

Novelty Framework Design for Student Feedback Analyses Using SaaS and AI

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Abstract — Among the many trends in current teaching and learning, approaches, the ones with a higher priority are feedback analysis methods and tools used for a deeper and more accurate understanding of students' opinions about the learning journey they are involved. This research aims to propose a novelty Framework for Student Feedback Analyses. The research is structured as follows: i) Overview of the feedback analyses and KPIs. ii) Identification of SaaS and AI tools for analyzing the students' feedback. iii) Development of a Framework for Student Feedback Analyses Using SaaS and AI. In conclusion, the next research steps in the implementation of the analyses into the real learning process in 2022/2023 school year are presented.

Zusammenfassung — Unter den vielen Trends in aktuellen Lehr- und Lernansätzen haben Feedback-Analysemethoden und -instrumente eine höhere Priorität, die für ein tieferes und genaueres Verständnis der Meinungen der Schüler über die Lernreise, an der sie beteiligt sind, verwendet werden. Diese Forschung zielt darauf ab, einen neuartigen Rahmen für studentische Feedback-Analysen vorzuschlagen. Die Recherche ist wie folgt aufgebaut: i) Überblick über die Feedback-Analysen und KPIs. ii) Identifizierung von SaaS- und KPI-Tools zur Analyse des Feedbacks der Studierenden. iii) Entwicklung eines Frameworks für studentische Feedbackanalysen unter Verwendung von SaaS und KI. Abschließend werden die nächsten Forschungsschritte bei der Umsetzung der Analysen in den realen Lernprozess im Schuljahr 2022/2023 vorgestellt.

I. INTRODUCTION

Digitalization during the last years and the COVID pandemic opened more opportunities for educators to use digital tools in different settings and scenarios. The online environment for learning (formal and non-formal) become a source of innovations for educational institutions, which were ready enough and digitalized their activities to an advanced level. Currently, the trends on a global scale show that more light is given to the learning process and assessment in the digital online environment, where the process occurs within and outside the LMS of the educational institution, and along with such processes, the students' feedback analyses and assessment are aligned.

The purpose for analyzing the learners' opinions depends on the analyse's objectives. Researchers have put attention to different aspects. For example, the reason can be to improve student knowledge/competency [1], to identify which approach for feedback analyses is better, written feedback than is the case with recorded spoken feedback [2], to understand how teachers and students in English as a foreign language writing classes were influenced by teacher electronic feedback offered synchronously via online class discussion [3], to analyse the acceptance of M-Learning as a useful tool that facilitates the learning activities among the students more quickly [4], etc.

This research aims to propose a Novelty Framework for Student Feedback Analyses using Software as a Service (SaaS) and Artificial Intelligence (AI) for a deeper and more accurate understanding of students' opinions about the learning journey they are involved. The research is based on a literature review and expert interview methods. The research question this study tries to answer is "What is the role of SaaS and AI for better understanding the students' "voice"?"

II. OVERVIEW OF THE FEEDBACK ANALYSES AND KPIs

Feedback represents learners' positive experiences, frustrations, and "pain" points. Feedback is a key element of the incremental process of ongoing learning and assessment.

Effective feedback assists the learner to reflect on their learning and their learning strategies, so they can make adjustments to make better progress in their learning. Usually, students' learning feedback analyses are a structural process. It can be conducted once, twice, or more times during the school year [5, 6]. In some scenarios, it can happen accidentally and without a planned schedule. Educational organisations worldwide apply feedback analyses depending on their strategies and educational vision. Some best practices from Germany, USA, and Australia show that among them there are some common but also different approaches.

A. Germany – FOM University of Applied Sciences for Economics and Management

FOM University of Applied Sciences for Economics and Management is Germany's largest private university. Students acquire sound theoretical expertise that they can apply directly to business practice [7]. FOM develop a comprehensive quality management system (QMS). FOM strives to continually improve performance in teaching, research, development, student supervision and organisation. Each semester, students are asked to evaluate each course they have. On a scale from 1 to 6 (1 being very good to 6 being very poor) they are asked to anonymously grade in the following KPIs:

- knowledge transfer;
- documents provided (e.g. possible scripts or presentations);
- professional competence of the lecturer;
- his/her commitment and his/her support.

The lecturers can access the results via Online Campus and gets his grading in relation to the last semester and to an average of all lecturers at FOM in the semester¹.

B. USA - Harvard Extension School

Harvard Extension School (HES) is the extension school of Harvard University in Cambridge, Massachusetts.

¹ Expert interview conducted in 2022/2023 school year

At the end of the semester, Harvard students are asked to grade the teaching course on a 5-point scale [8]. The feedback analyse shows that there is a strong relationship between the teaching models and how the students rate the lecturers' teaching [9]. Another example is a survey, conducted by HES in 2021, to assess student satisfaction with the online learning experience [10]. The Priorities Survey for Online Learners (PSOL) provides insights into institutional strengths and challenges in five key areas – KPIs areas (Fig.1).

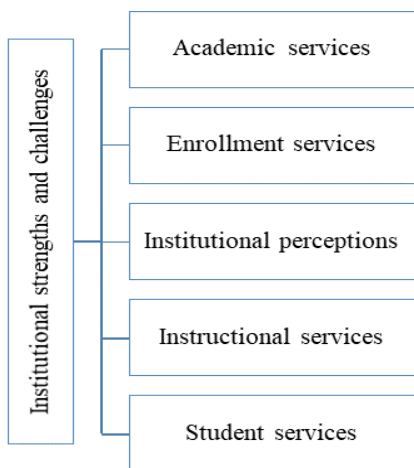


Fig. 1 HES - Priorities Survey for Online Learners

The main goal of the survey was to illuminate how HES student satisfaction compares to benchmarks of peer institutions. The PSOL was sent to 9,170 HES students. Of that number, 2,073 students completed the survey, which resulted in a 23% response rate.

C. Australia - Macquarie University, Sydney

Macquarie University is a public research university based in Sydney, Australia. In 2020 the total number of students counts to 44,832. Macquarie University is one of the best practices in e-Examinations. A research regarding e-Examinations underlines the importance of analyzing the students' "voice". A study is conducted in an Australian university in 2019 measures the suitability of the assessment task to computerisation, ease of use of the e-examination (e-exam) software, technical reliability, and the perceived security of the approach [11, 12].

A part of the questions included in a conducted feedback analyses² are grouped and summarized as follows:

Access to:

- ✓ a suitable space to do online exams.
- ✓ a suitable computer to do online exams.
- ✓ a suitable internet connection to do online exams.

The instructions provided to:

- ✓ get set up for Zoom online invigilation were clear
- ✓ supervisor staff did a good job of invigilating the exam.
- ✓ the methods used to conduct the online exam are robust against technical failure.

The steps to:

- ✓ get started were easy to follow.
- ✓ iLearn worked well for online exams.

Ability of the students to:

- ✓ login and get exam started in a timely manner.
- ✓ easily scan and upload my handwritten responses to iLearn³.

- ✓ focus on the exam during the session
- ✓ using Zoom for invigilation worked smoothly with computer

The student "voice":

- ✓ the student feels prepared to undertake an online Zoom invigilated exam.
- ✓ The student would recommend this method of doing online exams to others.

The feedback analyses KPIs are related to infrastructure, methodology of the analyses and how the questions are delivered, the ability of the students to interact, as well as how the students feel and if they would recommend this exam to others. The indicators used for recommendation are among the most efficient KPIs. Such an example is the Net Promoter Score (NPS) which has a huge impact on the long-term vision and strategy development of the educational institution. This is proven by much research, such as "93% of customers read online reviews before buying a product." [13].

III. LMS FOR CONDUCTING FEEDBACK ANALYSES

The research in the field of analyzing the learning journey - experiences and opportunities are diverse. They are developing at a higher pace due to the development of the Learning Management Systems, which is one of the sources for gathering the respondents' data.

Since the invention of the Learning Management Systems (LMS) much has been done, due to the fact of learners' data's useful uses. The first LMS is developed in 1924 as the first "learning machine". It has been looked like a typewriter with a window that can administer questions. One window was used to display the question and the other to fill in the answer [14]. The LMS continued to develop:

- Problem cylinder (1929);
- Adaptive teaching system (1956);
- Desktop (1970);
- TCP/IP (1982);

But since then, currently, there are more than a thousand LMS used worldwide. For example, Captera platform includes 1172 LMS [15]. This comes to show that the educational organization has many possibilities to improve the efficiency in the learning process design, development, and improvement, but also to analyses all characteristics of the learning journey including the feedback analyses by the student. A study shows that there will be an exponential rise in distance and blended courses offered worldwide. For example, in Germany, the predictions for the LMS market up to 2028 have a sustainable rise (Fig.2) [16].

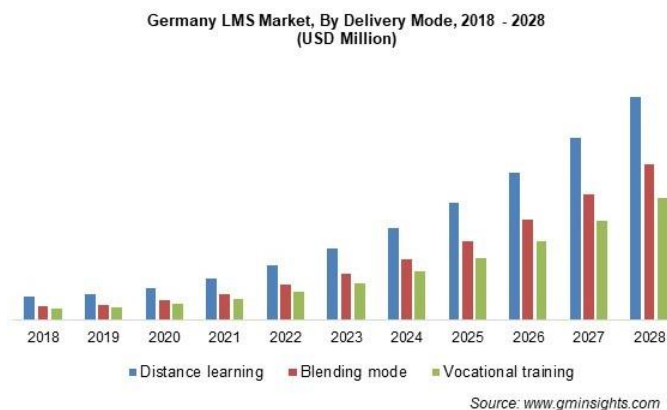


Fig. 2 Germany LMS Market 2018-2028

² Macquarie University – expert interview and talk conducted in 2022 year

³ iLearn – LMS (<https://ilearn.mq.edu.au/login/index.php>)

Among the best examples of LMS having the functionality for feedback analyses is ILIAS (Fig. 3). ILIAS is an Open Source LMS. ILIAS possesses three main working areas: Personal Desktop, Repository, and Administration - depending on the role that is assigned to the user, he/she has access to different functionalities [17].

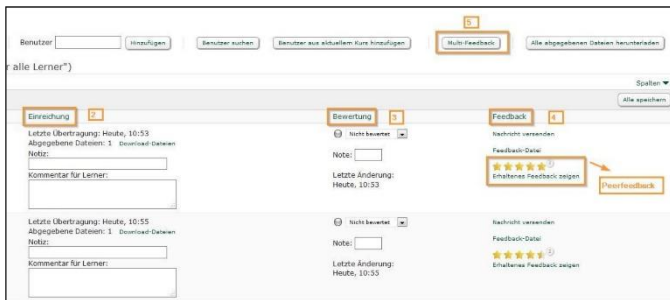


Fig. 3 ILIAS LMS – Multi-Feedback

Feedback analyses can be conducted not only using LMS, but also using external SaaS vendors and AI tools.

IV. SAAS AND AI TOOLS FOR ANALYZING THE STUDENTS' FEEDBACK

Software as a Service (SaaS) is a way of delivering applications over the Internet - as a service. Instead of installing and maintaining software, the users simply access it via the Internet, freeing from complex software and hardware management [18]. During the last several years, the SaaS vendors' growth gave to educational organisations many more opportunities for innovations within each educational domain. One of the very big advantages for educators was the use of many SaaS and AI tools for free or at a very low cost, along with advanced analytical functionalities. The benefit of SaaS is not only a result of the technology itself and the data analyses and visualisations, but also of the methodologies offered to the users. Some SaaS examples for feedback analyses are:

- Catalytics (<https://www.catalytics.com/>) - used by Harvard University
- Polleverywhere (<https://www.polleverywhere.com/>) - used by Harvard University
- Survey Planet (<https://surveyplanet.com/>) help the educators in four groups of feedback analyses:
 - ✓ Students surveys
 - ✓ Teacher surveys
 - ✓ Academic surveys
 - ✓ Dissertation surveys
- Qualtrics analytics (<https://www.qualtrics.com/>) - used by Cornell University, Mesa Public Schools, Western Sydney University. Advantage of Qualtrics is the course evaluation program by integrating with institutional systems for a seamless experience. It allows automatically creation of reminders for students who haven't filled out their course evaluations, integration with internal learning management and student information systems for a seamless student experience, view real-time course evaluation data via a role-based dashboard. It includes methodologies in the following groups:
 - ✓ Education Surveys and Academic Research
 - ✓ Student Satisfaction Survey
 - ✓ Course Evaluation Software

Artificial Intelligence (AI) tools can bring deeper understanding about what the students are saying and

“students' voice mining”. For an open ended questions, the following tools can be applied:

- Neticle is AI tool – It allows to be performed analysis to find out any text's meaning (<https://neticle.com/textanalysisapi/en/analysis-method>). Neticle possess functionality for emotion recognition. 8 emotions are recognised automatically: fear, sadness, disgust, joy, astonishment, anger, pleasure, and longing.
- Monkeylearn is AI tool, which allows building text classifiers for detecting topic, sentiment, intent and urgency (<https://monkeylearn.com/>). The tool's features includes:
 - ✓ Net Promoter Score (NPS) Analyses - Understand the experience of your customers by analyzing open-ended NPS feedback.
 - ✓ Review analyses - reviews are an integral source of customer feedback.
 - ✓ CSAT or customer satisfaction score is a metric which represents how satisfied or dissatisfied the customers are with the products, services, and in their interactions with representatives from the organisation.
 - ✓ Sentiment analysis – it is the process of detecting positive or negative sentiment in text.
- Wordclouds (<https://www.wordclouds.com/>) is AI tool allows to be identifies the most important and reasonable words in a given text collected as a open ended questions

V. NOVELTY FRAMEWORK DESIGN FOR STUDENT FEEDBACK ANALYSES

Digital learners are a generation of connected and social learners that actively uses technology for a more effective learning process. They prefer interactions with knowledge content in a diversity of digital ways. The current research showed that the domains of the feedback analyses are not only the knowledge content, the infrastructure, and the academic services, but also the teaching competencies and peers' feedback. A GAP that was identified is the need for feedback assessment of non-formal learning and how it impacts the formal learning process.

Based on the analysed literature and expert interview, the following concept model (Fig.4) is proposed. It is designed based on five dimensions for feedback learning process analyses. The five dimensions for analyzing the learners' “voice” include:

- Infrastructure;
- Peers and communications;
- Teaching – teachers' performance and knowledge content;
- Learning outcome assessment;
- Non-formal learning.

Each dimension includes KPIs. In order to be identified more correlations and to gain deeper insight into the students' "voice," specific SaaS and AI tools are going to be used.

The process is going to starts with gathering data, based on the designed learning analysis methodology and KPIs, implementation of analysis tools, and identification of the trends and results (Fig. 5).

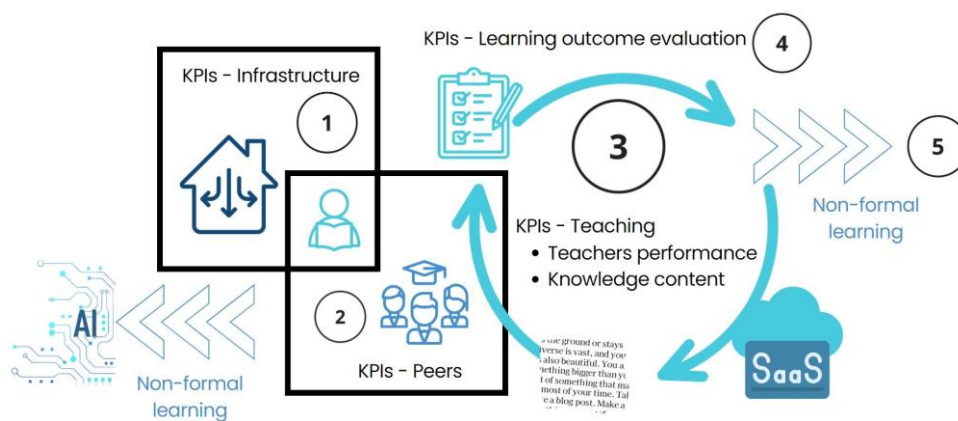


Fig. 4 Learning Feedback Analysis - Conceptual Framework

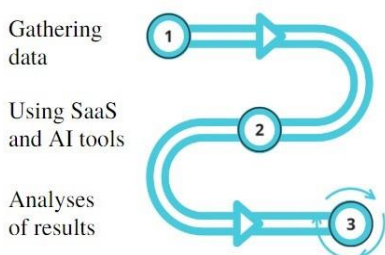


Fig. 5 Feedback analyses – process

Student feedback analyses have to be an integral part of the education system and the learning process. Feedback analysis has to be planned according to the learning journey and to be conducted at least twice a year, having an optimal number of KPIs.

VI. CONCLUSION

The advantages of feedback analyses are many. The answer to the research question of this study, regarding the role of SaaS and AI for better understanding the students' "voice" has no doubt. SaaS and AI can broaden the analyses perspective and gives new insight into the understanding of the learners' feedback. One of the domains having huge importance for the analyses, which was not met in the reviewed literature and sources, is the impact of non-formal learning engagement in the learning process. That is why, the contribution of this research is to propose a novelty five-dimensional framework including non-formal learning, which framework integrates SaaS and AI, in order to be reached a higher level of learners' path discovery. The 5-dimensions framework with a detailed explanation of the KPIs is going to be implemented in the 2022/2023 and 2023/2024 school years. The objective of the research is to be identified trends of correlations into the student's "voice", which is an excellent source for improvement of the learning process in the short and long term period. Recommendations for improvements and priority learning process areas for activities will be defined.

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