LEARNING ANALYTICS-BASED EVALUATION MODEL FOR ONLINE PROFESSIONAL DEVELOPMENT PLATFORMS

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Abstract: *Online professional development platforms generate a large amount of digital traces: logins, course views, video progress, assignment attempts, forum activity and assessment results. However, many platforms evaluate learning mainly through final test scores and do not sufficiently use learning analytics for early risk detection and adaptive support. This article proposes a learning analytics-based evaluation model for online professional development courses. The model connects data collection, indicator normalization, engagement analysis, progress monitoring, feedback generation and course redesign. A compact mathematical scoring approach and an analytical comparison of evaluation methods are presented. The results show that learning analytics can improve the quality of feedback, support course personalization and help administrators evaluate the effectiveness of online learning platforms in a more objective and practical way.*

Keywords: *online education, professional development, learning analytics, LMS, adaptive learning, digital platform, learner engagement, feedback, educational data.*

INTRODUCTION

Online education has become one of the most important forms of professional development because it allows learners to update their knowledge without interrupting work and family responsibilities. The uploaded dissertation emphasizes that modern professional development requires flexible, accessible and technologically supported learning platforms. It also shows that online education includes video lectures, interactive assignments, tests, discussion forums, feedback, mobile access and adaptive learning components. These components create a rich digital environment, but their real pedagogical value depends on how systematically the collected data are interpreted.

In many learning management systems, course quality is still assessed by simple indicators such as final test results, number of enrolled learners or completion percentage. Such indicators are useful, but they are not enough to understand why a learner succeeds, becomes passive or drops out. Learning analytics offers a broader approach: it transforms educational data into meaningful evidence for teachers, course designers and administrators. This article therefore focuses on the development of an evaluation model that can be used to measure and improve the effectiveness of online professional development platforms.

The purpose of the article is to propose a compact learning analytics-based model for evaluating online professional development courses. The model is designed for platforms that support LMS functions, mobile learning, interactive tasks, feedback tools and adaptive recommendations. The research is based on the methodological ideas of online

learning analysis, comparison of platforms and platform effectiveness assessment described in the uploaded file.

2. Related Work and Research Gap

Online education platforms such as Moodle, Canvas, Blackboard, Coursera, Udemy and edX demonstrate that digital learning can be organized through different technological and pedagogical models. LMS platforms provide course management, content delivery, assessment, communication and reporting tools. Mobile applications extend access to learning materials, while gamification and interactive tasks increase learner motivation. The dissertation material also highlights the importance of artificial intelligence, machine learning, big data and analytics for personalization of learning paths.

Despite the broad functionality of modern platforms, a practical gap remains. Many systems collect a large amount of data but do not convert it into a clear pedagogical decision. Teachers often see grades, but they may not see early warning signs such as irregular access, low video completion, passive forum behavior or repeated errors in formative tests. Course administrators may also know the number of participants, but they may not know which course elements actually support learning progress. Therefore, the research gap addressed in this article is the lack of a simple, transparent and implementation-oriented model that connects LMS data with course improvement decisions.

3. Proposed Learning Analytics Evaluation Model

The proposed model is called LA-PDP, which means Learning Analytics for Professional Development Platforms. It evaluates online learning effectiveness through five interconnected groups of indicators: access, engagement, progress, assessment and feedback. Each group reflects a different aspect of the learning process. Access shows whether learners can enter the platform and use materials regularly. Engagement shows how actively they interact with content and peers. Progress shows how consistently they complete modules. Assessment reflects the quality of knowledge acquisition. Feedback reflects the speed, clarity and usefulness of support provided to learners.

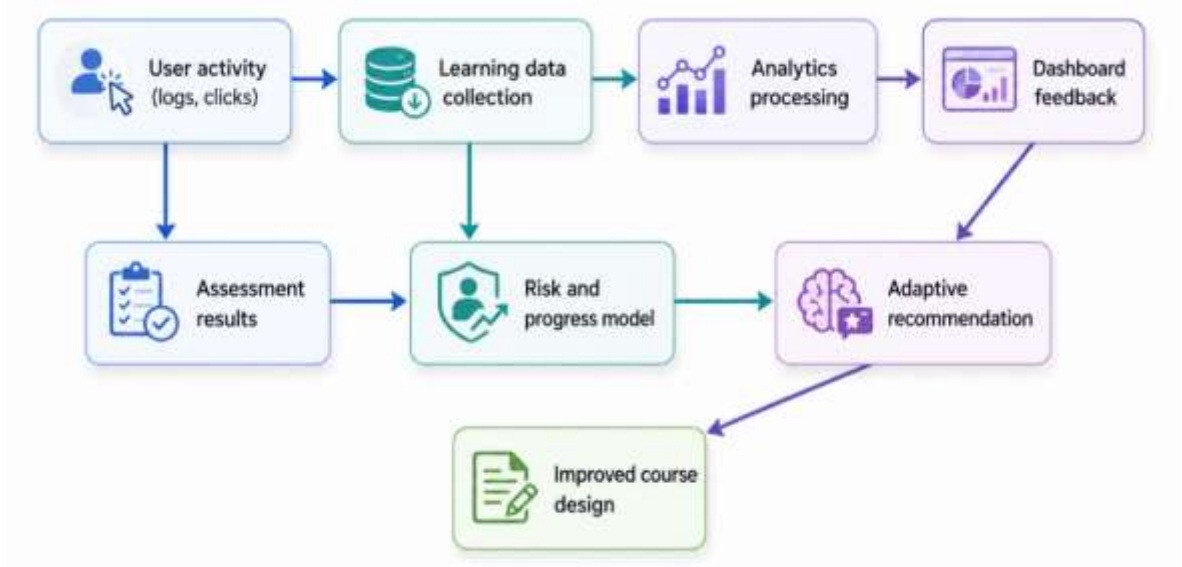

Figure 1. Learning analytics cycle for online professional development platforms.

As shown in Figure 1, the model begins with the collection of user activity data from the LMS. These data include login frequency, time spent in course modules, video viewing percentage, assignment attempts, quiz scores, forum participation, feedback requests and course completion status. After data collection, indicators are normalized and processed. The system then calculates the learning effectiveness score and identifies learners or course units that require pedagogical attention.

4. Mathematical Description of the Model

To make the evaluation process transparent, each raw platform indicator is first normalized. This is necessary because different indicators have different measurement scales. For example, quiz score may be measured from 0 to 100, while login frequency may be measured as number of sessions per week. Normalization is expressed as follows:

$$x_i^n = (x_i - \min(x)) / (\max(x) - \min(x)) \quad (1)$$

Here, x_i is the raw value of a selected learning indicator, min(x) and max(x) are the minimum and maximum values in the dataset, and x_i^n is the normalized value. After normalization, the main learning analytics vector is formed:

$$V = [A, E, P, S, F] \quad (2)$$

In Eq. (2), A represents access regularity, E represents engagement, P represents module progress, S represents assessment success, and F represents feedback quality. The overall effectiveness score of an online course or learner group is calculated by weighted summation:

$$LAE = w_1A + w_2E + w_3P + w_4S + w_5F, \quad \Sigma w_i = 1 \quad (3)$$

The LAE score ranges from 0 to 1. A value close to 1 means that the course demonstrates strong learner activity, stable progress, high assessment results and effective feedback. A value below 0.50 indicates that the teacher or platform administrator should analyze the course structure, learning materials, task difficulty or feedback mechanism. This simple formula is suitable for practical use because the weights can be changed depending on the course purpose. For example, in a skills-based professional development course, practical task completion may have a higher weight than forum activity.

Table 1. Key indicators of the learning analytics evaluation model

Indicator group	Main data source	Pedagogical meaning	Possible intervention
Access regularity	Login history, device access	Availability and continuity of learning	Technical support, mobile access, reminder messages
Engagement	Video views, clicks, forum posts	Learner participation in online activities	Interactive tasks, gamification, peer discussion
Progress	Module completion, deadlines	Stability of course movement	Adaptive schedule, micro-learning units
Assessment	Quiz scores, assignment attempts	Knowledge and skill acquisition	Additional explanations, practice tasks
Feedback	Teacher comments, response time	Quality of pedagogical support	Automated and teacher-guided feedback

5. Analytical Evaluation and Discussion

The proposed model was analytically compared with two common evaluation approaches: static LMS reporting and interactive LMS reporting. Static LMS reporting usually provides attendance, completion and final test statistics. Interactive LMS reporting additionally includes communication and activity indicators. The learning analytics-based model extends both approaches by connecting indicators with adaptive recommendations and course redesign decisions.

Table 2. Comparison of online learning evaluation approaches

Approach	Data depth	Early risk detection	Feedback quality	Course improvement value
Static LMS statistics	Low	Weak	Low	Limited
Interactive LMS reporting	Medium	Moderate	Medium	Useful
Learning analytics model	High	Strong	High	Strategic

The comparison indicates that an analytics-based approach is more suitable for professional development because adult learners often combine learning with work, professional duties and personal responsibilities. In such conditions, delayed feedback may lead to course abandonment. Early warning indicators help teachers identify learners who are not progressing and provide support before the final assessment. In addition, analytics dashboards can help administrators understand which modules are too difficult, which videos are not watched completely, and which assignments generate repeated errors.

The model also supports personalization. If a learner has high access regularity but low assessment results, the platform may recommend additional explanatory materials. If a learner has good assessment results but low engagement, the teacher may provide more challenging tasks. If many learners demonstrate low progress in one module, the course designer may revise the content, divide it into smaller parts or add interactive examples. Thus, learning analytics is not only a measurement instrument but also a mechanism for continuous improvement of online education.

6. Scientific Novelty and Practical Value

The scientific novelty of the article lies in the integration of professional development pedagogy, LMS functionality and learning analytics into one compact evaluation model. Unlike traditional approaches that rely mostly on final grades, the proposed model evaluates the entire learning process: access, engagement, progress, assessment and feedback. This makes it possible to interpret platform effectiveness not as a single result, but as a dynamic interaction between learners, content, teachers and digital tools.

The practical value of the model is that it can be implemented in different LMS environments. The model does not require a complex artificial intelligence system at the first stage. It can start with basic platform logs and gradually be expanded with machine learning-based prediction, adaptive recommendations and automated feedback. For universities, training centers and corporate education departments, this approach can

support evidence-based decisions about course quality, learner support and digital content improvement.

7. Conclusion

This article proposed a learning analytics-based evaluation model for online professional development platforms. The model was developed using the ideas of online learning methods, LMS platforms, mobile learning, adaptive education, artificial intelligence and effectiveness assessment presented in the uploaded dissertation material. The proposed LA-PDP model includes data collection, normalization, indicator vector formation, effectiveness scoring, feedback generation and course redesign.

The analytical discussion shows that learning analytics can improve online course management by providing early risk detection, personalized feedback and evidence-based course improvement. Future work should test the model with real platform data, compare results across different professional development courses and develop a software dashboard that visualizes access, engagement, progress, assessment and feedback indicators for teachers and administrators.

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