**Research Article**

# Design and Implementation of an Online Course Model Based on the Study of Digital Competencies in Students of CECyT 18 "Zacatecas"

## *Diseño y aplicación de un modelo de cursos en línea a partir del estudio de competencias digitales en alumnos del CECYT 18 "Zacatecas"*

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## Abstract

In today's society, the development of digital competencies has become a key element in academic training at the upper secondary education level, particularly in the context of the incorporation of virtual learning environments. The objective of this study was to identify the digital competencies of students at the Centro de Estudios Científicos y Tecnológicos No. 18 "Zacatecas," in order to design and apply a model for the development of online courses, initially implemented in the Digital Networks learning unit through the Moodle platform. The research was conducted under a quantitative approach, with a non-experimental, descriptive design, using a case study methodology. As a data collection technique, a Likert-scale questionnaire based on the INTEF framework was applied to a population of 78 students enrolled in the Digital Systems Technician program. The results indicate that most

students present an intermediate level of digital competencies, with areas for improvement in critical evaluation of information, digital security, and digital content creation. Based on these findings, the EDIE instructional model (Study, Development, Implementation, and Evaluation) was designed, allowing the structuring of an online course adapted to the identified needs. It is concluded that diagnosing digital competencies is essential for the design of relevant online courses, and that the EDIE model represents a viable alternative for strengthening the teaching–learning process in virtual environments at CECyT 18 "Zacatecas."

**Keywords:** Digital Competencies, Virtual Learning Environments, Instructional Model, Moodle Platform, Information and Communication Technologies (ICT), Education.

## Resumen

En la sociedad actual, el desarrollo de competencias digitales se ha convertido en un elemento clave para la formación académica en el nivel medio superior, particularmente ante la incorporación de entornos virtuales de aprendizaje. El objetivo de este estudio fue identificar las competencias digitales de los estudiantes del Centro de Estudios Científicos y Tecnológicos No. 18 "Zacatecas", con la finalidad de diseñar y aplicar un modelo para el desarrollo de cursos en línea implementado en la unidad de aprendizaje Redes Digitales mediante la plataforma Moodle. La investigación se desarrolló bajo un enfoque cuantitativo, con un diseño no experimental y de tipo descriptivo, utilizando un estudio de caso. Como técnica de recolección de datos se empleó un cuestionario tipo escala de Likert basado en el marco del INTEF, aplicado a una población de 78 estudiantes de la carrera Técnico en Sistemas Digitales. Los resultados evidencian que la mayoría de los estudiantes presenta un nivel intermedio de competencias digitales, con áreas de oportunidad en la evaluación crítica de la información, la seguridad digital y la creación de contenidos. A partir de estos hallazgos, se diseñó el modelo instruccional EDIE (Estudio, Desarrollo, Implementación y Evaluación), el cual permitió estructurar un curso en línea adaptado a las necesidades detectadas. Se concluye que el diagnóstico de competencias digitales resulta fundamental para el diseño de cursos en línea pertinentes, y que el modelo EDIE representa una alternativa viable para fortalecer el proceso de enseñanza-aprendizaje en entornos virtuales en el CECyT 18 "Zacatecas".

**Palabras clave:** Competencias digitales, Entornos virtuales de aprendizaje, Modelo Instruccional, Plataforma Moodle, Tecnologías de la Información y la Comunicación (TIC), Educación.

## 1. Introduction

At the upper-secondary level, Information and Communication Technologies (ICT)

have progressively become integrated into educational processes, particularly in subjects with a strong technological component. The incorporation of digital devices, internet access, and educational platforms has transformed traditional classroom dynamics and generated new forms of interaction and access to information.

However, these changes do not automatically improve learning outcomes. Their effectiveness depends largely on the development of students' digital competencies. Digital environments have facilitated online learning and collaborative work through virtual platforms, yet the mere presence of technology does not guarantee effective academic use. Students must be able to search for, analyze, and use information critically while interacting responsibly in digital environments.

International organizations such as UNESCO have emphasized digital literacy as an essential competence for students. Likewise, virtual learning environments and Learning Management Systems (LMS) such as Moodle have become valuable tools for expanding educational opportunities. Their effectiveness, however, depends on course designs that consider students' actual digital competencies and contextual conditions.

This study aims to identify the digital competencies of students at CECyT 18 "Zacatecas" as a basis for designing and implementing an online course model through Moodle, initially applied in the Digital Networks learning unit.

Research Question:
What digital competencies do students at CECyT 18 "Zacatecas" possess, and how can these competencies be considered in the design and implementation of an online course model for the Digital Networks learning unit?

Specific Questions:
• What elements are important for configuring Moodle and implementing online courses with optimal performance?
• What characteristics should an online course design model have in the academic environment of CECyT 18 "Zacatecas"?
• How can an online course be improved for students enrolled in the Digital Networks learning unit?

General Objective:
To identify the digital competencies of students at CECyT 18 "Zacatecas" as a basis for creating an online course model to be implemented through Moodle.

Specific Objectives:
• Identify the key elements for configuring Moodle and implementing effective online courses.
• Design a model for implementing online courses in the Digital Networks learning unit.
• Design an online course for students enrolled in the Digital Networks learning unit.

## 2. Method

Digital competencies are understood as a set of skills that enable students to use technologies critically, efficiently, and for learning purposes. These competencies include knowledge, skills, and attitudes required for responsible participation in digital environments.

Educational technology has evolved through the incorporation of digital media and virtual platforms that support teaching and learning. Moodle enables the design of

structured courses that promote interaction between teachers and students. Effective implementation requires adequate levels of digital competence among users.

The study followed a quantitative case-study design involving 78 students enrolled in the Digital Systems Technician program. Data were processed using SPSS software. A Likert-scale questionnaire with 50 items was administered across five dimensions: information literacy, communication and collaboration, digital content creation, security, and problem solving. The instrument was based on the INTEF framework and applied to students from groups 6IM3, 6IM4, and 6IM5.

The results indicated that students were generally familiar with everyday technology use and digital communication. However, weaknesses remained in critical evaluation of information, digital security, and content creation. These findings provided the basis for designing the instructional model.

## 3. Discussion

The findings confirm the importance of digital competencies in upper-secondary education, especially in contexts where virtual learning environments have become increasingly necessary. Students demonstrated an intermediate level of digital competence. While they are comfortable using digital technologies, this does not necessarily translate into critical and reflective academic use.

Areas related to information literacy and digital security showed important opportunities for improvement. These findings support the integration of cybersecurity and ethical information-use content into online courses, particularly in technical education programs.

The EDIE instructional model aligns with student-centered digital learning approaches. Unlike more rigid models such as ADDIE, EDIE prioritizes adaptation based on prior diagnosis of students' digital competencies, making it especially useful for specific educational contexts.

## 4. Conclusions

The study demonstrates the need to strengthen students' digital competencies, particularly in critical information evaluation, digital security, and content creation. Although students exhibit an intermediate level of competence in everyday technology use and digital communication, these skills do not always translate into strategic academic use of ICT.

The implementation of the Moodle-based online course improved access to educational materials and promoted interaction between teachers and students through collaborative activities and digital resources.

Based on the diagnostic results, the EDIE model was developed with four phases:

- Study: Diagnosis of digital skills and learning needs.
- Development: Creation of interactive content and learning strategies adapted to students.
- Implementation: Deployment of the course in Moodle using multimedia resources, gamification, and collaborative activities.

• Evaluation: Assessment of impact through rubrics, self-evaluations, and Moodle performance metrics.

The EDIE model represents a viable alternative for improving online education through a dynamic and structured approach. The findings support the idea that diagnosing digital competencies is a key element in designing relevant and contextualized online courses.

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