Teacher training model in artificial intelligence and learning analytics for course design in Moodle

Diego Patricio Columba Tibanta
dpcolumbat@ube.edu.ec
https://orcid.org/0009-0000-4833-7196
Affiliation: Universidad Bolivariana del Ecuador
Country: Ecuador

Raúl López Fernández
rlopezf@ube.edu.ec
https://orcid.org/0000-0001-5316-2300
Affiliation: Universidad Bolivariana del Ecuador
Country: Ecuador

Tatiana Tapia Bastidas
ttapia@ube.edu.ec
https://orcid.org/0000-0001-9039-5517
Affiliation: Universidad Bolivariana del Ecuador
Country: Ecuador

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pág. 1

ABSTRACT

Continuous teacher training is a priority for any educational system, particularly when supported by technological advancements such as artificial intelligence (AI), learning analytics (LA), and Moodle course design, which further enhance its relevance. The objective of this research was to develop a teacher training model in artificial intelligence (AI), learning analytics (LA), and Moodle course design to be applied in their pedagogical practice. Theoretical methods such as historical-logical and inductive-deductive analysis were employed. From an empirical perspective, diagnostic assessment, semi-structured interviews, modeling, expert judgment, and Regnier's abacus were used. The results yielded the development of an applicable and adaptable training model, tailored to each educator's pedagogical practice, with the added advantage of being customizable and improvable based on their specific training needs. In conclusion, AI and LA tools are essential in the design of virtual courses, which must be structured, organized, and implemented by the teachers themselves, the primary beneficiaries of the training. An additional key factor is that participants can become multipliers in the application of the model.

Keywords: learning analytics, teacher training, artificial intelligence, Moodle course design.

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pág. 2

INTRODUCTION

Artificial intelligence (AI) is transforming the education landscape by providing innovative tools to support teaching and learning (Giró & Sancho, 2021). On virtual platforms such as Moodle, AI can automate processes, personalize experiences and improve course quality. These opportunities are particularly valuable in an increasingly digitalized world, especially in the field of education, where face-to-face interaction is combined with online learning (Campoverde et al., 2024). Nevertheless, to achieve these benefits, educators must possess the skills to effectively integrate AI into course design, which constitutes a significant challenge in educational settings where technological training is limited, thus diminishing the positive impact that these tools may provide.

A significant benefit of using AI is the automation of repetitive administrative tasks, such as grading tests, tracking progress, and generating reports, which allows teachers to engage in other more strategic and creative activities, such as lesson planning and personalized student support (Sanabria et al., 2023). In addition, the use of artificial intelligence in education provides instant feedback, which is key to informing students about their progress and motivating them to improve, creating a more dynamic and flexible learning

One of the main advantages of artificial intelligence is access to high-quality educational resources anytime, anywhere, promoting autonomous learning through the use of tools such as virtual tutors, interactive simulations, and artificial intelligence platforms that enhance the learning experience by providing modern and flexible materials. This is especially valuable in places where access to teachers or traditional resources may be limited (López et al., 2024). In other terms, AI improves the teaching-learning process by making it more personalized, effective, and accessible, which makes learning a more meaningful and impactful experience.

AI development should be integrated into the educational teaching process, promoting the aforementioned advantages, with learning analytics (LA) being no exception.

Learning analytics (LA) is based on the use of data and advanced technologies to analyze and optimize educational processes. It combines statistical tools, algorithms, and data visualization techniques to understand student behavior and the impact of teaching strategies.

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pág. 3

Through LA, it is possible to identify learning patterns that might otherwise go unnoticed, enabling informed pedagogical decision-making (Salica, 2021). Moreover, LA contributes to personalized learning by identifying students' strengths and weaknesses, benefiting both learners and educators (Soler et al., 2022).

One of the most notable benefits of **LA** is its ability to proactively identify students at risk. By analyzing data such as grades, attendance, and participation, alerts can be generated to intervene before difficulties negatively affect academic performance (Intriago et al., 2023).

By integrating technology, data analysis, and pedagogy, learning analytics transforms education into a more dynamic, comprehensive, and effective experience for both teachers and students.

A teaching resource is any material designed or adapted to facilitate the teaching–learning process. These resources range from traditional materials, such as textbooks and guides, to innovative tools like educational videos and concept maps (García et al., 2020). Their primary advantage lies in their capacity to make abstract concepts more concrete, promoting meaningful learning. Teaching resources can also be adapted to different learning levels, supporting classroom diversity. The correct selection of these resources by the teacher is essential to ensure that they are relevant, attractive and aligned with educational objectives.

A particularly relevant case is digital teaching resources, understood as educational material that is presented or transmitted via digital media, such as computers, tablets, or mobile phones; their main objective is to facilitate student comprehension and learning (Morales, 2021). Among these are learning management systems (LMS), one of the most widely used being Moodle, which provides a flexible and adaptable environment for designing learning experiences. Despite the fact that there are still a significant number of teachers who only use its basic functions, missing out on the opportunities for personalization and optimization offered by artificial intelligence. Vera (2023) and García et al. (2020) have shown that inadequate knowledge of these tools limits the effectiveness of instructional design, which affects both student motivation and learning outcomes. Therefore, it is important to train teachers in the advanced use of these technologies to maximize their potential, as training in the use of artificial

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pág. 4

intelligence and learning analytics not only meets technical needs but also pedagogical ones, especially in the context of distance and hybrid education (Tomalá de la Cruz et al., 2023).

González (2023) demonstrates that training programs in the use of digital tools contribute significantly to improving teachers' ability to develop interactive and effective courses. This not only benefits students by providing them with a dynamic and personalized experience, but also strengthens the confidence and professionalism of teachers, who can take on a proactive and innovative role in their teaching activities (Bravo et al., 2022).

Nevertheless, the integration of artificial intelligence into learning environments, while presenting numerous opportunities, also involves several challenges. One of the main obstacles is the digital divide among teachers, which can complicate the adoption and effective use of these tools. In addition, the lack of appropriate training can lead to resistance and poor implementation of technologies. It is essential to consider the role of teachers in this new context, ensuring that artificial intelligence serves as a tool that complements and enhances their work, rather than replacing it.

Another constant challenge in education is the lack of use of learning analytics by teachers. Learning analytics is often carried out at the end of the school year, which limits the possibility of making timely adjustments during the teaching process. This limits the potential of learning analytics to provide real-time information on student progress, detect difficulties and tailor activities to individual needs.

One other significant challenge to keep in mind is the resistance some teachers show to integrating digital resources and artificial intelligence tools into their teaching practices. This reluctance often arises from factors such as a deficiency in technological training, conformity to traditional teaching methods, or the false belief that these innovations complicate the teaching process. Consequently, this resistance to change can lead to a rejection of new technologies.

The situation discussed above has given rise to the following scientific problem: How can we support teacher training in artificial intelligence (AI), learning analytics (LA) and course design in Moodle? The previous question was addressed through the following objective: to develop a

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pág. 5

model for training teachers in artificial intelligence (AI), learning analytics (LA) and course design in Moodle for application in their pedagogical practice.

METHODOLOGY

Materials y Methods

This research was conducted through a qualitative approach, with the aim of understanding the needs and applicability of integrating artificial intelligence (AI), learning analytics (LA), and course design in Moodle into teachers' pedagogical practice. This approach allowed for the analysis of their experiences, challenges, and prior knowledge, thus addressing the specific needs of teachers. Furthermore, this methodology is suitable for investigating training needs in the field of education, where the drive to integrate technology and pedagogy is gaining momentum in an ever-changing world (Cortez & Solorio, 2024).

The theoretical methods were historical-logical and inductive-deductive (Mansilla et al., 2021). From an empirical point of view, the diagnosis, semi-structured interview, modelling, expert criteria and Regnier's abacus were employed.

The methodological approach was based on a diagnosis carried out with teachers through a structured interview. Next, the proposed model design was modelled, which was validated and assessed through expert criteria using the competence coefficient and Regnier's abacus for subsequent readjustment.

Categories

1. Training model for teachers in artificial intelligence (AI), learning analytics (LA) and course design in Moodle.
2. Teaching practice.

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pág. 6

Central Argument

Implementing a functional, integrated, flexible, and contextualized model for training teachers in artificial intelligence (AI), learning analytics (LA), and course design in Moodle will guarantee better teaching practices among teachers.

Limitations Of the Study

The main limitation of the study was the resistance of teachers to new technologies in their pedagogical practice.

Training Model Design

Definition

According to Valle (2007), the training model is a theoretical-methodological construct that provides a systematic and contextualized framework for the process of developing professional or pedagogical skills. It integrates essential components such as objectives, content, methods, and evaluation, but its essence lies in its flexibility to adapt to the needs of individuals and institutions, avoiding rigid frameworks and promoting a training dynamic focused on the qualitative transformation of learning.

The following structure was taken into account in developing the model for this research:

Figure 1: Stages in the design of a teacher training model

Note: Summary of the fundamental parts of training model according to Valle (2007)

Source: Own elaboration

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pág. 7

1. Needs Diagnosis

Educational Diagnosis

According to Lara & García (2025), educational assessment is a systematic and reflective process that allows us to understand the characteristics, needs and contexts of students with the aim of adapting educational practices and promoting meaningful and equitable learning among students.

Application of the Semi-structured interview

Based on the proposal by Martínez (2006), the steps for conducting a semi-structured interview are:

Objective:

To identify teachers' preparation in artificial intelligence (AI), learning analytics (LA) and course design in Moodle for their training.

Interview Guide

1. **Experience with Artificial Intelligence (AI)**
   Could you describe your current experience and knowledge of Artificial Intelligence in the educational context? Have you used or considered using AI tools in your teaching practice?

2. **Knowledge of Learning Analytics (LA)**
   What do you understand by Learning Analytics and how do you think it could be applied in your teaching? Have you had any previous experience with LA tools?

3. **Skills in designing courses in Moodle**
   What is your level of experience in designing and managing courses on the Moodle platform?
   Which Moodle features do you use most frequently in your courses?

4. **Training Needs**

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pág. 8

Considering the areas of AI, LA and Moodle, in what specific areas do you feel you need more training to improve your teaching practice? What type of training would be most useful to you?

Responses to the interview

Number of individuals interviewed: 6 Educators.

Question 1

Teacher A, B, C, E y F

They agree that they have used AI to develop micro-curricula, lesson plans, assessments, etc. However, they report that they use it more to find adaptive activities for students with SEN, as it is almost always difficult to find one that provides the student with meaningful learning. They also use it as a guide to describe processes that are adapted to the reality of the group of students.

Most commonly used examples of AI: ChatGPT, Perplexity, and chatbots.

Teacher D

He states that he has little experience and experimentation using AI in the educational context.

Question 2

Teachers E y F

They state that in their teaching practice, they analyze data from socio-emotional diagnostic assessments to understand the student's context and how it influences their academic performance. The same applies to diagnostic assessments at the beginning of the school year. This is generally used in final subject reports.

Teachers A, B. C y D

They say that they are unfamiliar with learning analytics and that they are researching the topic in order to use it later in their teaching practice, as it is part of their job to keep up to date.

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pág. 9

Question 3

Teachers B, D, E y F

They state that they have basic knowledge of the Moodle platform from their experiences as students or from courses they have taken, but that they have not used it in their teaching practice due to the educational context in which they find themselves. Consequently, their students are also unfamiliar with it.

Teachers A y C

They have not used interactive platforms.

Question 4

All teachers agree that advances in teaching and learning technologies are useful in teaching practice, which is why constant updating and training in these three areas is necessary. However, many teachers are unable to achieve this due to a lack of interest or financial resources.

Interview Analysis

Question 1

In the first question, most educators interviewed claim to have experience using AI, and its limitations are related to planning, searching for activities, assessments, etc. The most commonly used tools are ChatGPT, Perplexity, and chatbots. In summary, teachers need pedagogical training to use this type of resource.

Question 2

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pág. 10

Regarding this second question, most teachers state that they are not familiar with learning analytics, but are willing to learn about it in the future. This question reveals the need for teachers to apply LA as good teaching practices.

Question 3

Most teachers lack knowledge about Moodle and its usage. They are familiar with it from online courses taken through the ministry where they are students, and they do not have the skills to design and deliver courses as teachers.

Question 4

Educators are receptive to the need for training in these three areas: AI, AA, and Moodle. Although they have cultural knowledge of their functionality and application in the educational context, they lack the skills to implement them in the teaching process.

The diagnosis has highlighted the need to provide training to teachers, and the authors of this research have decided to design a model that promotes the necessary knowledge among teachers about AI, AA, and course design in Moodle.

2. Strategic Planning

Train teachers in artificial intelligence (AI), learning analytics (LA), and course design in Moodle to apply in their teaching practice.

Specific Objectives

1. Prepare teachers in artificial intelligence to apply in their teaching practice.
2. Train teachers in learning analytics to apply in their teaching practice.
3. Train teachers in course design in Moodle to apply in their teaching practice.

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pág. 11

3. Program Design

Table 1: Program Design. Quito, 2025

Objective	Content	Method	Teaching resource	Teaching organization	Assessment
Prepare teachers in artificial intelligence for application in their teaching practice.	**Module 1: Introduction to AI in Education** • What is AI and how is it applied in education? • Examples of AI tools such as: Deepseek, Gemini, Copilot, Gamma, image generators, and virtual assistants. • Benefits and ethical challenges. **Module 2: AI Tools for Teachers** • Generating educational content such as lesson plans, activities, and rubrics. • AI assistants for providing feedback and assessment. • Personalization of learning with AI.	**Practical and Collaborative approach** • Brief presentation plus live demonstration. • Guided workshops where teachers experiment with tools. • Group discussion on real use cases. **Project-based learning** Every teacher designs a resource and an activity with the help of AI for their subject.	**Digital** • Interactive presentation using Google Slides or Canvas.. • Access to AI platforms: Deepseek, Gemini, Gamma, ChatPDF. • Video tutorials on how to use them in class. **Physical** • Quick guide to AI prompts. • Templates for activity design. • Laptop	**Workshops Modality:** virtual **Group Dynamics:** • Theoretical introduction and demonstrations. • Collaborative work in workshops. **Individual:** Creation of a project applied to your context.	**Diagnostic:** Initial questionnaire on prior knowledge of AI. **Formative:** Delivery of an AI activity prototype. Example: planning using Gemini. **Summative:** Brief presentation of the project to the group explaining how you will apply AI in your class.

	Module 3: Practical implementation • Designing a pedagogical activity with AI. • Use of chatbots for automatic tutoring. • Creation of multimedia resources with AI. Example: images, videos, quizzes.				
Prepare teachers in learning analytics to apply in their teaching practice.	**Module 1: Fundamentals of Learning Analytics**• • What is learning analytics? • Benefits: Risk detection, personalization, improvement of teaching strategies. • Ethics and student data privacy. **Module 2: Key Tools and Data** • Platforms with integrated analytics: Google Classroom, Moodle, LMS, Jamovi.	**Practical and reflective approach** • Analysis of real cases: Data from previous courses. • Guided workshops: Teachers explore data from their own classes. **Collaborative Learning** Group discussion on how to adapt analytics to their con texts.	**Digital** Platforms that use analytics. Examples: Google Classroom reports or Moodle graphs. **Physical** • Analysis templates such as Excel/Jamovi tables. • Laptop	**• Grupal:** Analysis of simulated or real databases. **• Individual:** Development of an action plan for your course.	**Diagnostic:** Brainstorming about what data you already use in your teaching practice. **Formative:** Submission of a simplified report with key findings from your course. **Summative:** Presentation of an analytics-based intervention plan. Example: "30% of my students do not review feedback, so I will propose

	• Basic metrics: participation, task time, error patterns. Data visualization in graphs. **Module 3: Practice Application** How to interpret data to adjust teaching. Example: identifying students at risk. • Designing data-driven interventions. Example: personalized tutoring. • Success stories in education.				automatic reminders."
Prepare teachers to design courses in Moodle for use in their teaching practice.	**Module 1: Course Design in Moodle** • Automatic content generation, such as: - Creation of guides, instructions, and class slides with the help of AI. - Design of automated quizzes and assessments. •Organization of resources and activities using AI.	**Live Demonstration.** Creating a course module in Moodle using AI and generating activities with the help of Gemini. **Practical Workshop** Each teacher designs a section of their course in Moodle with the help of AI. Role-playing Simulating the role of the student to test the	**Digital.** • Moodle test platform (Milaulas) • Free AI tools such as: DeepSeek, Magic School AI, Gamma. • Video tutorials. **Physical** •Downloadable templates: - Course structures. - Prompts.	**Practical Workshop: Individual** • Designing activities with AI and uploading them to Moodle. • Socialization: Presentation of progress and group feedback. **Group** 3 to 4 people: Collaboration on	**Formative:** Real-time review of activities created during the workshop. **Summative:** Final assignment: A course module in Moodle designed with the help of AI. It must include at least one activity, one resource, and one feedback mechanism.

Example: A structure suggested by AI according to learning objectives.

Module 2: Customization and Automation
• Use of AI for automatic feedback such as rubrics and comments on assignments.
• Integration of chatbots into Moodle for automated tutoring.

Module 3: Implementation and Practice
• Uploading and configuring AI-generated content in Moodle.
• Practical examples of AI-powered courses in Moodle.

activities created with the help of AI.

Role-playing
Simulate the role of the student to test the activities created with the help of AI.

the design of a module.

4. Instructor Training

The cycle of training that emerges after these workshops, where trained teachers become instructors for other colleagues, increases the impact of pedagogical innovation. It also strengthens a collaborative culture of continuous improvement. When teachers assume the role of facilitators, they internalize knowledge better when they share it with others, thus developing educational leadership skills while applying what they have learned in real contexts. This ensures that the integration of AI, AA, and Moodle is not only theoretical but also applicable and contextualized. True educational transformation begins when teachers cease to be passive recipients and become active agents of teaching.

Table 2: Program Design. Quito, 2025

5. Program Implementation	6. Evaluation and Monitoring	7. Feedback and Continuous Improvement
Platform All workshops will be delivered through a virtual course on Milaulas designed specifically for this training. Participants will have access to resources, activities, and collaborative spaces. **Duration and Structure of the Workshops** Duration: 6 days. Each workshop will consist of two 2-hour sessions and one 1-hour asynchronous session (6 hours per workshop): Theory/Practice (2 hours) Asynchronous (1 hour) Total Course Duration: 18 hours. **Virtual Methodology on Milaulas** • 24/7 access	**Final product (AI)** Each teacher creates content and activities according to their subject, supported by AI ready to be implemented in their teaching unit plan.	**Positive feedback** This is based on the critiques made between the subgroups established through the Moodle "workshop" activity.
	Final product (AA) Each teacher identifies a key metric to monitor in their course and designs a strategy to act on it. Examples of measurements: learning styles, grade measurement, achievement of learning objectives, etc.	**Specific Feedback** This will be provided by the reports generated by the Moodle platform in the monitoring of resources and activities.
	Final Product (Moodle) Every teacher designs a functional module in Moodle with the help of AI, ready to be implemented in their courses.	**Constructive Feedback** Redesign of the functional Moodle module based on the task reviewer's comments.

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pág. 16

Materials such as videos, guides, and templates will be available on Milaulas for asynchronous review.
• Synchronous sessions
The two hours per day will be held virtually via Zoom or Teams, with recordings available.
• Practical activities
Each workshop will include exercises on Moodle such as forums, assignments, glossaries, quizzes, etc.
• Support
Communication and help via the platform's messaging system.

Validation by expert criteria using Regnier's Abacus

Selection of experts

The selection of experts was carried out according to the methodology and criteria of (López et al., 2018). To select the experts, teachers who met the following criteria were chosen:

- More than 10 years as teachers of English
- More than six years with an Excellent evaluation
- More than two scientific publications
- More than two participations in scientific events
- Master's degree in education

We worked with 12 potential experts, leaving 9 with the category of experts after applying the competence coefficient.

Table 3: Competence coefficient for the selection of experts. Quito 2025

Enhanced	**Ka**	**Kc**	**1/2(Ka+Kc)**	**Category according to score**
Enhanced A	0,90	0,80	0,85	**Medium**

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pág. 17

Enhanced B	0,70	0,70	0,70	Low
Enhanced C	0,90	0,93	0,92	High
Enhanced D	0,92	0,90	0,91	High
Enhanced E	0,71	0,67	0,69	Low
Enhanced F	0,88	0,92	0,90	High
Enhanced G	0,90	0,94	0,92	High
Enhanced H	0,69	0,68	0,69	Bajo
Enhanced I	0,89	0,94	0,92	High
Enhanced J	0,92	0,92	0,92	High
Enhanced K	0,91	0,97	0,94	High
Enhanced L	0,93	0,90	0,92	High

Nota: The table shows the scores for the knowledge coefficient (kc), argumentation coefficient (ka), and competence coefficient (k).

Source: Own elaboration

RESULTS AND DISCUSSION

After calculating the competency coefficient, nine of the 12 participants remained as experts, to whom the Regnier Abacus was applied.

Phase 1: Questions to experts about the fundamental parts of the program.

Question 1: Do you think the questions asked in the interview reflect the reality of teachers?

Question 2: Are the main topics of the course (IA, AA, and Moodle) in line with the current demands of digital education?

Question 3: Do you think the theoretical activities are adequate for teachers to become instructors?

Question 4: Is the 2-hour synchronous daily format sufficient for active participation?

Questions 5: Does the final product truly measure the skills acquired during the course?

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pág. 18

Question 6: Do these feedback mechanisms allow teachers to improve their digital skills in a specific way?

Phase 2: Colorimetric analysis of the questions asked

Table 4: Coloremetric Analysis Quito, 2025

Enhanced	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
Enhanced A	Somewhat Agree	Agree	Somewhat Agree	Agree	Agree	Agree
Enhanced C	Somewhat Agree	Agree	Disagree	Agree	Agree	Agree
Enhanced D	Agree	Agree	Agree	Agree	Somewhat Agree	Somewhat Agree
Enhanced F	Agree	Agree	Agree	Somewhat Agree	Agree	Agree
Enhanced G	Agree	Agree	Somewhat Agree	Agree	Agree	Agree
Enhanced I	Agree	Agree	Agree	Somewhat Agree	Agree	Agree
Enhanced J	Somewhat Agree	Agree	Agree	Agree	Somewhat Agree	Agree
Enhanced K	Agree	Agree	Somewhat Agree	Agree	Agree	Agree
Enhanced L	Agree	Agree	Agree	Agree	Disagree	Agree

Note: The table contains the responses of each expert, identified by the corresponding color.

Source: Own Elaboration

Legend

Agree (green)	Agree
Somewhat Agree (yellow)	Somewhat Agree
Disagree (red)	Disagree

Phase 3: Assessment of qualitative elements expressed by experts

Regarding the needs assessment, three of the experts (33%) recommended that emphasis be placed on gathering previous experiences with digital tools in order to understand the individual context of each teacher.

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pág. 19

In relation to the program design, the experts agreed that its structure is properly constructed with the topics and activities necessary for teacher training in the areas covered.

In addition to the training of instructors, four of the experts (44%) recommended modifying the training activities by adding final projects to each module so that trainees can apply what they have learned and develop skills that will enable them to become trained instructors in their own context and pass on their knowledge to other colleagues.

According to the experts, two of the experts representing 22% suggested adding an hour to the program for practical activities, workshops, forums, among others, based on the development of skills in AI, AA, and Moodle.

Three experts representing 33% of the experts assessed the measurement of skills and valued the incorporation of assessment activities aimed at know-how, as the trend in the design was towards content reproduction.

In relation to monitoring and feedback, only one expert (11%) suggested that the critiques made at each assessment point, in addition to being shared with the participant, should be subject to collective analysis in order to achieve collaborative learning.

Phase 4: Conclusion

Taking into account the assessments provided by the experts, it was necessary to readjust the training course design by modifying and/or adding the collection of previous experiences, final projects in each module, more time for asynchronous activities, monitoring of results, and constructive feedback with interactive participation from all, which ensured the robustness of the final product of this research.

CONCLUSIONS

This research has developed a model for training teachers in artificial intelligence (AI), learning analytics (LA), and course design in Moodle, which can be applied to teaching practice.

The model was validated through expert criteria, using the competence coefficient for them, and where they responded positively to the model's functionalities using Regnier's Abacus, and their assessments were used to readjust the fundamental elements identified by these personalities.

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pág. 20

Finally, artificial intelligence was integrated into course design, optimizing teachers' time, reducing their workload, and allowing them to devote that time to innovation, preparation, and building better educational quality.

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pág. 21

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pág. 22