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## Questions Database of IFCE: a WEB System to Help Student Assessment in Higher Education

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### ABSTRACT

Higher Education Institutions (HEIs), as agents acting in society, play an indispensable role in the formation of students, because in addition to the technical knowledge they must offer, they must also focus their work on the development of competences and skills aiming to transform students into protagonist beings. and proactive in the context in which they are inserted and in life itself. The present work is an original work and has as technical procedures the bibliographical, documentary and experimental research. It is an applied research of empirical study and quantitative approach. The aim of this paper is to verify if an online software that maintains a database of higher education issues can assist the teacher in diagnosing competencies and skills that need to be reinforced. Through research on the use of tools that positively impact the students' teaching-learning process, it was found that these tools can serve as an aid and improvement in the teaching-learning process. To achieve the objective of the work, a web system was developed for the centralization of questions with the same structure as the Enade (National Student Performance Examination) questions. The IFCE Questions Database was validated through an online questionnaire that aimed to verify the veracity of the tool against its objectives and the intention of its use in the classroom.

### KEYWORDS

Questions database. Evaluation. WEB system.

## Banco de Questões do IFCE: um Sistema Web para Auxiliar o Processo de Avaliação do Estudante no Ensino Superior

### RESUMO

As Instituições de Ensino Superior (IES), como agentes atuantes na sociedade, têm um papel imprescindível na formação dos estudantes, pois além dos conhecimentos técnicos que devem oferecer, também devem focar o trabalho no desenvolvimento de competências e habilidades objetivando transformar os alunos em seres protagonistas e proativos do contexto em que estão inseridos e da própria vida. O presente trabalho, é um original e possui como procedimentos técnicos a pesquisa bibliográfica, documental e experimental. É uma pesquisa aplicada de estudo empírico e de abordagem quantitativa. O objetivo do presente trabalho é verificar se um *software* online que mantenha uma base de dados de questões para o ensino superior pode auxiliar o professor no diagnóstico de competências e habilidades que precisam ser reforçadas. Através de pesquisas sobre o uso de ferramentas que impactam positivamente no processo de ensino-aprendizagem dos alunos, foi possível averiguar que essas ferramentas podem servir como elemento de auxílio e melhoria no processo de ensino aprendizagem. Para se atingir o objetivo do trabalho, desenvolveu-se um sistema *web* para a centralização de questões com a mesma estrutura das questões do Enade (Exame Nacional de Desempenho dos Estudantes). A validação do Banco de Questões do IFCE deu-se através de um questionário online que objetivou averiguar a veracidade da ferramenta frente aos seus objetivos e a intenção do seu uso em sala de aula.

### PALAVRAS-CHAVE

Banco de Questões. Avaliação. Sistema WEB.

## Base de Datos de Preguntas do IFCE: un Sistema WEB para Ayudar a la Evaluación de los Estudiantes en la Educación Superior

### RESUMEN

Las instituciones de educación superior (IES), como agentes que actúan en la sociedad, desempeñan un papel indispensable en la formación de los estudiantes, porque además del conocimiento técnico que deben ofrecer, también deben centrar su trabajo en el desarrollo de competencias y habilidades con el objetivo de transformar a los estudiantes en protagonistas. y proactivo en el contexto en el que se insertan y en la vida misma. El presente trabajo es original y tiene como procedimientos técnicos la investigación bibliográfica, documental y experimental. Es una investigación aplicada de estudio empírico y enfoque cuantitativo. El objetivo de este documento es verificar si el software en línea que mantiene una base de datos de problemas de educación superior puede ayudar al maestro a diagnosticar las competencias y habilidades que deben reforzarse. A través de la investigación sobre el uso de herramientas que impactan positivamente en el proceso de enseñanza-aprendizaje de los estudiantes, se descubrió que estas herramientas pueden servir como un elemento de ayuda y mejora en el proceso de enseñanza-aprendizaje. Para lograr el objetivo del trabajo, se desarrolló un sistema web para la centralización de preguntas con la misma estructura que las preguntas Enade (National Student Performance Examination). La validación del Banco de Preguntas de IFCE se realizó a través de un cuestionario en línea que tenía como objetivo verificar la veracidad de la herramienta contra sus objetivos y la intención de su uso en el aula.

### PALABRAS CLAVE

Banco de preguntas. Evaluación. Sistema WEB.

Introduction

Currently the courses of Higher Education Institutions (HEIs) are evaluated regularly (annually, and is repeated per course every three years). The evaluation cycle has an essential role in education, as it produces changes in curricula, teaching methodologies, training concepts and practices, management, institutional models, educational system configurations, research policies and priorities (SOBRINHO, 2010).

The evaluation program started to be implemented in 2004 with the National Higher Education Evaluation System (Sinaes), which is formed by three main components: the evaluation of institutions; the evaluation of courses; and assessment of student performance (INEP, 2019). It assesses all aspects that revolve around the three axes, mainly teaching, research, extension, social responsibility, student performance, institution management, faculty and facilities (INEP, 2019). Thus, the evaluation contemplates the global and integrated analysis of the dimensions, structures, relationships, social commitment, activities, purposes and social responsibilities of the HEIs and related courses (BRITO, 2008). In this perspective, the National Student Performance Exam (Enade) aims to assess the performance of graduates of higher education courses, focusing on the syllabus, competencies and skills learned in their training (ENADE, 2019).

Since 2004, the Ministry of Education (MEC) has made available the assessments and templates applied in Enade. Teachers can consult the questions and apply them in their assessments. Finding specific questions that work with a certain profile, competence and objects of knowledge becomes difficult and can take days, because the site where the tests are available, only allows you to filter by year and course.

In the day-to-day of the classroom of higher education courses, it is necessary to use questions in the format of external assessments (such as Enade) so that students can learn about and adapt to the formats used. In general, the questions have a certain abstraction and need interpretation in order to arrive at an answer. Thus, it is believed that the more the student knows the format of the questions, he tends to be able to reason and use what he has learned to reach the necessary conclusions for a good performance in the question. For the teacher, it is necessary to find out which skills need to be better worked in the classroom to improve their planning and achieve increasingly satisfactory results from their teaching practice. This is very relevant and depends on the subjects and their relationships in the classroom. A particular class may have a shortage of content X, while another class may have a shortage of content Y.

There are several factors related to this issue, notably one of the most relevant is that the subjects who relate in the classes are human beings, each with their own learning time. In this scenario, the teacher needs to know his students very well and understand the methodology that best suits the student's learning, thus, having a tool that helps in the diagnosis of each student would facilitate the teaching practice.

It is based on the perspective that the best way to consolidate and strengthen the scarce skills and competences of students in Higher Education courses, is to develop a solution capable of identifying gaps and streamlining the student evaluation process, as well as bringing greater interactivity between students, students and teachers, since the current evaluation system often does not offer so much dynamism and interaction of students, which can prevent the student from graduating with the desired skills, abilities and profiles.

The problem addressed by this research is: the lack of a tool that centralizes questions corresponding to the structure of the questions offered by external evaluations, and that provides teachers with the creation and customization of tests based on the skills and knowledge objects that best need to be worked on in the classroom. When analyzing the problem, this work aims to verify if an online software that maintains a database of issues for higher education can assist the teacher in diagnosing competences and skills that need to be reinforced. For that, it was necessary to develop the web system called IFCE's Questions Database, which is an instrument capable of identifying the proficiency levels of students in the required competencies and skills, providing a means of assessment and intervention by the teacher.

It is expected that after validating the software, teachers have access to a base of centralized questions and organized according to the competencies and objects of knowledge required by MEC in relation to their disciplines, and from the tool they can create assessments and analyze the responses of the participants in order to be able to diagnose more quickly which students are lacking in content, or skills and abilities.

**Collaborative Platforms**

The proposal addressed by this work is a collaborative platform, which according to Abegg, Bastos and Müller (2010), can be defined as a system based on a computer program, which has a set of people involved in an objective or task common. Several collaborative platforms have been developed, a good example is the Scholr tool, which is a tool inspired by online collaborative learning experiences which supports the development, delivery, evaluation and administration of educational courses (VICKERS et al., 2014).

Kirchner and Razmerita (2015) conducted a study that identified collaborative practices and factors that positively and negatively impact satisfaction with collaboration in Collaborative Learning in the Cloud, and concluded that the use of online systems (ie, in the cloud) has the potential to expand collaborative learning and student teaching.

Abegg, Bastos and Müller (2010), carried out a work with the Moodle wiki. The term wiki is used to define collaborative software that creates a set of linked pages from which they form a hypertext or hypermedia. Abegg, Bastos and Müller (2010), state that collaborative platforms such as wikis add other perspectives in the teaching and learning process, enabling new and / or different ways of carrying out study activities and, adding value to collaborative planning.

## Legislation

The Higher Education assessment process started with Law No. 9,131, of November 24, 1995 (BRAZIL, 1995), called Exame Nacional de Cursos (ENC) - popularly known as “Provão”, it was applied to all students graduates from predefined fields of knowledge.

After the ENC, the National Higher Education Evaluation System (Sinaes) was created, which was created by Law No. 10,861, of April 14, 2004, and aims to ensure the national evaluation process of higher education institutions, undergraduate courses and the academic performance of its students (BRASIL, 2004).

According to Brasil (2004), the main purposes of Sinaes are: to improve the quality of higher education; guide the expansion of its offer; permanently increase academic and social institutional effectiveness; deepen social commitments and responsibilities through democratic values, respect for differences and diversity, and strengthen autonomy and institutional identity.

To this end, Verhine, Dantas and Soares (2006) carried out a comparative analysis between ENC and Enade and listed some criticisms and disadvantages related to ENC compared to Enade:

1. The implementation system was not aimed at an overview of the institutions' quality;
2. It was imposed from the outside in, without the participation of the institutions to be evaluated;
3. Emphasized specific final competences in each area of knowledge, leaving aside fundamental aspects related to the teaching-learning process;
4. It did not act as a quality indicator, its instruments contributed to unstable and unparalleled results;
5. He concentrated his efforts on the regulatory aspects of the policy, thereby confusing the concepts of evaluation and regulation.

Enade, being one of the evaluation pillars adopted by Sinaes, has in its composition according to Brazil (2019b):

1. General Formation (FG): composed of 10 questions, 8 of which are multiple choice and 2 are discursive.
2. Specific Knowledge (EC): composed of 30 questions, 27 of which are multiple choice and 3 are discursive.

For the formulation and elaboration of questions of Enade, the registration is made by professors who are interested in being Elaborators and Reviewers of Higher Education Items in public notices that request the participation of teachers from all over the country in the elaboration and revision of items for the National Database of Higher Education Items (BNI - ES) which gives legitimacy, plurality and transparency to the process of building large-scale exams under the responsibility of the National Institute of Educational Studies and Research Anísio Teixeira (Inep) (BRAZIL, 2004).

The evaluation process includes improving the merit and value of institutions, areas, courses and programs, in the dimensions of teaching, research, extension, management and training; improve the quality of higher education and guide the expansion of the offer, in addition to promoting the social responsibility of the HEIs, respecting the institutional identity and autonomy of each organization (INEP, 2019).

In this sense, Sinaes opened new possibilities for the evaluation of higher education, having the capacity for a more democratic approach to higher education courses compared to ENC (BRASIL, 2004).

It is noticed that the evaluation of higher education courses has evolved over time, and with that the quality of courses is increased. This is important in order to verify if the Higher Education Institutions are in fact training professionals in line with the Profile of the Graduated provided in the National Curriculum Guidelines.

Methodology

This research was submitted to the Ethics and Research Committee (CEP) of IFCE and is in an approved situation, with CAAE 07408819.1.0000.5589.

Initially, a bibliographic research was carried out, which according to Marconi and Lakatos (2017), is an activity that is carried out for the investigation of theoretical or practical problems based on available sources, such as printed documents, scientific articles, books, theses or dissertations. For the inclusion criteria of the results of the bibliographic research, results related to the thematic and problem of this research were used, such as: Higher Education Competencies and Skills, Evaluation of higher education courses and tools in the teaching-learning process.

The bibliographic research was carried out in databases such as IEEE, SciELO, ACM, FGV Digital Library, UFC Repository, AEDB, periodicals from Universidade Estadual Paulista (Unesp), National Association of Education Policy and Administration (anpae), Federal University of Rio Grande do Sul (UFRGS), repository of the Federal University of Santa Catarina (UFSC), Carlos Chagas Foundation (FCC), Institutional Repository of the University of Brasília (RIUnB), National Education Congress (EDUCERE) and related articles in order understand what the profiles, skills and competencies required by external assessments are.



As for technical procedures, documentary research was adopted, since the source of data collection was through previous evidence (documents) of external evaluations (MARCONI; LAKATOS, 2017). The documentary research provided an understanding of the structure of external evaluations of higher education courses, as well as learning the structures of the questions required and offered in the evaluations; this research, carried out in Federal Public domains - Inep.

The present work has as its nature applied research, which is used to study the problem in a context, seeking solutions to the challenges faced in a specific environment (MASCARENHAS, 2012). It is an original work, because according to Wazlawick (2017), the work of an original nature seeks to present new knowledge based on theories or observations that will be explained. For this, through the results obtained through bibliographic and documentary research, a software called IFCE's Questions Database was developed, which will be presented in detail in the next section. The IFCE Questions Database is responsible for maintaining and centralizing questions in the standard of external assessments, in addition to assisting in the assembly of assessments and providing an analysis of the data, to strengthen requirements required for graduates of higher education courses.

The study is empirical, as it is not enough to just believe in the intuition or the words of masters, it is necessary to objectively verify whether the phenomenon described is really true (WAZLAWICK, 2017); and yet, manipulating an aspect of reality by introducing a tool, aiming to find out if there can be a contribution to the teaching-learning process (WAZLAWICK, 2017). The research is of an experimental nature, because according to Marconi and Lakatos (2017), the experimental research consists of investigation of empirical research. In this context, the tool was introduced to teachers, then a standard user was created for teachers to have access to the tool. After the presentation, the 01 week period was made available so that teachers could use and test it.

The research is based on quantitative research: the quantitative approach is based on the quantification of data collection and its treatment, with which it is presented, using statistical techniques such as percentages, averages and standard deviation (MASCARENHAS, 2012). For this, a questionnaire with 10 statements was elaborated. The questionnaire was developed on Google Forms and shared with teachers through a link.

The research subjects were 09 teachers who work in higher education. As inclusion criteria, only teachers who work at IFCE campus Cedro were included in the sample, as it became possible to train teachers and monitor usage.

As exclusion criteria, the following were adopted: teachers who teach less than 03 subjects in higher education courses, since the IFCE campus Cedro contains technical and higher education courses, and the possibility of teachers teaching (also) high school subjects is high; and, who worked less than 02 years in higher education, since it was important that the chosen teachers had experience in higher education, as it is estimated that they have basic knowledge of the structure of external assessments.

As a tool for data collection, the Questionnaire was used, which consists of an ordered series of questions, which can be answered without the presence of the interviewer. As for the form of the questionnaire questions, they were multiple choice, closed questions, which presented a series of possible answers (MARCONI; LAKATOS, 2017).

To create the survey validation questionnaire and instrument for data collection, the Google Forms platform was used. Along with the questionnaire, the Free and Informed Consent Term (ICF) was placed, which was a prerequisite for teachers to answer the questionnaire. Google Forms is an online tool that provides the planning, management and collection of information of small or large quantity through surveys, questions and personalized forms (GOOGLE, 2019). The tool helped in the assembly of the questionnaires and generation of spreadsheets with data from the answers.

The scale adopted for the survey metric was the Likert scale, which the user demonstrates his degree of agreement with the question addressed. For, Aguiar, Correia and Campos (2011, p.2) the Likert scale is conceptualized as: one of the most widespread self-report scales, consisting of a series of questions asked about the respondent, where respondents choose one among several options, usually five, being named as: Strongly Agree, Agree, Neutral / Indifferent, Disagree and Strongly Disagree.

The step by step for data analysis consisted of: i) Generating the spreadsheet through Google Forms; ii) feed a database in the R Studio software in version 1.1.3.83, with the language R in version 3.4.3 with the spreadsheet generated from Google Forms; and iii) generate the graphics with the likert package, so that there is a careful analysis of the responses submitte.

The R project is a free software environment that allows working with statistical computation and graphics from which it compiles and runs on various platforms such as Windows, MacOS and UNIX (R, 2019). The R Studio software is a professional Open Source tool (open source) that allows you to analyze data for free contributing to science, education and industry (RSTUDIO, 2019). The likert package provided a better visualization of Likert results through more intuitive graphics (BRYER, 2016).

### Analysis of Results

Participated in this research 09 professors of the superior courses of the Federal Institute of Education, Science and Technology of Ceará - campus Cedro. Of which: 03 who work in the Higher Degree in Mathematics; 03 who work in the Higher Degree in Physics; and 03 who work in the Bachelor's Degree in Information Systems. All teachers work in higher education for more than 02 years and teach at least 03 subjects in higher education.



Figure 1. Initial screen of the Question Database system



Source: the authors.

Figure 1 shows the first screen of the system. Through this screen the teacher can view how many questions are active in the questions database and, therefore, can be used for application in assessments. The questions are organized according to the courses, taking into account all those that have already been validated.

Figure 2. View the Complete Question

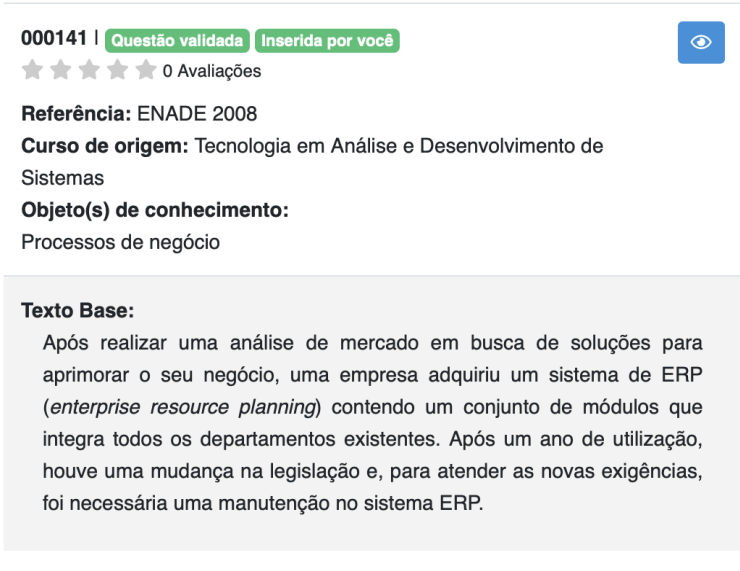


Source: the authors.

Figure 2 represents the question display screen. Through it, the teacher can have access to the profile, competence and knowledge objects that the issue works with. This visualization also shows the base text, the statement, the template and the alternatives that are

not correct for the context of the issue (the distractors). Through this screen, it is also possible to comment on each answer item, this comment remains as feedback to the student (when the student finalizes the resolution of the test).

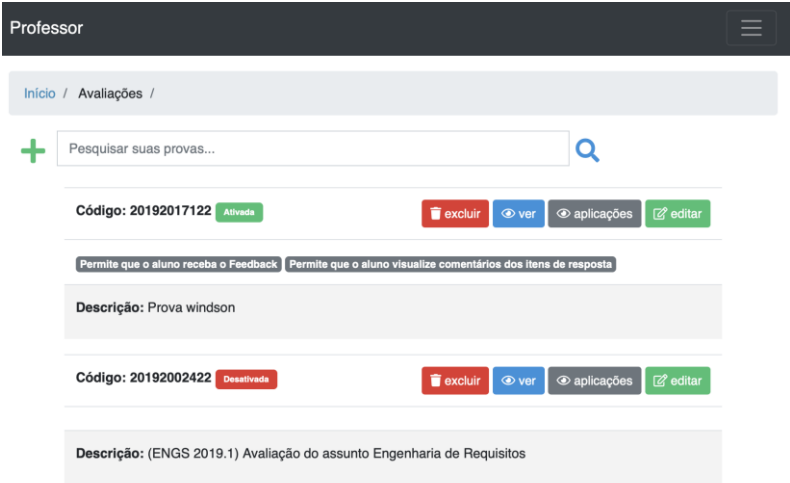
Figure 3. View the question in the list of questions



Source: the authors.

Figure 3 shows the question that teachers can register. After registering the registered question it can be sent for validation. Validation allows other teachers to analyze whether the issue has quality or not. If the validation has two accepted the question becomes part of the questions database of the course for which it was created. The question can be rated by users who can rate it with one or five stars, it is important to analyze the view of other users on the question.

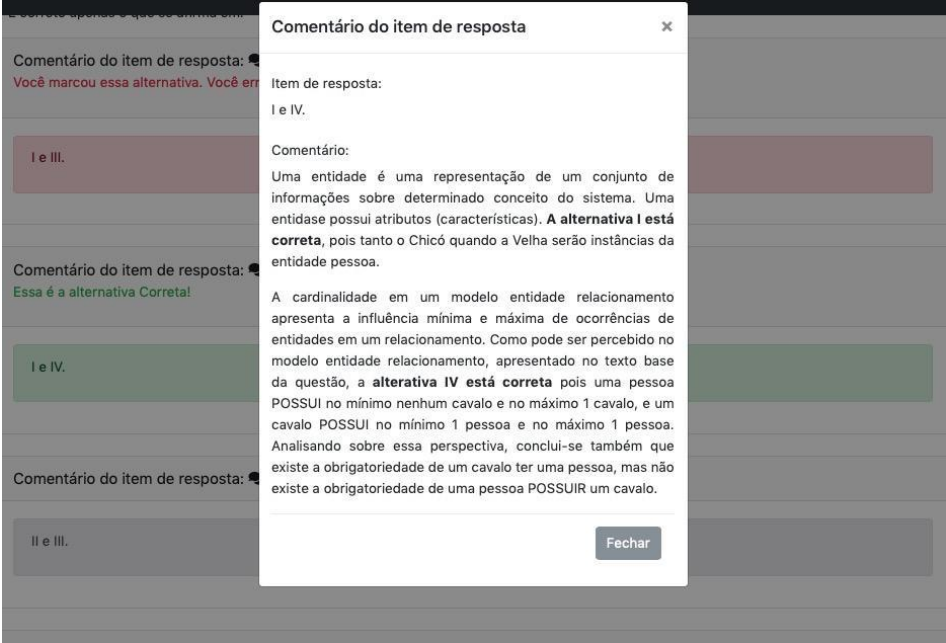
Figure 4. List of reviews



Source: the authors.

The screen shown in figure 4 is the one where the teacher can register his evaluations. Each assessment has a code that must be shared with students. If the exam is active, students are able to resolve the issues.

Figure 5. Feedback da questão para o aluno



Source: the authors.

Figure 5 shows the feedback given to the student after completing the question, in which the system shows a brief explanation of the correct alternative and the reason for the alternative being correct.

To obtain results, the IFCE Question Database software was initially presented to all respondents and a user and password was made available so that participants could use it for a week. After the participants' adaptation and testing period, a questionnaire was sent containing 10 statements, which were possible to Totally Agree, Agree, Stay Neutral, Disagree or Totally Disagree. Table 1 presents the statements provided in the questionnaire.

**Frame 1.** Statements made to the interviewees

Identificador	Afirmação feita aos entrevistados
P1	The IFCE Question Database tool allows me to insert questions into the external evaluation standard for higher education courses.
P2	The IFCE Question Database tool provides a database of reliable questions related to the competencies and / or knowledge objects expected by external evaluations of higher-level courses.
P3	The IFCE Question Database tool provides a database of centralized questions related to competences and / or knowledge objects expected by external evaluations of higher education courses.
P4	Through the IFCE Question Database I can set up tests based on the skills and / or knowledge objects that are being worked on in class.
P5	The IFCE Question Database tool provides a statistical report from which I can analyze the performance of each student individually.
P6	Through the IFCE Question Database tool, I can identify which skills and / or knowledge objects need to be better reinforced in my classes.
P7	Through the IFCE Question Database I can assemble customized tests according to the skills and / or knowledge objects that should best be reinforced in my classes.
P8	The IFCE Question Database tool can be used in the process of evaluating my classes to assess the needs of each class.
P9	The IFCE Question Database tool allows a question to be reviewed by other teachers when inserted, ensuring that the questions released for the assembly of the tests are of good quality.
P10	I intend to use the IFCE Question Database tool as an educational tool to provide students with better knowledge about the question pattern of external evaluations of higher education courses.

Source: the authors.

The statements in Table 1 were intended to validate the tool according to the objectives of this work.

In the statement of identifier P1, respondents approved with 78% Totally Agreeing and 22% Agreeing, because in the process of inserting questions in the database, the tool allows teachers to insert highly personalized questions with: Fonts in title form, styles ( or types) of fonts, images between texts; alignment of texts, insertion of enumerated lists and / or without numbers, tables or citations.

In statement P2 67% of the interviewees Agree Totally and 33% Agree that the tool provides a database of reliable questions; for an issue to enter the system database it needs to receive approval from two teachers out of three chosen at random by the system itself.

Respondents' responses to statement P3 were: 67% Totally Agree, 22% Agree and 11% remained neutral; confirming that the system provides the centralization of issues related to competences and knowledge objects, thus, it becomes simpler to find the questions (centralization) and the search for them, since they are related to the competences and knowledge objects of a given course.

In statement P4 with the results of 89% that totally agreed and 11% that agreed. Respondents stated that in the IFCE Question Database tool it is possible to assemble tests based on the skills and abilities that are being worked on in classrooms. The system also

makes it possible to issue a statistical report which, according to the statement of identifier P5, which resulted in 56% Totally Agree and 44% Agree by the interviewees, it is possible to statistically analyze the individual performance of each student.

Statement P6 with the results of 67% of respondents who Totally Agree and 33% who Agree, strengthens the results of statement P5, because through a concise, well-defined and complete report it is possible to obtain a good analysis and subsequently adopt appropriate measures to improve results, which is the basis for statement P7: which results in 56% of respondents Totally Agree and 44% Agree that through the tool it is possible to assemble personalized tests capable of reinforcing skills that must be strengthened.

The tool can be used in the class evaluation process to estimate the needs of each class, because according to the results of the statement of identifier P8, 67% of respondents chose to totally agree and 33% chose to agree.

The tool obtained a satisfactory level of acceptance. In the statement of identifier P10 67% opted for Totally Agree and 33% opted for Agree. Thus, it can be said that teachers intend to use the platform in the classroom as an educational tool.

Therefore, it can be said that the assessment of learning is an important tool in the discovery of possible teaching deficiencies in the classrooms, as it provides data so that policies can be created to improve the efficiency of the education system and for teachers and managers can improve the teaching-learning process (CESPE, 2013). Therefore, the use of online teaching-learning tools that impact this aspect is not recent, it contributes to the formulation / reformulation of methodologies to improve teaching, as well as helping to direct objectives.

The research actually solves the exposed problem, because according to the results found, everyone wants to use the system in the classroom, since the tool provides an environment in which the teacher can create and personalize questions and / or evaluations, assist / improve the students' evaluation process, contribute to the dynamization of this process and show results that help the teacher to diagnose which contents, competences and skills need to be reinforced

### Conclusions

It can be concluded that, although the IFCE Question Database is a predominantly summative evaluation system, it goes further, as it proposes to evaluate the process and improve teaching and learning strategies.

The data analyzed through the respondents' responses, could highlight the importance and intention of using the IFCE Question Database tool in the classroom. It is possible to affirm that, in fact, the instrument produced in this research enables teachers to develop

questions with the necessary requirements of a question to identify students' skills and abilities, as well as to develop and apply good quality assessments for students. The tool helps teachers to verify the proficiencies that should be worked on better (if necessary) in the classroom so that students become graduates with skills and abilities required by the National Curriculum Guidelines for higher education courses. The online tool Questions Database from IFCE is an excellent quality tool to help teachers in the teaching-learning process.

This work presents as a limitation the reduced number of participants in the use of the tool due to the short time for the presentation of the proposal to all possible teachers who teach in Higher Education. Based on the results of the survey data, the tool proved to be efficient and effective. However, there are possible improvements and future work that can be done, such as: the application of the tool in the classroom with a certain number of students to verify if in fact the tool can help the teacher to identify the competences and skills that should be worked on better. students.

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