of putting the evidence, and its main purpose is to confer a certificate.

Source: Adapted from Harlen e James (1997), Sant'Anna (2011), Gil (2012)

Taking into account the types of assessments presented by Gil (2012), Barbosa, Leal, and Pereira (2020) did one research that aimed to identify and analyze the types of assessments adopted in the teaching-learning process in Accounting courses in the Southeast of Brazil. The results of this research indicate that the investigated professors adopt both formative and summative assessments in their subjects. On the other hand, only 27% of professors answered that they used diagnostic assessments, which was defined in the research as an initial assessment of the necessary prerequisites for the discipline.

The form of assessment explored in this article has characteristics of both diagnostic and formative assessment. The term used in the studies conducted previously was diagnostic evaluation (Shoulders & Hicks, 2008; Thomas et al., 2013), and for this reason, this will be the term used to refer to the evaluation object of study in this work. A type of diagnostic evaluation applied at the beginning of the course was researched by Sargent (2013). In this study, the author investigated the impact of the fulfillment of prerequisites on the result of the Intermediate Accounting discipline. The skills prerequisites were identified through an online proficiency test on a system that also offered tutorials in areas of learning identified as low performance.

Thus, Sargent (2013) argues that the diagnostic tests gave students the opportunity to identify whether they were prepared for the next discipline, as well as to find and correct their own learning difficulties. That said, this approach avoided the need to select only trained students or try to teach prerequisite skills to all students. The implantation of diagnostic exams before the beginning of

classes showed positive results on academic performance in the Intermediate Accounting discipline (Sargent, 2013). Considering the positive effects of applying diagnostic assessments and the results of Barbosa et al., (2020), which indicate that only 27% of the investigated professors use this type of assessment, it is clear that this is a teaching approach that can be best explored in the Brazilian context.

According to Libâneo (2013), the diagnostic evaluation can be applied before, during, and at the end of a discipline. In the case of this study, the diagnostic evaluation was applied during the discipline of Cost Accounting. One of the reasons presented by Sargent (2013) for conducting his research was the high failure rate in the Intermediate Accounting discipline. This is also a problem reported by research in the Cost Accounting discipline (Borges et al., 2014; Severino et al., 2017). In this way, this study aims to contribute to the improvement of the teaching and learning process in Cost Accounting and potentially mitigate the failure rate in the discipline.

2.2 Cost Accounting Discipline

Disciplines related to Cost Accounting have been the object of study in a large number of researches in the area of accounting education. These studies indicate that Cost Accounting is an important and complex area of accounting knowledge. Borges et al. (2014) sought to investigate the probable reasons for the high failure rate in the Cost Accounting discipline offered in the undergraduate course in Accounting Sciences at the State University of Maringá (UEM). Based on the students' perception, the researchers classified the possible reasons for the high failure rate in the discipline in two large interconnected groups: "difficulty" and "disinterest".

Some of the variables related to the "difficulty" group were: the complexity of the discipline, difficulty with calculations, text interpretation, and anxiety, among others. The possible reasons related to the "disinterest" group were: student attendance in classes, lack of dedication, and disinterest, among others (Borges et al., 2014). Collaborating with the results found by Borges et al. (2014), procrastination, the lack of interest and dedication, the complexity of the contents, and difficulties with the calculations were pointed out as relevant variables in academic performance and failure rate in the perception of students who went through subjects related to Cost Accounting in an Institution of Higher Education of the State of Minas Gerais - Brazil (Severino et al., 2017).

Also exploring the students' perception, this time at a public university in the State of Santa Catarina - Brazil, Tibola et al. (2012) aimed to identify the quality attributes perceived by students in Administration and Accounting disciplines for the study of costs. The main characteristics of quality perceived as relevant by the students were: professor commitment, application of practical examples, understanding of the subject, clarification of doubts, and didactics of the professor. It should be noted that a point of dissatisfaction pointed out by some students was the form of assessment of the discipline, and one of the suggestions presented was "more tests and exercises" (Tibola et al., 2012, p. 389).

The main findings of these empirical studies point out to the need for improvements in the teaching and learning process of the Cost Accounting discipline. This is evidenced, for example, in Borges et al. (2014) in which the authors

state that “it is possible to verify what measures or strategies can be adopted to try to reduce the failure rate, some of which depend on the student and others on the professor” (p. 433). There are works in the literature that discuss the possibilities for improving the teaching of Cost Accounting, for example, Gandía and Montagud (2011) and Muller et al. (2017).

Muller et al. (2017) investigated the students' perception of opportunities for improvement in the teaching of Cost subjects. This research showed that the priority improvement points for the students surveyed are: adequate professor qualification; student participation in classroom discussions; greater interaction of students during the exposure of the content. This last point is related to the clarification of doubts and the didactics of the professor, pointed out as a relevant characteristic for students in the research by Tibola et al. (2012). The results of Muller et al. (2017) also show that some students perceived that the content was being passed very quickly and that the materials indicated for reading were difficult to understand, reinforcing the results found by Borges et al. (2014) regarding the difficulty perceived by students.

In a more practical approach, Gandía and Montagud (2011) investigated the relationship between the adoption of innovative teaching methods (Teaching Cases, Problem-Based Learning, and Seminars) and the academic performance of students in the discipline of Cost Accounting at the University of Valencia, Spain. In this work, there was a comparison between the performance of students in different periods: from 2005 to 2007, in which students received classes with traditional methodologies, compared to the period from 2008 to 2010, in which student-centered teaching methodologies were applied. The results point to an improvement in academic performance after the implementation of active teaching methodologies (Gandía & Montagud, 2011).

Considering the findings of the need for improvement in the teaching and learning process of the Cost Accounting discipline and based on the positive results found in the use of diagnostic exams in the subjects of Intermediate Accounting I and II (Shoulders and Hicks, 2008) and Introductory Accounting (Thomas et al., 2013), it is expected that the ADEPT technique, even with adaptations, can bring benefits to the teaching and learning process of the discipline of Cost Accounting. The application of diagnostic assessments can, for example, reduce the level of anxiety of students at the time of the test (Borges et al., 2014), since they would have a better level of knowledge about their skills for carrying out the assessment. With the application of the ADEPT technique, students can potentially correct their mistakes and misunderstandings in the learning process before taking the test that will determine their grades. Thus, the application of diagnostic assessments has the potential to improve the performance and satisfaction of academics.

2.3 The ADEPT Technique

The teaching and assessment approach explored in this article was an adaptation of the ADEPT Learning Cycle model, studied by Shoulders and Hicks (2008) and Thomas et al. (2013). According to Thomas et al. (2013), the ADEPT Learning Cycle is a teaching and classroom management approach that aims to help the students know when they have achieved sufficient knowledge of a topic

for them to have the ability to be successful in knowledge assessments (summative type).

This technique requires students to do diagnostic exams that have no direct impact on the final grade. In the studies carried out by Shoulders and Hicks (2008) and Thomas et al. (2013), students should have a performance higher than 80% in the diagnostic exams in order to have the privilege of carrying out the evaluation that would determine the final grade. Students could take the diagnostic exam more than once, however, if they did not reach the minimum performance required in the diagnostic test (80%) in time to take the final exam, it would receive a score of zero in the given topic. The initiative to carry out the diagnostic evaluation came from the students themselves who could choose the moment they felt most prepared for the test. The exams were corrected as soon as possible, usually at the end of the exam.

ADEPT also involves individual guidance outside the classroom. Such individual guidance serves to correct any mistakes or misunderstandings identified in diagnostic tests. This instructor/student interaction may involve a combination of explanations related to the misunderstandings and guidance for areas that need further study. In this way, academics have feedback on their level of knowledge, with enough time to correct learning failures, before being punished with a low grade or even failing (Shoulders & Hicks, 2008; Thomas et al., 2013).

In the work of Shoulders and Hicks (2008), the application of diagnostic tests and subsequent individual orientations were the responsibility of the professor. These activities were more time consuming for professors and costly. A proposal for a solution to this problem was found by Thomas et al. (2013) in which tutors were used to applying the exams and giving orientation to academics, with the supervision of the faculty. Both studies cited compared the performance of a treatment group (with ADEPT) and control (without ADEPT), with both groups having the same professor, materials, tutors etc., that is, the basic difference between the groups was whether or not the ADEPT approach was applied.

However, a limitation of these studies is that the groups were not enrolled in the disciplines at the same time. More specifically, the performance of academics taught with the ADEPT technique was compared with the performance of students enrolled in a previous period when the technique had not been applied. This may have interfered with the results, since the compared groups may be inherently different, as the authors themselves pointed out. To minimize these limitations, previous performance in other disciplines was used as control variables. Both the work of Shoulders and Hicks (2008) and Thomas et al. (2013) have shown positive results regarding students' performance and retention rate (pass rate). The research by Shoulders and Hicks (2008) also identified improvement in student satisfaction with the discipline.

3 METHODOLOGICAL PROCEDURES

Due to institutional issues at the University and the Department where the following research was carried out, diagnostic tests were not mandatory for students. The performance in this test also could not significantly influence the final grade of the students, that is, the performance in the diagnosis could not prevent the student from taking the final test, as was the case in previous research by

Shoulders and Hicks (2008) and Thomas et al. (2013). Thus, some adaptations had to be made. The diagnostic exam was applied in the classroom one week before the bimonthly test. To verify the relationship between the application of diagnostic assessments and academic performance, this research adopted a quasi-experimental approach.

Diagnostic evaluations were applied in two classes of the Accounting and Cost Analysis discipline during the second semester of 2019. The diagnostic activity was optional for the students, this allowed the performance of those who participated in the activity to be compared with those who did not (did not attend the class). In this way, 44 students participated and 27 did not participate, thus composing the treatment (with ADEPT) and control (without ADEPT) groups, respectively. The main difference between the two groups was the participation or not of the diagnostic evaluation. The study variable (dependent) defined was academic performance, measured by the score in the bimonthly test that was applied one week after the diagnostic evaluations. The explanatory variable (independent) was participation in the diagnostic evaluation (dummy). The grades of the previous bimester and the frequency in classes (number of absences accumulated during the academic year) were used as control variables. For data analysis, we used the means test (t student) and multiple regression with the aid of the statistical software Stata 13®. The regression model used was as follows:

$$\text{Grade} = \alpha + \beta_1 \text{Prev. Grade.} + \beta_2 \text{Absences} + \beta_3 \text{Diagnosis} + \mu \quad (1)$$

In which:

Grade = Grade in the bimonthly test that the diagnostic evaluation was applied;

Prev.Grade. = Grade from the bimester prior to the application of the diagnostic evaluation;

Absences = Absences accumulated during the academic year;

Diagnosis = Dummy, 1 = participated in the diagnostic evaluation, 0 = did not participate;

μ = random error;

α , β_1 , β_2 , β_3 = parameters estimated by the regression

According to Hair, Black, Babin, Anderson and Tatham (2009), multiple regression analysis is a statistical technique that can be used to assess the relationship between a dependent variable and several independent variables. Thus, the regression model presented allows to assess the direction and statistical significance of the relationship between the application of diagnostic assessments (ADEPT Learning Cycle) and academic performance by controlling the variables of previous performance and frequency in classes.

3.1 Diagnostic Evaluation

The diagnostic evaluation used questions from the National Student Performance Exam (ENADE) of 2015 and 2018, which addressed the subject discussed during that two-month period. Each question was projected on the

board and students had around 5 to 6 minutes to answer each question. After all students had answered the projected question, the number of answers in each alternative was compiled on the board, and right after that, it was corrected and commented, according to the most frequent errors. In order to maintain a reasonable level of incentive in solving exercises, the class was divided into groups of 5 to 6 students at random to encourage competition between groups. The resolution of the exercise was individual, and the groups basically served to accumulate points. Thus, at the end of the diagnostic evaluation, the members of the group with the most correct individual answers in the diagnostic exam received an extra point in the bimonthly grade. It is noteworthy that the performance measured in the study only considered the grade in the bimonthly exam, without taking into account the extra point and grades of other activities.

The way in which ENADE questions, as well as other institutional exams, are elaborated were useful to identify the main mistakes made by students, since the alternatives are designed in such a way that, if the student makes a certain mistake he will get to at a certain alternative. This is because these exams use the concept of distractors. According to Haladyna (2004), a distractor is an unquestionably wrong alternative, but it must be plausible for those examined who have not learned the knowledge or skill being examined yet, that is, the distractor must seem right (Table 2).

Table 2

Example of diagnostic evaluation question

Statement: A company sells its product at a price of \$ 7.00 per unit. The financial reports present a Variable Unit Cost of \$ 2.00 and a Fixed Cost and Expenses of \$ 150,000.00, with the Income Tax rate equal to 30%. In this situation, to obtain a net profit of \$ 31,500.00, the company must sell the corresponding to:

Alternatives	Possible mistake made
\$ 273.000,00 (Right answer)	
\$ 210.000,00	Disregarded profit in calculations.
\$ 195.000,00	Multiplied the amount at the economic breakeven point by the contribution margin.
\$ 254.100,00	It did not consider income tax on profit.
\$ 39.000,00	This is the economic break-even point in quantities and not in sales revenue.

Source: Adapted from Question 34 of ENADE 2015

It can be seen in the example shown in Table 2 that, given the number of responses in each alternative, it is possible to quickly identify the likely most frequent mistakes made by students. With this approach, it was possible to identify the main mistakes and misunderstandings of the students and to give general feedback to the class on what points should be improved. The student who presumably solved the exercise and came to the wrong alternative had immediate feedback on which point he probably missed. This approach is particularly useful for professors who work in groups with a large number of students, where correcting individual mistakes is particularly difficult. This general diagnosis has the potential to guide students to areas where they need to improve. The application of diagnostic evaluation one week in advance allowed students

to correct the necessary points and gave the opportunity for further clarification in the tutoring or directly with the professor during the week.

The changes in the form of application of diagnostic evaluations, in the researchers' view, did not affect the main aspects of the technique, which is to provide feedback on the level of knowledge of a given topic to students and correct mistakes and misunderstandings in the learning process. These changes were necessary due to the limited availability of time for professors and students. On the other hand, the non-need to achieve a minimum performance in the diagnostic exam and the lack of significant impact on the grade may have impaired the technique as to the incentives in the execution of the tests, since in the reference studies the students investigated had to do the diagnostic evaluations and perform well to have the right to make a final assessment.

4 ANALYSIS AND DISCUSSION OF RESULTS

4.1 Statistical Analysis

Table 3 shows the descriptive statistics of the dependent variable (grade), independent (diagnosis), and the two control variables (grade from the previous bimester and accumulated absences) used in the regression model. In these descriptive statistics, a wide range can be noted between the lowest and highest grades, both in the test score of the bimester that the diagnostic evaluation was applied and in the final grade of the previous bimester. The test score for the two months studied showed a positive and statistically significant correlation ($p < 0.01$) with the score for the previous two months. With regard to the accumulated absences during the academic year, these had a negative correlation with the test score, at a level of 5% significance. The non-parametric Spearman rank correlation test was used due to the non-normality of the variable "grade". This information indicates that these data represent important control variables for verifying the relationship between the application of diagnostic assessments and performance.

In order to verify whether diagnostic evaluations influenced academic performance, it was decided to perform a means test to verify whether the difference in the scores in the bimonthly test between the treatment and control groups was statistically significant. Using the means test, it is possible to better compare the results with the previous research by Shoulders and Hicks (2008) and Thomas et al. (2013) who also used this statistical technique in their analysis. The results of this test are shown in Table 4.

Table 3
Descriptive statistics

Variable	Average	Min.	Max.	Standard deviation	Shapiro-Wilk (p>z)	Spearman correlation			
						1	2	3	4
1. Grade	5.021	0.5	10.0	2.7708	0.028	1	-	-	-
2. Previous Grade	6.06	0.0	10.0	2.419	0.384	0.4936**	1	-	-
3. Absences	13.15	0	32	7.778	0.342	-0.2384*	-0.0004	1	-
4. Diagnosis	0.62	0	1	0.489	0.966	0.2922*	-0.0283	-0.2778*	1

** , *. Statistically significant at 1% and 5% significance, respectively.

Source: Prepared by the authors.

According to the results presented, the treatment group had an average performance superior to the control group. The average of the bimonthly evaluation scores for the group that participated in the diagnostic evaluation was 5.66, while for the group that did not participate, this average was 3.98, representing a difference of 1.68. This difference was statistically significant at 1% significance. These results indicate that the diagnostic exam was effective in identifying errors and mistakes made by the students, who corrected them and avoided making the same mistakes in the summative evaluation, resulting in a better performance in the test. This evidence indicates that there was an improvement in the learning of students submitted to the ADEPT Learning Cycle and they collaborate with the results presented by Shoulders and Hicks (2008) and Thomas et al. (2013).

Table 4
Means test of scores for the bimonthly exam with diagnostic evaluation

	No. of Obs.	Average	Standard Error	S. deviation
Without ADEPT	27	3.9814	0.5718	2.9714
With ADEPT	44	5.6590	0.3712	2.4624
Difference		-1.6776 **		
Test Statistics Value (t test):		-2.4606	One-tailed p-value:	0.0088

** , *. Statistically significant at 1% and 5% significance, respectively.

Source: Prepared by the authors.

The Shoulders and Hicks (2008) study compared the performance of 30 students submitted to the ADEPT Learning Cycle (treatment group) with the performance of 27 students taught by the same professor in the previous period without using the ADEPT technique (control group). In this sense, the present research is similar to the study by Shoulders and Hicks (2008) regarding the number of students investigated. The results of the work by Shoulders and Hicks (2008) showed that the average score on the intermediate exam for students taught with the ADEPT technique was 86.3 and that one of the students submitted to the traditional method was 69.4 (p. <0.001). The superior performance was repeated in the final exams (the same final exam was applied for both groups) and in the final grade of the course. In this study, researchers used past performance in other disciplines as a control variable for students' inherent performance and showed

that previous academic performance was not significantly different between control and treatment groups (Shoulders & Hicks, 2008). The results of Shoulders and Hicks (2008) also indicate an improvement in student retention and satisfaction with the application of the ADEPT approach.

The research by Thomas et al. (2013), which was applied in the subject of Introductory Accounting, also compared the performance of students taught with the ADEPT technique with the performance of students from the previous period (without ADEPT). The main difference between the research by Shoulders and Hicks (2008) and Thomas et al. (2013) was that the latter used tutors for the application of diagnostic tests and to give the feedback to the students. In the study by Thomas et al. (2013) 74 students formed the treatment group (with ADEPT) and 85 students, who studied in the academic period immediately prior to the application of the technique, formed the control group (without ADEPT). Tutors were available for both groups. ADEPT students had an average performance of 76.4 points in the intermediate exam, while students without ADEPT had an average of 63.2 (p. <0.00).

Like Shoulders and Hicks (2008), Thomas et al. (2013) controlled the previous performance in their analyzes and showed that the average previous performance of the two groups did not differ significantly. A limitation presented by Thomas et al. (2013) is that the effect of the tutors could not be isolated from the effect of the diagnostic evaluations, since, as much as both groups had the tutors available, the treatment group attended more tutorial sections compared to the control group.

Similar to the studies by Shoulders and Hicks (2008) and Thomas et al. (2013), who used previous performance in other disciplines as a control variable, the present research used the scores from the previous bimester as a control variable of students' inherent performance. Thus, to verify whether the evidence found was the result of the application of the diagnostic evaluation, and not to a higher performance inherent to the treatment group, the same test of means was performed in relation to the performance of the two groups in the previous bimester. The results of this test are shown in Table 5.

It is observed that there was no statistically significant difference in the previous performance of the two groups. The previous performance presented by the students who did not participate in the diagnostic evaluation was relatively superior to the performance of the group that participated in the evaluation. These results provide evidence that indicates the differences in performance shown in Table 4 were the result of the application of diagnostic tests, and not due to greater capacity, interest, or effort inherent in the treatment group, for example. These results reinforce the conclusions of Shoulders and Hicks (2008) and Thomas et al. (2013).

Table 5

Means test of scores for the previous bimester

	No. of Obs.	Average	Standard Error	S. deviation
Without ADEPT	27	6.1481	0.5061	2.6299
With ADEPT	44	5.8909	0.3392	2.2501
Difference		0.2572		
Test Statistics Value (t test):		0.4384	One-tailed p-value	0.6688

** , *. Statistically significant at 1% and 5% significance, respectively.

Source: Prepared by the authors.

The factors pointed out by Shoulders and Hicks (2008) as possible explanations for the better performance of students under the ADEPT approach include: (I) higher level of knowledge retention; (II) increase in the frequency of tests; and (III) directing the focus of classes and extra-class studies to areas of knowledge that need more attention. The authors claim that any of these factors, and most likely a combination of these, can explain the better performance of students who have been taught using the ADEPT approach.

Unlike the previous research cited, this study compared two groups enrolled in the same period, that is, who presumably had the same classes, with the same professor, with the same materials, etc. Thus, the main difference between the two groups was participation in the diagnostic evaluation, contributing to robust results regarding the effect of diagnostic tests on the performance of students. This approach significantly reduced possible biases, such as higher performance inherent to the treatment group, and changes in the didactics or the professor evaluation criteria, for example. The evidence found expands the results of the research area by indicating that the use of diagnostic tests is effective in increasing academic performance, even if it is applied collectively.

An individualized approach to diagnosis and feedback, as used in the studies by Shoulders and Hicks (2008) and Thomas et al. (2013), is evidently more desirable in relation to an error correction strategy in group, focusing on the most common mistakes of students. In a collective diagnostic evaluation, less frequent misunderstandings can go unnoticed and not be corrected because of this. On the other hand, an individualized diagnostic approach requires a lot of time from the faculty and students and is not compatible with the routine of most students and professors in several higher education courses in Brazil, as is the case of the course investigated in this study. Therefore, the results presented here are relevant to the area of teaching in Accounting Sciences, pointing out that the evaluation in the diagnostic (or formative) function improves the teaching and learning process, even when used collectively, with feedback carried out in group.

To contribute to additional analyzes in relation to previous works, this research also used a multiple regression model for data analysis, as described in the topic of methodological procedures. The use of regression made it possible to assess the influence of diagnostic evaluation on performance, controlling the variables of previous performance and frequency in classes. The results of the regression, as well as the subsequent validation tests, are shown in Table 6.

Table 6

Regression results

Number of Obs.=	71	Statistics F	14.34
Adjusted R ² =	0.3638	Prob. > F	0.0000

Variable	Coefficient	S. Error	t	P> t	Beta
Previous Grade	0.6022 **	0.1108	5.43	0.000	0.5187
Accumulated Absences	-0.0707 *	0.0353	-2.00	0.049	-0.1986
Diagnosis (Dummy)	1.5204 **	0.563	2.70	0.009	0.2682
Constant	1.4028	0.9775	1.44	0.156	-

	Value of Statistics	Prob.
Shapiro-Wilk (residuals)	z = 0.557	0.2887
Variance Inflation Factor (VIF)	Larger VIF = 1.09	-
Cameron & Trivedi	Qui ² = 7.50	0.4834
Breusch-Godfrey LM	Qui ² = 0.226	0.6343
Ramsey RESET test	F (3, 64) = 0.70	0.5553

** , * . Statistically significant at 1% and 5% significance, respectively.

Source: Prepared by the authors.

According to the results presented in the second part of Table 6, the regression model meets the assumption of normality of residues and does not present problems of multicollinearity, heteroscedasticity, or autocorrelation. According to the model specification test "Ramsey RESET test", the model does not have significant omitted variables. The determination coefficient (adjusted R²) indicates that the proposed regression model explains 36.4% of the variation in the dependent variable, that is, academic performance. According to the standardized Beta coefficient, the variable with the highest weight in the regression model was the score for the previous bimester, followed by the diagnostic variable.

The variable participation in the diagnostic evaluation had a statistically significant positive relationship ($p < 0.01$) with the performance in the bimonthly test that the diagnostic test was applied, controlled the variables of previous performance and frequency in classes. The results indicate that the students who participated in the diagnostic evaluation had a superior average performance of approximately 1.5 points in relation to the students who did not participate in the diagnosis. This evidence indicates that the diagnostic evaluation was effective in identifying the mistakes made by the students, reinforcing the knowledge acquired during the two-month period, and indicating points that needed further studies, among other possible consequences. Such results also reinforce the relevance of diagnostic assessments for the teaching and learning process and reiterate the importance of feedback to students, which even when carried out collectively, led to superior performance in the bimonthly test.

The evidence found indicates that the ADEPT Learning Cycle served the function of evaluating, according to the considerations presented by Almeida and Coimbra (2018). In other words, the applied diagnostic evaluation enabled

the professor to help students achieve an expected direction, achieve objectives, and/or promote changes that enabled an improvement in learning and a consequent improvement in the final performance of the bimester. The ADEPT approach allowed the professor to identify the points that students needed to improve and, with that, making it possible to provide guidance on how to achieve the learning objectives.

In line with the evidence from this study, positive results using the diagnostic/formative assessment approach were also reported in the study by Silva et al. (2013), in the discipline of Financial Mathematics of the Accounting Sciences Course. Qualitative evidence from the study by Silva et al. (2013) indicated that the use of diagnostic and formative assessment enabled the active participation of students and generated a learning environment, and not just teaching. The researchers also reported that the feedback generated by the assessments exposed the students' strengths and weaknesses, allowing them to rethink their learning strategies. In a complementary way, the results of the institutional evaluation indicated approval by the students of the methodology used (Silva et al., 2013).

Analyzing the control variables, as expected, the performance in the previous bimester was a significant factor in explaining the test score. According to results, each additional point in the previous bimester score corresponds to approximately 6 tenths (0.6 points) of the next bimester grade, remaining the other variables constant. This positive relationship was statistically significant at 1% significance. The accumulated absences during the academic year were also a statistically significant factor for the performance in the test of the studied period ($p < 0.05$). According to what was expected by the authors of this research, the accumulated absences had a negative relationship with the performance in the test. Results consistent with this evidence were found by Santos, Vilhena, Antonelli, and Meurer (2020).

The low frequency in classes can lead to loss of new content, the non-resolution of exercises, among other factors that result in possible lower retention of knowledge and a consequent lower average performance. The results of the work by Borges et al. (2014) indicate that, on average, 27% of students in the Cost Accounting discipline failed for absences in the analyzed period. In the analysis of this research, the authors associated this failure rate due to absences to the variables: "lack dedication" and "lack of interest". Forty-seven percent of the students investigated in the research by Borges et al. (2014) pointed out the lack of dedication and interest as possible causes for failure in the Cost Accounting discipline.

Other factors not controlled in the research may have influenced the difference in the scores of the treatment and control groups. For example, the fact that the control group was formed by students who missed the class in which the diagnostic evaluation was applied may have influenced the result since this class also served as a review of the content of the two-month period. The diagnostic exam was applied one week before the bimonthly test, and thus there was a review class between the diagnostic evaluation and the test. Those students who had participated in the diagnosis probably already knew which points they had the most difficulties and thus were able to better benefit from the review of the next class. Thus, the results could be different if the control group had participated

in two traditional review classes, while the treatment group had one class for diagnostic evaluation and another review class.

4.2 Students' Perception

As a way of expanding the analysis and triangulating the statistical results with the students' perception of the diagnostic evaluation, a questionnaire was sent to the students who participated in the diagnostic exam. The questionnaire contained five questions, three of which were binary (yes or no) regarding the identification of errors previously made, improvement in performance in the assessment (summative), and the importance of feedback from the evaluations in general. The other two questions were open-ended and asked about the positive points and the points that could be improved in the diagnostic evaluation. The questionnaires were sent by e-mail to all students who participated in the activity (44), but only five of them answered (response rate approximately 11%).

The data resulting from this questionnaire should be evaluated with caution, since the low response rate may have created a sample selection bias. In other words, students who were satisfied with the diagnostic activity would have more incentives to demonstrate their satisfaction by answering the questionnaire. In the same sense, students who somehow felt dissatisfied with the diagnostic evaluation could be more inclined to answer the questionnaire. Thus, the responses of students who were willing to fill out the online form may not be representative of the general opinion of the class on the diagnostic test applied.

When asked if the diagnostic evaluation helped them to identify the mistakes made, all the respondent students agreed that they did. In the same vein, four of the five respondents agreed that the diagnostic activity contributed to a better performance in the test. This information reinforces the results found regarding the influence of diagnostic assessment on academic performance and indicates that students, in general, perceive diagnostic assessment as beneficial to the teaching and learning process.

In a broader question, it was also asked whether the students considered important that professors offer feedback on the evaluations performed. In this question, all students said yes. The results of the study by Barbosa et al., (2020) indicate that 95% of the questioned professors provide feedback to students after evaluative activities. Comparing research evidence, there is an indication of convergence between student requirements and professor practices in providing feedback on assessments. These findings reinforce the importance of using assessments as pedagogical tools, and not just as classification mechanisms, isolated at the end of a period.

In an open question, students were asked to cite two to five positive points of the diagnostic evaluation. The comments made are presented as they were typed by the respondents in Table 7. Comments on the identification of errors made and content review were recurrent among students. Such comments suggest that the diagnostic evaluation fulfilled the function of helping students to find the mistakes made and covered the content that was taught during the two-month period. Based on the performance improvement found and the considerations made by the students, it can be considered that the diagnostic

evaluation can be an efficient way to review the content before exams, for example.

Some comments on positive points were related to the dynamics of the class, such as: "I tried to pay more attention because it was a competition" and "It was carried out in a different way from everyday academic life". These statements indicate that the diagnostic evaluation was able to instigate students to answer the questions carefully. Another positive point was that the diagnostic test did not identify individual responses when compiling the results on the board. The fact that individual errors and successes were not exposed was important for some students and can be seen in fragments of responses such as: "It did not identify the students' responses" and "There was no constraint". In this way, students knew the answer they had marked and received feedback on the possible mistake made, without exposing individual responses to other students.

Table 7

Student comments on the positive aspects of diagnostic evaluation

Student 1	All content was covered; I was able to easily identify what went wrong and why; I tried to pay more attention because it was a competition.
Student 2	It recalled exercises, did not identify the students' responses.
Student 3	I was able to review the content. I remembered mistakes.
Student 4	It was done in a different way from everyday academic life. Thus, it allowed involving several people in the class, working on various concepts, and working with timed time.
Student 5	There was no constraint, each one did his own without being exposed, well organized.

Source: Prepared by the authors.

The work of Shoulders and Hicks (2008) also presented the students' perception of the diagnostic evaluation. In general, the statements presented by the authors are similar to the answers to the questionnaire of this research. Some of the excerpts from students' comments on the diagnostic assessments presented by Shoulders and Hicks (2008) were: "diagnostic exams were very helpful" (1), "is a great helpful professor that makes sure the students understand what he is talking about" (6) and "it gives you a really good idea of how much more preparation you need to get ready for the test" (10), among others (p. 180).

In the same way as it was asked about the positive points, academics were asked to indicate points that could be improved in the diagnostic evaluation. The most cited dissatisfaction point was the issue of the extra point for the group with the highest number of correct answers. The option for the extra point was made to stimulate competition among students and thus stimulate the effort in solving exercises. However, some students considered it unfair that only a few students received the extra point. This aspect of the approach can be adjusted without significantly impairing the effectiveness of the diagnostic test. One possibility to solve this problem and maintain the incentive to solve the exercises could be to assign a score according to the proportion of correct answers individually.

Another negative point in the perception of one of the respondents was the time to resolve the exercise. A maximum time for the resolution of each exercise was considered necessary so that it was possible to cover most of the bimonthly

content in a class. This option depends on the time available by the professor and how he intends to apply the diagnosis. As an example, the professor can use more classes for diagnosis and give more time for solving exercises. Time was also a problem pointed out by students in the Shoulders and Hicks study (2008), and can be seen in statements such as: "while the diagnostic exams were very time-consuming, they were definitely helpful" (17) and "I felt there was too much information incorporated into the short amount of time we had "(21) (p. 180). To deal with the lack of time in class, a diagnostic evaluation can also be applied in the form of homework, including being able to use online tools. This last option has limitations regarding the timeliness of the feedback, but it can still fulfill the diagnostic functions.

Therefore, even with a limited number of respondents, it is possible to observe that, in general, students perceive that the diagnostic evaluation was important for the identification of the mistakes made and for the review of the content of the two-month period. The speeches of the students who answered the questionnaire are in accordance with what is found in the literature on diagnoses and reinforce the results found in the statistical analyzes of this research, as well as of previous research such as Shoulders and Hicks (2008) and Thomas et al. (2013). It is expected that the results obtained in this article show the relevance of the evaluations for the teaching and learning process in higher education, especially for Accounting courses.

5 CONCLUSIONS

Upon completing this research, it was possible to meet the objective presented, which was to verify the relationship between the application of the Learning Cycle ADEPT and the academic performance of students enrolled in the discipline of Cost Accounting. It was possible to verify that the ADEPT Learning Cycle, even with adaptations, had a positive relationship with the performance of students in the discipline of Cost Accounting at a State University in Parana - Brazil.

The results of this research also contribute to the strengthening of the ADEPT technique as an effective teaching practice in improving academic performance, collaborating with the research by Shoulders and Hicks (2008) and Thomas et al. (2013). The main contribution of this research, in relation to previous works, was to verify that diagnostic evaluations were useful in identifying misunderstandings in the learning process and in indicating steps to correct these errors, even when applied collectively in the classroom. The results also indicate that the improvement in performance with the application of diagnostic tests is significant even when the previous performance and frequency in classes are controlled.

Such results have implications for the teaching practice in Accounting, more specifically about how assessments are seen within the teaching process. More broadly, this work highlights the need for evaluations to be seen as an important part of the learning process, and not only as an isolated classification tool at the end of a period, as pointed out by Garcia (2009) and Almeida e Coimbra (2018). This article presents one of several ways that assessments can be used to improve learning. Professors can adapt the procedures presented to their own purposes, in view of the basic feedback functions.

The conclusions obtained can also be useful for students, who may require their professors to carry out a diagnostic evaluation before the final tests or to correct the tests together with the academics, explaining and correcting the mistakes made. Students can also look for ways to diagnose their level of knowledge individually, for example, with the aid of online simulations or exercise books.

Although the results presented here are significant, they have certain limitations. The results cannot be generalized to a larger student population, as it is not possible to ensure that the sample is representative of the general population. Given the need to isolate as many variables as possible, by applying a quasi-experimental approach, this research was limited to exploring the influence of diagnostic assessments on performance in two classes of the Cost Accounting discipline, in just one bimester.

Future research may involve professors from more disciplines and extend the period of analysis, thus raising the sample of the study. With the inclusion of professors from more than one discipline, it would also be interesting to capture their perception of the technique and how it can contribute to improving learning. Another limitation was the low response rate of students to the questionnaire. Future research can minimize this problem by collecting responses in the classroom or providing some form of incentive to respondents, for example.

Later studies can explore different ways of applying diagnostic tests, such as traditional homework or online. It can also be explored as differences in students' performance with conventional content standards and articles using diagnostic evaluation. Another suggestion would be to investigate the effect of applying diagnostic analyzes on other variables, for example, satisfaction, anxiety, interest, among other possible variables. Such studies can be applied in different courses, as well as in different accounting disciplines.

REFERENCES

- Almeida, N. S., & Coimbra, C. L. (2018). Avaliação discente. In G. J. Miranda, E. A. Leal, & S. P. C. Casa Nova (Orgs.). *Revolucionando a docência universitária: orientações, experiências e teorias para a prática docente em negócios* (Cap. 3, pp. 59-82). São Paulo: Atlas.
- Barbosa, R. S., Leal, E. A., & Pereira, J. M. (2020). Modalidades de avaliação propostas para o processo de ensino-aprendizagem nos cursos de Ciências Contábeis: uma análise à luz da Teoria da Avaliação. *Contabilidade Vista & Revista*, 31(2). <https://doi.org/10.22561/cvr.v31i2.5280>
- Bolzan, L. M., Fernandes, D., & Antunes, E. D. D. (2019). Concepções avaliativas no ensino superior de Administração. *Meta: Avaliação*, 11(32), 376-405. <https://doi.org/10.22347/2175-2753v11i32.1998>
- Borges, I. M. T., Santos, A., Abbas, K., Marques, K. C. M., & Tonin, J. M. F. (2014). Reprovação expressiva na disciplina de contabilidade de custos: quais os possíveis motivos?. *Revista de Educação e Pesquisa em Contabilidade (REPeC)*, 8(4), 420-436. <https://doi.org/10.17524/repec.v8i4.1201>

- Gandía, J. L., & Montagud, M. D. (2011). Innovación docente y resultados del aprendizaje: un estudio empírico en la enseñanza de la contabilidad de costes. *Revista Española de Financiación y Contabilidad*, 40(152), 677-698. <https://doi.org/10.1080/02102412.2011.10779716>
- Garcia, J. (2009). Avaliação e aprendizagem na educação superior. *Estudos em Avaliação Educacional*, 20 (43), 201-213. <http://dx.doi.org/10.18222/eaec204320092045>
- Gil, A. C. (2012). *Didática do ensino superior*. São Paulo: Atlas.
- Haladyna, T. M. (2004). *Developing and validating multiple-choice test items* (3rd ed.). New Jersey: Lawrence Erlbaum Associates, Inc.
- Harlen, W., & James, M. (1997). Assessment and learning: differences and relationships between formative and summative assessment. *Assessment in Education: Principles, Policy & Practice*, 4(3), 365-379. doi: 10.1080/0969594970040304
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2009). *Análise multivariada de dados* (6ª ed.). Porto Alegre: Bookman.
- Henderson, M., Ryan, T., & Phillips, M. (2019). The challenges of feedback in higher education. *Assessment & Evaluation in Higher Education*, 1-16. <https://doi.org/10.1080/02602938.2019.1599815>
- Kickert, R., Meeuwisse, M., Stegers-Jager, K., V. Koppenol-Gonzalez, G., R. Arends, L., & Prinzie, P. (2019). Assessment policies and academic performance within a single course: the role of motivation and self-regulation. *Assessment & Evaluation in Higher Education*, 1-14. <https://doi.org/10.1080/02602938.2019.1580674>
- Libâneo, J. C. (2013). A avaliação escolar. In J. C. Libâneo. *Didática* (2a ed., Cap. 9, pp. 216-244. São Paulo: Cortez.
- Luckesi, C. C. (2000). *Avaliação da aprendizagem escolar: estudos e proposições* (10a ed.). São Paulo: Cortez.
- Miranda, G. J., Leal, E. A., Gama, M. A. F., & Miranda, A. B. (2019). ENADE: os estudantes estão motivados a fazê-lo?. *Revista de Educação e Pesquisa em Contabilidade (REPeC)*, 13(1), 12-28. <https://doi.org/10.17524/repec.v13i1.1720>
- Muller, S. H., Schuster, H. A., & Zonatto, V. C. S. (2017). Oportunidades de melhoria no ensino de disciplinas que abrangem conteúdos de Custos: uma análise com base na percepção de discentes. *Administração: Ensino e Pesquisa*, 18(2), 301-344. <https://doi.org/10.13058/raep.2017.v18n2.535>

- Rodrigues, L. L., Pinho, C., Bugarim, M. C. C., Craig, R., & Machado, D. (2017). Factors affecting success in the professional entry exam for accountants in Brazil. *Accounting Education*, 27, 48-71. <https://doi.org/10.1080/09639284.2017.1361851>
- Sant'Anna, I. M. (2011). *Por que avaliar?: como avaliar?: critérios e instrumentos* (15a ed.) Petrópolis: Vozes.
- Santos, M. J. C., Vilhena, E. M. S. R., Antonelli, R. A., & Meurer, A. M. (2020). Desempenho acadêmico e características sociodemográficas, comportamentais, psicológicas e de formação docente: análise de alunos portugueses da área de negócios. *Contabilidade Vista & Revista*, 31(2). <https://doi.org/10.22561/cvr.v31i2.5286>
- Sargent, C. S. (2013). Find it, fix it, and thrive: the impact of insisting on proficiency in prerequisite knowledge in intermediate accounting. *Issues in Accounting Education*, 28 (3), 581-597. <https://doi.org/10.2308/iace-50456>
- Severino, C., Leal, E. A., & Borges, L. F. M. (2017). Motivos associados ao rendimento acadêmico nas disciplinas de Contabilidade de Custos. *Anais do Congresso UFU de Contabilidade*, Uberlândia, MG, Brasil, 2.
- Shoulders, C. D., & Hicks, S. A. (2008). ADEPT learning cycles enhance intermediate accounting student learning success. *Issues in Accounting Education*, 23 (2), 161-182. <https://doi.org/10.2308/iace.2008.23.2.161>
- Silva, M. Z., Theiss, V., & Rausch, R. R. (2013). Avaliação da aprendizagem na educação superior: relato de uma experiência. *RACE - Revista de Administração, Contabilidade e Economia*, 12(3), 363-398. Recuperado de <https://portalperiodicos.unoesc.edu.br/race/article/view/3349>
- Struyven, K., Dochy, F., & Janssens, S. (2005). Students' perceptions about evaluation and assessment in higher education: a review. *Assessment & Evaluation in Higher Education*, 30(4), 325-341. <https://doi.org/10.1080/02602930500099102>
- Thomas, W. S., Bell, S. L., & Shoulders, C. D. (2013). ADEPT Learning Cycles using student tutors improve performance of introductory financial accounting students. *International Journal of Education Research*, 8 (1), 24 - 36.
- Tibola, J. A., Silveira, A., & Mais, I. (2012). Atributos de qualidade em disciplinas de Administração e Ciências Contábeis voltadas para o estudo de custos: o ponto de vista dos discentes. *Revista de Educação e Pesquisa em Contabilidade (REPeC)*, 6(4), 383-398. <https://doi.org/10.17524/repec.v6i4.271>