Learning analytics to validate academic performance analysis

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***Abstract*—The learning process is increasingly on the agenda. As well as the mechanisms that can be used to optimize it, both in terms of improving student performance, as well as improving teacher performance. On this subject, there has been continuous research, and increasingly trying to take advantage of technological development, and thus be able to take full advantage of technology and achieve a significant leverage in this field. This work is developed within the scope of the evaluation of school performance. Namely, with the introduction of additional and customized resources, such as thematic courses on the Coursera platform, and the utilization analysis of the e-learning platform used by the teaching institution. With this, it was possible to develop some tools, which are used as dashboards to give the teacher a greater perception of the student's learning process and performance. And if any student is in the prospect of failing, the teacher receives an immediate notification, so that he can carry out the respective follow-up, and thus be able to act proactively to avoid failure.**

***Index Terms*—learning-analytics, dashboard, academic-performance, coursera**

I. Introduction

In the realm of education, the ability to accurately assess and evaluate academic performance is crucial for educators, administrators, and students alike. This project aims to leverage the power of learning analytics to enhance the validation process of academic performance analysis, ensuring reliable and meaningful insights [1].

Learning analytics refers to the collection, analysis, and interpretation of data generated through educational activities. By harnessing this vast amount of data, this project seeks to provide a comprehensive and holistic view of students academic performance, shedding light on their strengths, weaknesses, and areas for improvement [2].

The primary goal of this project is to develop an advanced analytics system that utilizes machine learning algorithms and statistical models to validate academic performance analysis. By leveraging cutting-edge technology, we aim to enhance the accuracy, reliability, and transparency of the assessment process [3].

Through this project, we seek to address various challenges associated with traditional methods of academic performance analysis. These challenges may include subjective grading, biases, limited data points, and time-consuming manual evaluation. By employing learning analytics techniques, we can overcome these limitations and provide a more comprehensive and objective understanding of students academic achievements [4].

This project emphasizes the importance of leveraging multiple data sources to validate academic performance analysis. This includes utilizing data from various educational platforms, such as learning management systems, online assessments, and student feedback systems. By integrating these diverse data streams, we can capture a comprehensive picture of students performance, allowing for a more accurate and insightful evaluation [20].

Furthermore, this project aims to develop a user-friendly interface that enables educators and administrators to visualize and interpret the validated academic performance data effectively. This interface will provide intuitive dashboards, visualizations, and custom reports, empowering educational stakeholders to make data-driven decisions and provide targeted support to students [22].

In addition to enhancing assessment validity, this project also strives to improve student engagement and learning outcomes. By leveraging learning analytics, we can identify patterns, trends, and learning gaps in real-time, enabling educators to personalize instruction, provide timely interventions, and support students on their individual learning journeys [21].

Overall, this project, seeks to transform the way academic performance is assessed and validated. By harnessing the power of learning analytics, we aim to provide educators, administrators, and students with a reliable, objective, and data-driven approach to understanding and improving academic

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achievements.

After analyzing the problem, the following objectives were identified for this work:

- analysis of the relationship between the use of resources available in the Learning Management System (LMS) used in the higher education institution and the students academic performance;
- prediction possibility of dropping school by a particular student;
- characterization and statistical analysis of subjects / courses regarding school dropout rate;
- identification of internal/external factors that influence school performance;
- development of a Learning Analytic's Dashboard, with personalized predictive information for each student;
- suggestions to support decision making by the teacher.

It is intended with this work the development of a tool that allows the analysis of several factors, namely the use of the different functionalities present in the LMS by the students. And based on that information, try to measure the students performance, and at the limit the possibility of him abandoning the discipline, course, or school.

This information should be provided in real time to the teacher, so that he can intervene immediately, through a special support plan, or any other form of support for the student.

II. Materials and methods

At the following subsections are described the learning analytics processes and the different developed dashboards.

A. Learning analytics

Learning analytics consists of measuring, collecting, analyzing and reporting data. By doing this, it will be possible to understand and improve the environment where this data is collected.

Learning analytics uses the data collected from students and will use it to help the institution understand and improve what it needs to do in order for it to improve students grades and also be able to give more support to students regarding resources they need to achieve a great academic success [5].

Talking about the benefits of Learning Analytics, we can point as the major benefit, the *prediction* of what will be the academic success of students and can also predict what will be the most used resources thus making it possible to make resources changes, in a way that they become more appealing. With this, we open the following possibilities and features:

- intervene when learners are struggling, to maintain the pace providing necessary instructions on every activity;
- recommending the success stories for motivation and creating the interest;
- personalize the learning process for each and every student, encouraging the necessary improvements;
- providing the required type of content resources accessibility towards the widgets like calendars for displaying the activities ahead and completed, reminders for the planned activities, and others;
- adapt teaching and learning styles via socialization, pedagogy and technology;
- participation among the peer groups discussions for solving the assignments and achieve the knowledge;
- view the information processed in the form of user specific dashboards;
- dashboards are acting as the progress monitors that can provide the complete picture of where the student is standing in the subject.

Another major benefit can be the *improvement of the teaching quality*. Namely for the teachers we can explore the following possibilities and features:

- help the instructor with better information on the quality of the content resources and activities assigned to the students, and on their assessment/assignment process;
- helps to identify and address the issues during the student learning process, and these interventions can help to build good relations among the peer group and the instructors;
- used to monitor the live performance of their students while they are accessing a specific module;
- if required they can adapt their teaching methods, for example, they can identify the students who are struggling on a specific topic/activity based on the time they spent.

Relative to students we can outstanding the following possibilities:

- identify the struggling students earlier;
- personalized interventions such as guidance or support from the instructor can be automatically provided to help those students;
- providing the success stories can also acts as a motivation add-on.

In this case we use learning analytics on the institution leaning management system (LMS) to be able to collect data related to students and their grades, doing this we are creating a relationship between having high grades, attendance in class and how often they go to the LMS.

What are the resources that students use, and among other types of data so through the results obtained we can make an improvement in the school environment so that students go more often to classes, more often use the resources that teachers make available in the LMS.

And will also allow teachers to find improvements that they can make, either in the resources they disseminate and they will also be able to see the state in which students are, in relation to their success in their subject.

B. Developed dashboards

At the following subsections are described the developed dashboards, namely for students and lecturers.

1) Students dashboards: The developed pages, will have a lot of similarities with the LMS used in the institution, to have a good integration. As we can see at Figure 1 that shows the student's information regarding his school success.

In this figure we can see the page features and content, the student will have access to a notification area, here they can

see their grades in the different subject and finally the student will see their general progress (percentage) in the respective subject, the higher this percentage will mean that the student has an higher chance of failing the subject.

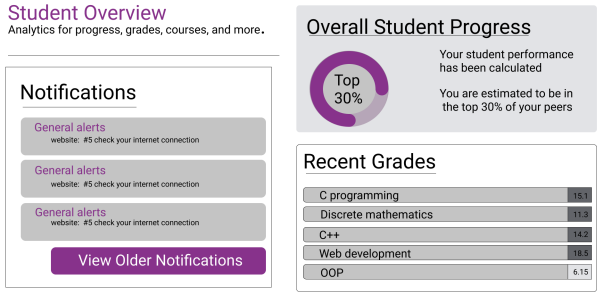

Fig. 1. Student Page - Academic dashboard.

Students will also have access to a new section, called logs presented at Figure 2. When students click on there, they will have access to a page that indicate the number of times the student logged into this subject, the number of subjects that students have and also the total downloads they have made.

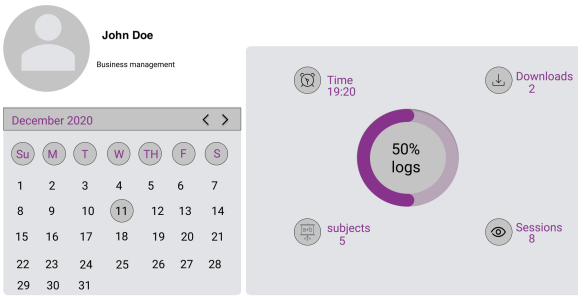

Fig. 2. Student Page - Academic Logs.

2) Lecturer dashboards: The grades on the lecturer view, works almost the same as the grades view for the student. However, the lecturer has the option to see the students grades and most importantly the status of the student.

At figure 3 we can see that the student *John Doe* did four assessments, and his final average is 3.67 and his status indicates a green light. The other student *Madonna* performed poorly in her assessments and her status is shown at red.

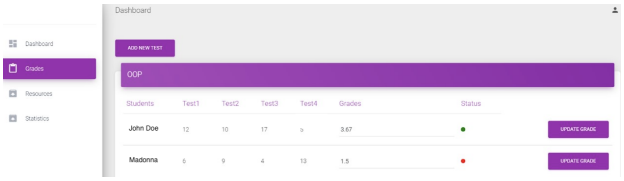

Fig. 3. Lecturer Page - Grades and student status.

The application will send a notification to the OOP lecturer that Madonna needs attention, as we can seen at Figure 4. The application will always inform the lecturer if a student needs help at this section.

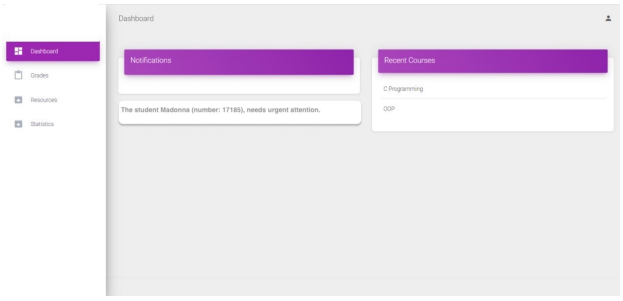

Fig. 4. Lecturer Page - Notifications.

This is the most important page to the lecturer as they can see the number of times a student visits the LMS, the times their students visited the LMS and the number of student that are enrolled at that subject.

They also have the option to see how (witch platform) their students use to access the LMS. These numbers are in real time and a lecturer can track a student's learning behaviour through this part of the application. All the detail can be seen at Figure 5.

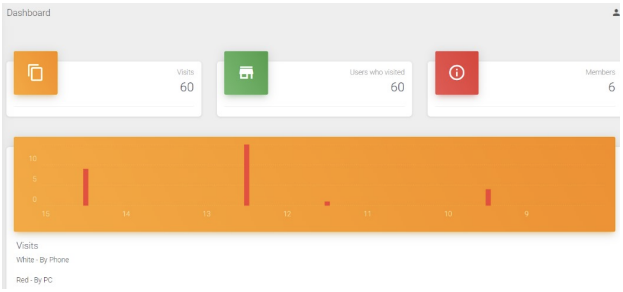

Fig. 5. Lecturer Page - Student overall statistics.

III. Conclusions

In conclusion, this project, has successfully harnessed the power of data and advanced analytics techniques to revolutionize the assessment and validation of academic performance. By leveraging learning analytics, we have overcome traditional limitations and provided a more accurate, objective, and insightful evaluation of students achievements.

Through our project, we have developed a sophisticated analytics system that utilizes machine learning algorithms and statistical models to validate academic performance analysis. By integrating diverse data sources from educational platforms, we have obtained a comprehensive understanding of students' performance, enabling us to make reliable and informed assessments.

The impact of this project extends beyond validation. By leveraging learning analytics, we have unlocked new opportunities to enhance student engagement, personalize instruction, and improve learning outcomes. Real-time identification of learning gaps and patterns has empowered educators to provide timely interventions and targeted support, ensuring that every student receives the guidance they need for success.

Moreover, this user-friendly interface has facilitated effective data visualization and interpretation for educators and administrators. With intuitive dashboards, visualizations, and customizable reports, educational stakeholders can easily access and utilize the validated academic performance data to make data-driven decisions, implement evidence-based interventions, and track progress effectively.

As conclusions, it can be said that this being a very interesting topic, and with a lot of literature on it, there is still a lot to develop. It is in this sense that this project was been developed. There will certainly be some limitations, namely regarding access to information from the academic community, but which is thought to be possible to overcome in order to continue and achieve the implementation of the proposed solution for this project, at global scenario.

The developed dashboards and result continue under analysis, namely to retrieve students and learners feedback. And in this way to improve them, and develop new one to achieve the best possible results for th community. We can also see this has the future work, that it will analyzed and developed to improve this project.

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