

CREATING INTERACTIVE LEARNING MATERIALS TO PROMOTE STATISTICAL SKILLS IN HIGHER EDUCATION

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Abstract

New opportunities for lifelong learning, alternative curricula in pre-university education and fairly “open” policies on access to Higher Education (HE) have boosted, in recent decades, the problem of the lack of homogenization of knowledge and skills of “freshmen” students in Higher Education Institutions (HEI). This problem becomes overwhelming when it comes to “constructive” basic curricular units, such as Mathematics or Statistics, in non-mathematical degrees, in areas as Administration, Accounting or Management. This is a daily “struggle” faced by teachers of these curricular units as they try to talk about more advanced subjects to a very heterogeneous audience, with significant differences in Math background, promoting the participation of all students and avoiding the early drop out of some. In this sense, other didactic strategies, which include a set of activities that combine higher order thinking skills with math subjects and technology, for students of HE, appear as remedial but important, proactive and innovative measures in order to face and try to level up Math competences without risking the “repetition process”, that unfortunately promotes other kind dropout behaviors.

In this paper some of these strategies, developed in the Polytechnic of Porto (P.PORTO) and based on the creation and usefulness of the interactive teaching and learning materials, will be presented. The actual need for innovating in the teaching-learning process was felt and the search for a good support software, that enables to develop all the materials and implement real interactions, culminated with the choice of iSpring Suite 9. This software is a powerful eLearning toolkit for PowerPoint that allows to develop quality courses, video lectures, and assessments that will work on any desktop, laptop and mobile platform. Therefore, the use of the iSpring Suite 9 will be described, with a special focus on core objective when teaching statistics to students from the Management and Business degree in a HEI and facing the abovementioned issues - to improve students’ basic statistics skills and enhance their motivation in learning Statistics.

Keywords: Innovation, Technology, Interactive Learning Materials, Higher Education, Online Learning.

1 INTRODUCTION

In recent decades, information and computer technologies (ICT) and eLearning have grown incredibly quickly. ELearning was initially used as an additional source of traditional teaching resources and has been implemented in different stages at higher education institutions (HEI). Furthermore, has become quite important for HEI, as it enables them to provide many services across borders. E-learning consists of a process aimed to obtain a set of skills and competences from students, trying to guarantee the highest quality to the entire process, thanks to essentially, the use of Web-based technologies, a set of sequenced and structured subjects based upon pre-defined but flexible strategies, the interaction with students and the appropriate assessment procedures ([1], [2]). According to [3] and [4], the use of e-learning brings some benefits to students, such as: time and location flexibility, which means that it is easy to access by the students wherever and whenever they are expected to learn; results in cost and time for HEI; student centered activities and learning material interactivity, it means that the student is not passively going through in the contents but that they have to solve problems, make decisions and look for portions of information; open access to learning material and maintain and update knowledge more efficiently. Therefore, nowadays educators and their students may have fascinating opportunities through the use of innovative technology and media. In this digital era, the role of educators have changed significantly. They must be able to apply digital technology, need to have an open mindset to innovation, to new proposals and suggestions, must be flexible, creative and adaptable to new challenges.

The research and development in creating interactive learning materials become the focus of many studies in order to improve the teaching and learning process. Several researches on the implementation of technology in teaching and learning show how effective technology is in this process

([5], [6], [7], [8], [9]). In 2000, the National Council of Mathematics Teachers recommended the use of technology in teaching and learning mathematics [10]. UNESCO, in 2002, also suggested the utilization of information and communications technology (ICT) in teaching and learning process [11].

Currently, there is a lot of software to support and improve the teaching and learning process. Based on P. PORTO *e-learning experts*, we chose iSpring Suite 9 software (Fig. 1), a fully e-learning toolkit which allows to turn PowerPoint presentations (Fig. 2) into interactive online materials for e-Courses and upload them to a LMS, for instance, Moodle.

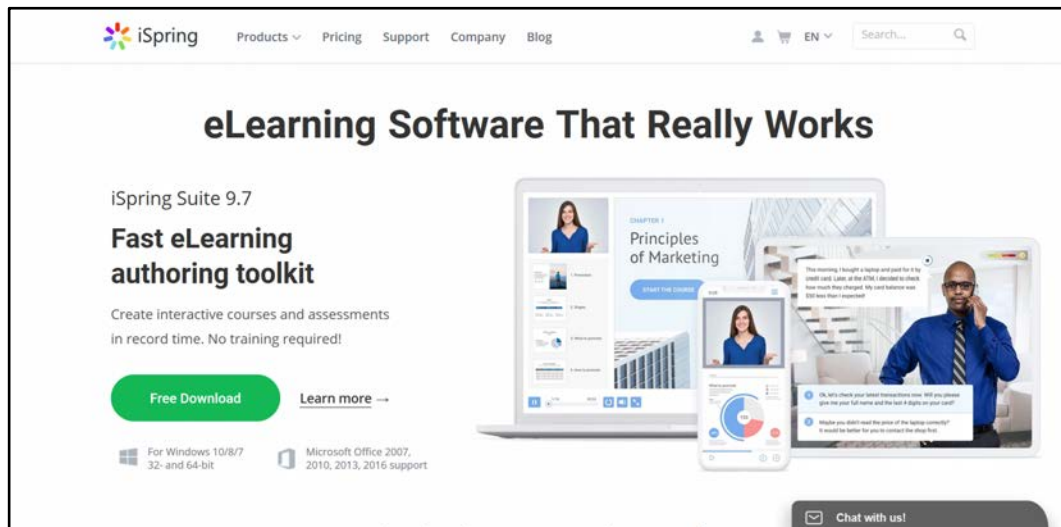


Figure 1. Print screen from <https://www.ispringsolutions.com/ispring-suite>.

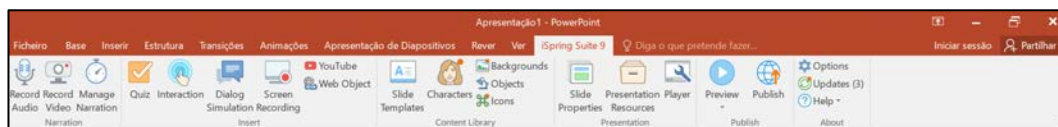


Figure 2. Print screen from iSpring PowerPoint Extension Features.

iSpring Suite 9 also allows to create video lectures, eLearning interactions, record screencasts and interactive assessments and quizzes. Furthermore, this software has a Math equation editor, which is very important for this project (Fig. 3).

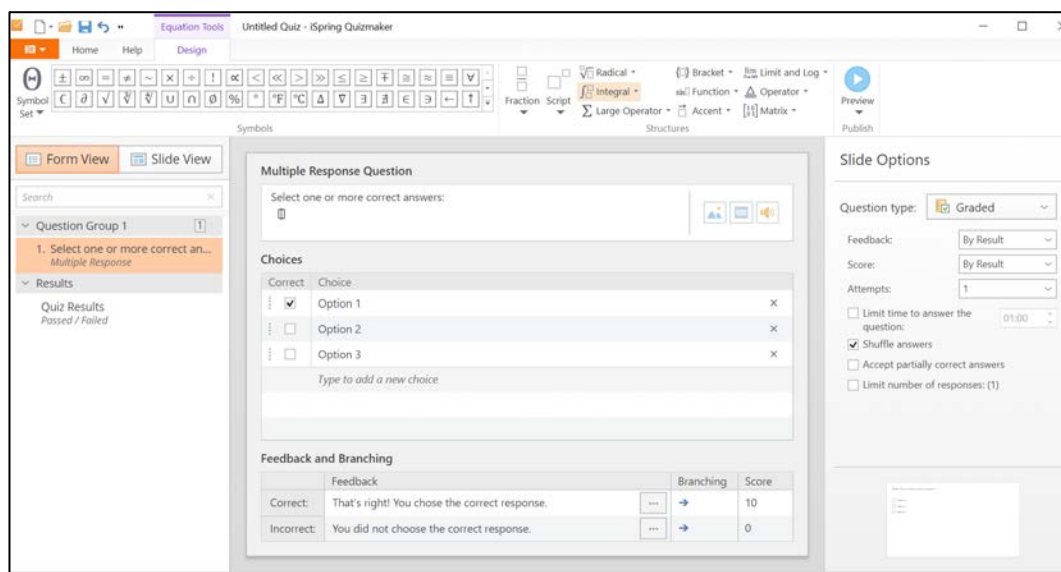


Figure 3. Print screen from iSpring Equation Tools.

Recent studies show that iSpring software has a positive impact on teaching and learning process ([12], [13], [14], [15], [16]).

2 METHODOLOGY

This study applied the development design which refers to the model of Budiyo [17], that consists of four stages, these are: (1) the preliminary study; (2) product development; (3) product trial on its effectivity; (4) dissemination and product implementation. Nevertheless, this study is only up to the product trial stage only (Fig 4).

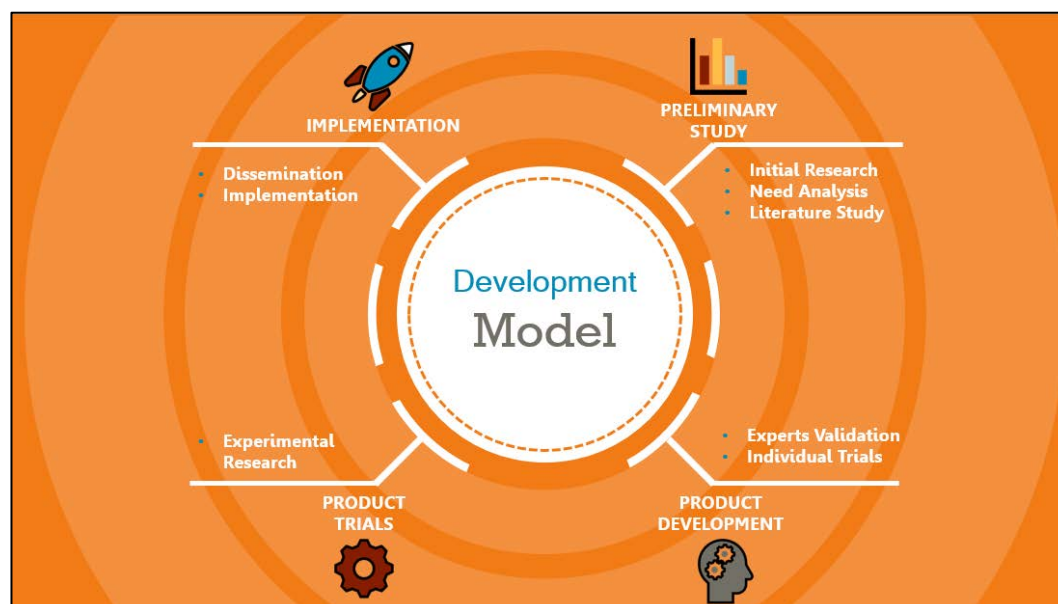


Figure 4. Development Model according Budiyo.

The preliminary phase incorporated the initial research, the needs analysis, and literature study in e-learning development. Here, several problems in teaching/learning process were identified, the learning needs to the participants and provided a solution as an alternative through the development of e-learning interactive resources. The all project was planned from the beginning, teaching learning process, collecting materials and tests, validating and evaluating.

The product development phase included the experts' validation and individual trials. According to Miller [18], to achieve efficient e-learning it is essential the competence of an instructional design specialist, associated with good technologies development tools. The Polytechnic of Porto (P. PORTO) has several instructional designers, some of them from the Scientific area of Mathematics, which collaborated on this project, specialized in instructional technology and e-learning. With their background and experience, they were able to provide consultation on best practices for implementing several topics in a Statistics e-course to support the traditional classes. The professor was the subject matter expert who identified the fundamental issues to include in the course. Through the Statistic course design period, the professor collaborated with the e-learning designer to define the relevant content for the iSpring toolkit. This Statistic e-course consisted of some modules that students use in their studies outside of the classroom at their own pace. The content comprised several Web 2.0 technologies and Mathematics sources such as YouTube Video Lectures, narrated PowerPoint Presentations and Interactive Quizzes. The literature defends the idea that students are pleased with online contents that were developed using narrated PowerPoint [18]. Using iSpring Suite 9 was a worthy instructional distribution tool to create an interactive, attractive and engaging online course.

The product trials phase is using the experimental research with a static group comparison design using an experimental and a control group selected with random sampling.

The dissemination and implementation phase is using the Moodle LMS has the course delivery chosen to introduce the modules to the students. The iSpring contents, training quizzes and tests were embedded into Moodle platform. Some of the tests were also made by using Moodle's powerful Quiz feature.

3 STATISTICS E-COURSE - ISPRING DEVELOPMENT

Before using iSpring for creating interactive learning materials to promote statistical skills, instructor prepared the teaching material and put it into PowerPoint, as into the example of Figure 5.

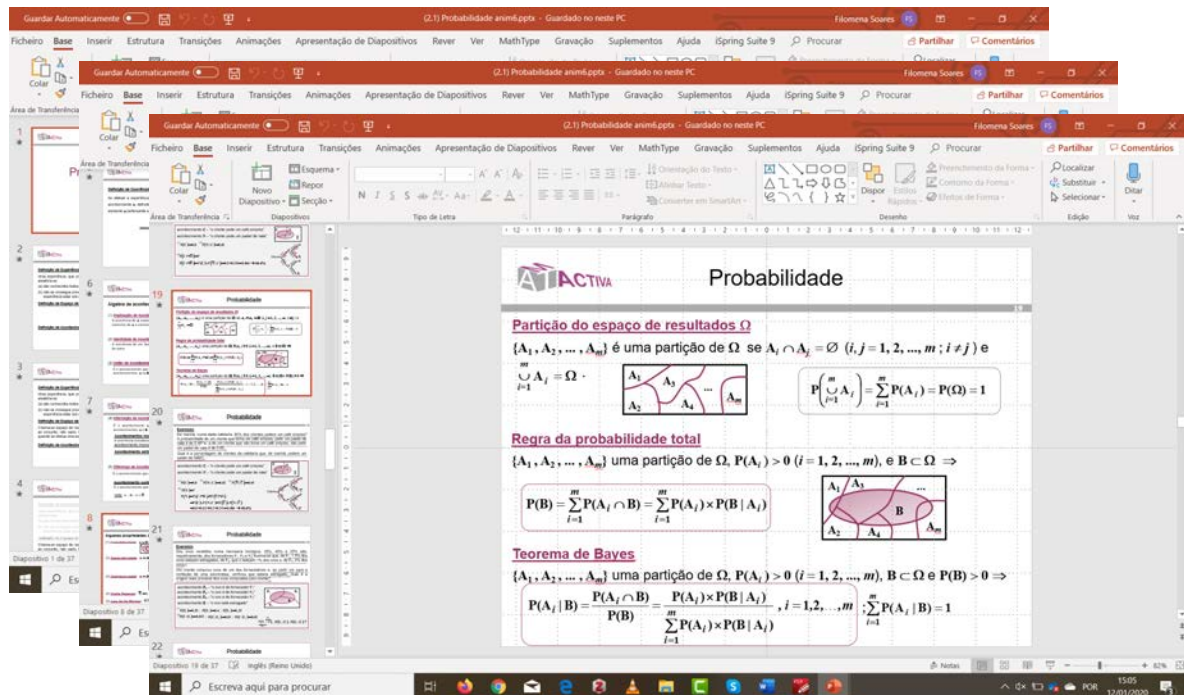


Figure 5. Print screens from a PowerPoint slide created for the Statistics e-Course.

Based on the validators' suggestions and feedbacks, the instructors made the improvements and developed the lacking materials, then validated it again and created the learning materials with iSpring eLearning interactions (Fig. 6).

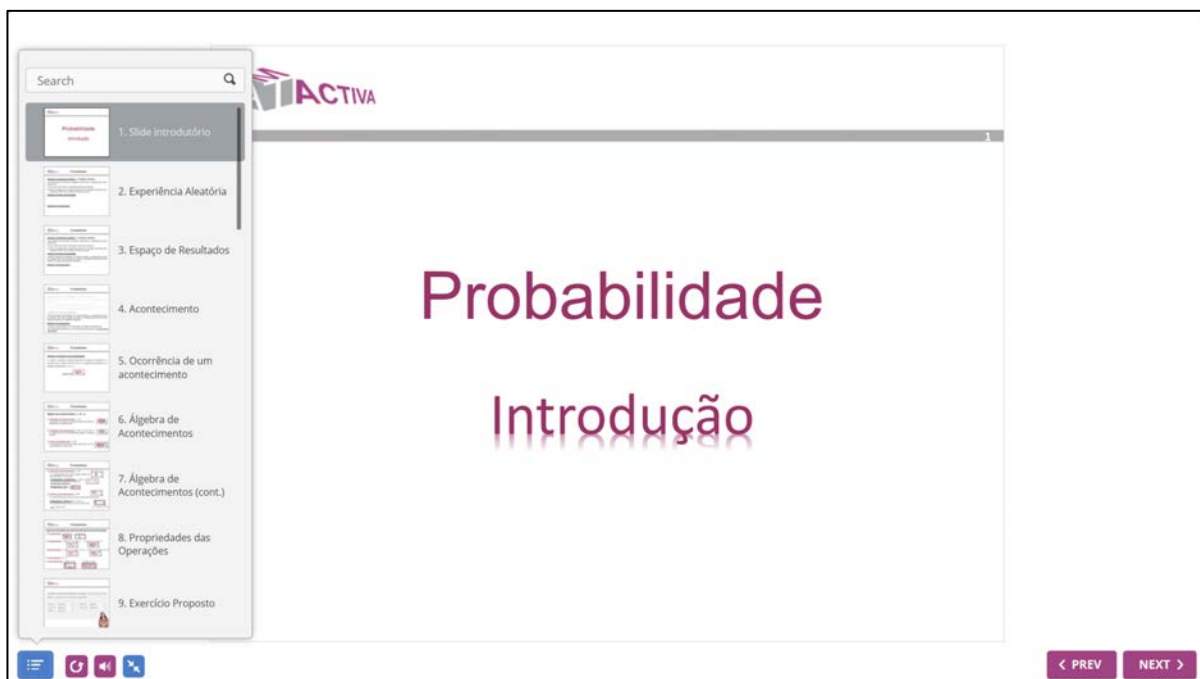


Figure 6. Print screen from a PowerPoint converted into eLearning Statistics Course with iSpring.

iSpring QuizMaker has 14 versatile question types: Multiple Choice, Multiple Response, True/False, Short Answer, Numeric, Sequence, Matching, Fill in the Blanks, Select from Lists, Drag the Words, Likert Scale and Essay (Fig.7). There were created several quizzes for learning, knowledge check and skill building. Furthermore, through QuizMaker menu, instructor added some quizzes into PowerPoint slides, after the different issues were explained, in order to create interaction with the students, and subsequently transformed into SCORM packages and placed in the Moodle platform.

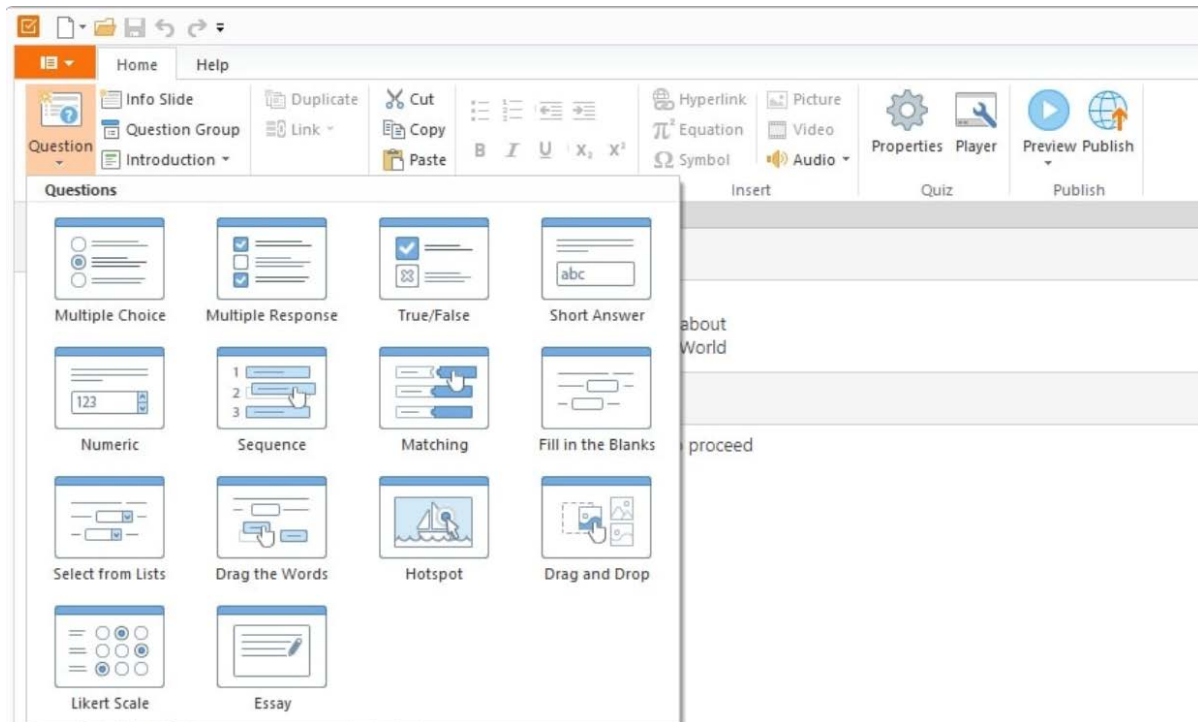


Figure 7. Print screen from iSpring QuizMaker.

In this project there were several types of questions that were used, in Figure 8 a drag and drop question is presented (editing and final view) and in Figure 9 we can see a Matching question.

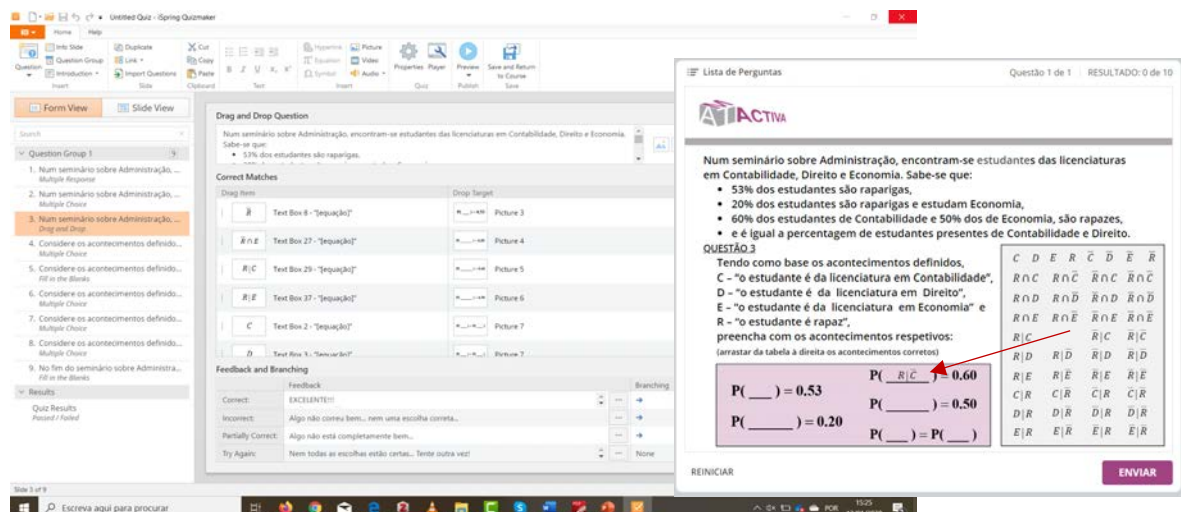


Figure 8. Print screen from a Drag and Drop question.

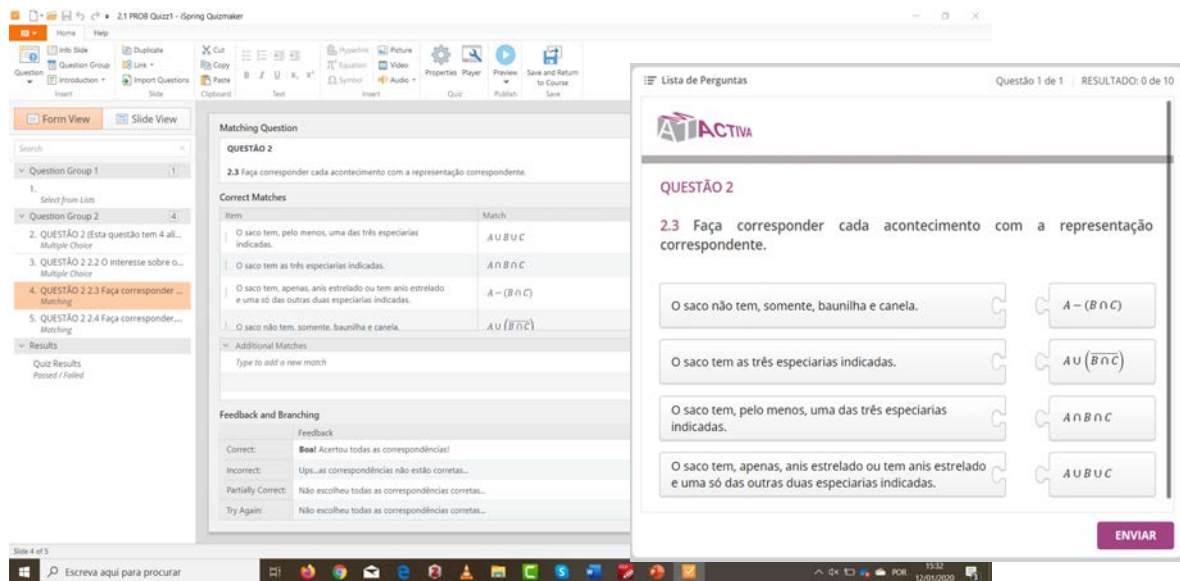


Figure 9. Print screen from a Matching question.

Each of these questions have some different characteristics, different question forms and also different assessments. All the questions developed for this Statistics e-course have, besides the correct answer, a "step by step" proposed solution (Fig. 10).

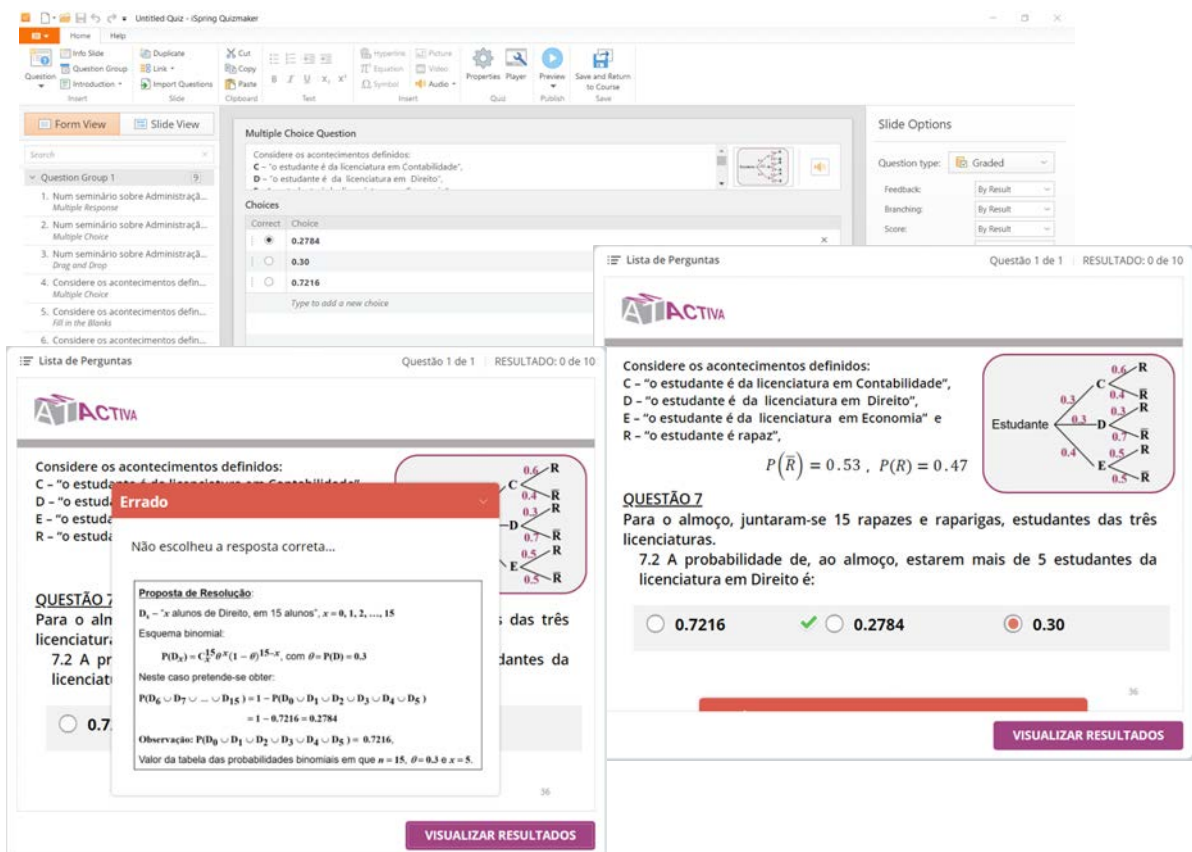


Figure 10. Print screen from a Multiple Choice Statistics question and the proposed solution.

4 CONCLUSIONS

The world is constantly changing, and new technology is being develop. There is no doubt that Information and computer technologies (ICT) play a fundamental role in man's life and his education.

Therefore, this reality demands changes in the teaching-learning process. The computer utilization allows better organization of the education in the schools and in the way and methods of presenting the issues. Some studies show how important technology is in the learning/teaching process and e-based interaction persuades the students in an active learning process [20].

The use of iSpring application is very helpful in increasing interaction within a learning community in Statistics and can be used as an assistant during the teaching/learning process. The application can assist the instructors' role but can't replace the professors themselves.

With iSpring Suite 9 we were able to create interactive and engaging learning materials to promote statistical skills in higher education. It turns a PowerPoint presentation into an e-course, with quizzes, tests and other interactions preserving the presentation effects. The system supports SCORM packages, Flash/HTML5, audio/video and more which could be uploaded to a LMS (Moodle platform) in an easy way, share it with students, and track their progress. Moodle is one of the most widely used eLearning platforms (LMS) in the world. Being one of the most complete and user-friendly systems, having a significant implementation in distance learning and aided by the fact that it is distributed in Open Source, it facilitates the dissemination of knowledge and accessibility to new users.

Future research can be conducted exploring interactivity in the form of self-assessment exercises and formative feedback between students and courses. This research can be also developed in other courses and materials at HEI, in order to improve the theory that the use of interactive learning materials can be extensively recognized.

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