Abstract

We have been using technology so much these days in each and every domain of our lives, be it education or the regular household work, to improve and advance the quality of certain aspects. Technology in education was a debatable topic among the society. Everyone had their own views on modernizing education and making it technology aided, but gradually it was embraced by the educational institutes and communities and the common reason was that with technology, educators, students and parents have a larger variety of learning tools at their fingertips. Teachers can collaborate to share their ideas and resources online, students can develop valuable research skills at a young age while having access to an expanse of material.

In the context of elearning, tests and quizzes play an essential role and provide a wide array of benefits for both the learner and the instructor. Automating this type of work provides several benefits for both sides. The more early advantages come for the teacher since most of the hassle-free task as corrections can be automated via specific software system solution. E-learning systems usually provide automatic grading if the correct options for an individual question is known or some of them are equipped with keyword tracking tools that grade depending on what has been mentioned in the essays. This isn't a foolproof system but it helps save some time in comparison with long grading sessions.[1]

The process of quizzing can also be made unique by randomizing question and answer order. This is really useful when a student has to re-do a test such that that test is not completed from memory, but rather by thinking through the correct solution once again. Another area that is greatly improved with online quizzes is the feedback aspect. Since the instructor has to provide tips and feedback for each individual learner to improve on particular areas, the Learning Management Systems can provide thorough analysis of student reports and provide automatic progress tracking, rankings, basicly business intelligence solutions. That way, an instructor has the ability to analyze which students scored highest/ lowest, and which questions were hardest/ easiest for the majority of students. This kind of reporting allows the instructor to improve the curriculum if deemed necessary.

Another very important benefit, that can be easily overlooked is the fact that going from hard-copy tests/ quizzes to offering the same capabilities online, reduces consumption of goods such as paper, the latter being more environment friendly.

In my approach of implementing this Learning Management System, described with this paper, I aimed and managed to partially address all the points mentioned above. The role of this application is to make the quiz taking process easier and more efficient, both for the teacher and for the student. It is a web application that can be easily accessed by any device with an internet connection. It allows professors to create different type of quizzes, each type having an existing template to ease the creation process, send those quizzes to the interested parties and go through a set of useful graphs describing the impact of his curriculum. The student has access to all the quizzes, can submit his response on a particular topic, receiving either instant results and feedback or the old fashioned way of waiting for his input to be graded.

The application's goal to improve quizzing solutions is achieved by automating various parts of the process, like the creation through the use of predefined templates, automatic grading and result publishing and providing, through the use of elasticsearch and kibana, a way to better understand and evaluate the learning process. The adopted microservice architecture using spring boot ensures application scalability and the battle tested functionalities from spring cloud netflix provide additional core features for a reliable distributed system.

This paper is structured in 6 chapters, as follows:

- **Chapter 1: Introduction -** offers a short description in the context of the theme of the paper and the need of these kind of software solutions
- **Chapter 2: Problem Description -** talks about the context, the role and the motivation that drove the choosing of this subject. It also offers a look into the functional specification of the application.
- **Chapter 3: State of the art -** it lists existing implemented approaches to this subject, and the advantages and disadvantages of each compared to my solution.
- **Chapter 4: Technologies -** presents the technologies used and how each of them helped in end to the solution
- **Chapter 5: Solution Description -** describes the general architecture, the most important use case flows and how they translate to the software code level.

- **Chapter 7: Conclusions -** offers the conclusions resulting from the implementation, the most important takeaways and also, list some functionalities that could be added in the future, debates the ease of addition and the advantages each would bring.
- **Chapter 8: Bibliography -** lists all the sources that were used in redacting this paper.

I state that this work is the result of my own activity. I have neither given nor received unauthorized assistance on this work.