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Ensuring Education Quality in E-Learning using the 4th Industrial Revolution Framework ROFSET

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ABSTRACT

The impact that elearning has created over the last two decades has been revolutionary. It provides both an asynchronous and synchronous teaching environment that can be accessed by students around the world from urban to rural regions. There is no need for the student to physically travel to faraway places to seek quality education. With eLearning, students can learn from the best teachers while being in their homes. This provides tremendous opportunities to students in terms of affordability, and convenience. It is envisaged that elearning will continue to grow rapidly as the platform of choice. Unfortunately, elearning education is not widely accepted as a proper degree by many institutions and companies worldwide. There are good reasons for this unacceptability as mentioned below.

All current elearning platforms fail to ensure that the learner is actually learning the required content. In addition to this there are no mechanisms to authenticate the learners throughout the course to make sure that no one else is attending the course on their behalf. Furthermore, there is no way to ensure that the students are actively interacting and are engaged with the content of the course as they would do in a real classroom e.g., taking notes, answering questions, and being able to ask questions. At times, students fail to gauge the importance of certain sections in the course content. Furthermore, the students also often fail to understand certain topics due to monotonous teaching pedagogies.

An ideal situation would be to create an elearning environment that emulates a real classroom as much as possible. With the rapid development of the 4th Industrial Revolution Technologies (Artificial Intelligence, Internet of Things, Automation, Predictive Analysis, 5G), creating a virtual classroom that closely emulates a real classroom has now become possible. This would ensure that all the necessary checks and balances found in a real-class room are also present in the new 4IR enabled eLearning platform. This new approach to elearning would guarantee, in an objective way, that the students will learn the course content as they would in a real classroom. In this article, we propose an innovative educational framework that can address the aforementioned challenges using 4IR technologies. The new elearning framework is called Real-time Objective Feedback System for Effective Teaching (ROFSET). In the ROFSET framework, we use smart biometrics to authenticate the learner. In addition to this, we track the time learner spends on each portion of the content. In order to see how well the learner is learning, questions at regular intervals should be asked and answers be recorded for evaluation. All learner's interactions are recorded to produce an evidence based learning portfolio to ensure quality in elearning systems. This paper will discuss the ROFSET framework in details.

1.Introduction:

E-Learning has now been around for about two decades. Its wide acceptance at the learner's end is undoubted, and the exponential growth of the industry validates it. eLearning has emerged over the years as a learner centred approach of learning, where the learner from any part of the world can learn in a personalized environment. However, without proper Monitoring and Evaluation, Quality is often compromised.

For Instance, it is very important for every one of us to get feedbacks. Feedbacks can help us enhance effectiveness. As Bill Gates says: 'We all need people who will give us feedback. That's how we all improve.'

Similarly, it is extremely important for teachers and students to get a feedback of their performance so that they know what their progress is, and they can improve it. In addition to this, although the eLearning system has been a success at the Learners end, but it has been observed that the employers are still sceptical about online degrees. In this paper, we shall portray the transformation of the eLearning system to the 'Advanced eLearning' system based on the Real-time Objective Feedback System of Effective Teaching (ROFSET) framework.

2.Literature Review:

The word 'eLearning' was first tossed about in 1999 in a Computer Based Training Seminar. It emerged as a Disruptive Revolution in the Education Industry. Within the last two decades, it has proven itself as the platform of choice for learners, as well as the teachers.

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3.Knowledge Economy:

"Economic success is increasingly based upon the effective utilisation of intangible assets such as knowledge, skills and innovative potential as the key resource for competitive advantage. The term "knowledge economy" is used to describe this emerging economic structure" (ESRC, 2005).

The Worldwide shift of Nations from a traditional Industrial Economy to the Knowledge Economy has carved ways for Disruptions in the way Knowledge is now seen. Knowledge is now considered the heart of the economy. It has not only brought about changes in the Classroom culture, but also to the workplace culture (Livingstone 2001; Industry Canada 2002a). eLearning has emerged as the flagbearer of the Knowledge Economy.

4.E-learning:

In the 'Communication of the ACM', E-learning is defined as a technology-based learning approach in which materials are delivered electronically to remote learners via a Computer Network. E-learning has bridged the gap between the Learner and the Instructor. By virtue of E-learning, Learners can now from any part of the world have access to Quality Education whenever they want, wherever they want

E-learning is a relatively recent concept, and is therefore in evolutionary stages. Its disruptive nature is filling in the gap between its disruptive concept, and the drawbacks it has.

Acceptability:

In spite of eLearning being around for the last two decades, its acceptability is still debated. Online degrees through eLearning are often seen by some as an opportunity and by some as a threat. Employers are still sceptical about the idea of earning a degree online. In fact, in a choice between two candidates of equal skills, employers were more inclined towards selecting the candidate with a traditional degree over a candidate with an online degree.

The reasons behind this hesitation by employers is obvious. The eLearning system that we have today has a lot of room for improvements. It doesn't cater to the Quality issues in education. For instance, the main reasons were: Increased Potential for Academic Dishonesty, No Evaluation of Outcome Based Education, Minimum Student Participation, Monotonous Pedagogies, often the exam is given by somebody else, no guarantee that the learner is actually learning the course etc.

In an experiment by DE Fleur & Adams (2004), when the respondents were to choose from two candidates, one with a traditional degree, and the other one with an online degree, 96% (258 managers) indicated that they would choose a candidate with a traditional degree, and only 4% (11 managers) indicated that they would choose a candidate with an online degree.

Quality Issues:

The traditional learning approach has been around for centuries now. Therefore, it has evolved over a period of time, and has catered to the loopholes or the drawbacks in the system. Monitoring and Evaluation Systems have been designed to evaluate the Learning Outcomes, Learning and Teaching effectiveness, and other several aspects of lecture delivery, and Student learning.

However, eLearning being in its evolutionary stages, is yet to design the system to measure the quality of education through the Key Performance Indicators embedded into the system. Therefore, up till now, the eLearning system does not have proper monitoring, and evaluation standards and procedures, and is therefore not accepted worldwide.

Unfortunately, there are no measures in eLearning systems that can guarantee that the learner is actually learning the content. In addition to this, many learners enrol themselves into eLearning courses just for the sake of the certification without actually learning the content.

Ethical Issues:

E-Learning being a recent concept, has more potential for academic dishonesty. eLearning Platforms at this stage were designed to impart education to the masses. And so far, they have been successful in doing so. Now with the success at the first stage, it is the need of hour to design the monitoring and evaluation systems in eLearning platforms that can assure quality, equity, and accountability. It is very difficult in eLearning platforms to assess whether the person getting the certification is the same person who is going through the content, rather than somebody else going through the content on his behalf.

Real-time Objective Feedback System for Effective Teaching (ROFSET):

In order to address the challenges in the eLearning industry, the need of the hour is to introduce Monitoring and evaluation in eLearning. One of the reasons as to why eLearning is widely used by learners is because it is affordable. So, while introducing Monitoring and Evaluation, the cost factor also needs to be considered, so that the usability remains unaffected. In order to address the aforementioned issues in eLearning, a monitoring and evaluation engine is needed, that can automatically analyse, and process the information, and generate useful reports in Real-time.

In this paper, we will introduce an educational framework that promises to address the key Challenges in the eLearning industry. ROFSET which stands for Real-time Objective Feedback System for Effective Teaching is rather a concept based on the idea 'if you can measure something, you can improve it'. The Implementation of ROFSET is: Cost-effective, Scalable, Data Collection and analysis is in Real-time, and it is easy to deploy.

ROFSET in E-Learning:
A ROFSET engine in eLearning Platforms is what the Learners and the Teachers need. It will keep track of everything a user does while interacting with the course content. It will then triangulate different sets of information to generate useful reports using the Artificial Intelligence supported ROFSET engine. By virtue of a ROFSET engine, the eLearning system can keep a track of the interest level of the Learner, the effectiveness of learning outcomes, and how well the learner is actually learning the content. Real-time Reports are the heart of ROFSET, because they are non-intrusive, Objective Analysis (they are machine generated reports with minimal or no human intervention), and automated. ROFSET Framework can address all Quality, and Monitoring and Evaluation issues in the eLearning Industry. In the later sections, details will be provided.

Virtual Classroom:
The physical Classroom environment has stood the test of time, and is the most suited method for enhancing teaching and learning effectiveness. An ideal e-learning environment would be a replication of the physical classroom environment. This is mainly so that the eLearning experience is more like a one to one learning experience. This can be done by replicating the elements of a physical classroom, into the eLearning platform using the 4th Industrial Revolution Technologies (such as Artificial Intelligence, Automation, Internet of Things etc). The role of a teacher can be reflected through a Virtual teacher which may interact with a student to maintain his interest. The virtual teacher would ensure that the eLearning environment emulates that of a Physical Classroom. The student will be expected to read, and respond to certain prompts to maintain Student interest.



Figure 1 Designed by macrovector / Freepik

Smart Biometric Authentication:
The part of the notion that eLearning doesn't guarantee that the person getting the certificate is actually the person going through the content is addressed by the Smart Biometric Authentication System that compliments the ROFSET framework. The use of Speech and Facial Recognitions at random points during the course content will act as a deterrent to unethical activities. The information will be processed into Real-time reports that will recognize the learner and make sure that the person getting the certificate is actually going through the content rather than somebody else going through it on his behalf. In addition to this, random pictures will be taken during different activities in the content to make sure that there's nobody guiding him.

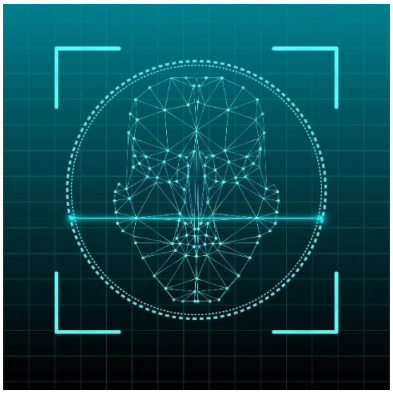
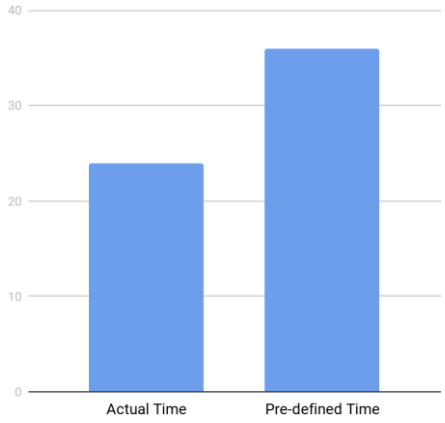


Figure 2 Designed by Freepik

Evidence Based Learning:
The concept of Evidence Based Learning is anchored by the ROFSET framework. The eLearning system will record the evidence of the learning activities of the learner as an evidence, which can be provided as a proof of work. It will also help the learner improve himself. Evidence Based Learning feature will enhance the credibility, and the acceptability of the eLearning system.

Predefined Content Time:
The conception attached to eLearning, that at times the learner enrols himself into the courses for the sake of a certificate, and often doesn't go through the content properly, is addressed by the Predefined Content Time. The Predefined Content Time Feature evaluates the time learner spends on every portion of the content which is then evaluated against an optimal time that the Subject Matter Expert suggests. The predefined time is drilled down to each slide, where the time spent on each slide is evaluated. The accumulated information is then triangulated with certain other KPI's to give reports on Learning Effectiveness. This will also monitor the overall quality of the system.



Internet of Teaching Elements:
ROFSET compliments the concept 'Internet of Teaching Elements' -- a system of interconnected teaching elements (such as Bloom's Taxonomy, Pedagogies, Learning Outcomes, Lecture Time etc) in a virtual space. The concept is proposed for the first time in this paper, and is a proprietary concept of ROFSET Framework. In Internet of teaching elements, the pedagogies, Bloom's Taxonomy, Solo Taxonomy etc are all interconnected for an eLearning environment, and the Teaching, and Learning effectiveness are calculated by a set of algorithms through triangulation of the interconnected sets of information.

Real-time Reports:
The ROFSET framework automatically keeps a record of the activities of a learner through a variety of modes such as audios, videos, images etc. The Big data collected for this purpose is triangulated with different sets of data such as the Blooms Taxonomy Reports, Learning Effectiveness reports to generate required reports through machine learning that ensure quality education in the eLearning environment. ROFSET framework is based on the concept of 'Kaizen' and supports continuous improvement through real-time feedbacks generated through artificial intelligence supported ROFSET engine.

5.Conclusion:
E-Learning systems have been a disruption at the learner's end in the traditional learning approaches. But when the learners entered the market with their online degrees, it was observed that their skills did not compliment the online degrees. With the increase in saturation of the eLearning graduates, the results became more prominent. This adversely affected the credibility, and the acceptability of the eLearning system.

Real-time Objective Feedback System for Effective Teaching (ROFSET) is the educational conceptual framework that can transform the current eLearning platforms to 'Advanced eLearning' platforms. The advanced eLearning platform ensures quality, equity, accountability, and affordability. The platform is designed to offer an environment that emulates a physical classroom environment. A virtual teacher expects the learners to interact by reading aloud different prompts, and answering questions in the content.

In a nutshell, the idea is to provide a virtual classroom environment with automated monitoring and evaluation through the artificial intelligence based ROFSET engine that generates real-time triangulated analytical reports for the different stakeholders.

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