

Application of the ADDIE Model in an Industrial Metrology Training Module

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ABSTRACT: This article presents the application of the ADDIE model for the design of a training module aimed at metrology personnel in a company within the metal-mechanic sector. The study addresses the need to strengthen the technical competencies of the quality department in response to deficiencies in the use of precision instruments, blueprint interpretation, and uncertainty estimation. A quasi-experimental research design with a mixed-methods approach was conducted, applying the ADDIE methodology (Analysis, Design, Development, Implementation, and Evaluation). The module was implemented through the Google Classroom platform and validated through a pilot test with five metrologists, whose results showed an average improvement of 32% in their scores after training. The findings demonstrate that structured metrology training helps enhance operational efficiency, reduce part release times, and strengthen the professional development of technical personnel, thereby consolidating the company's competitiveness.

KEYWORDS- ADDIE model, technical training, job competencies, operational efficiency.

I. INTRODUCTION

Metrology constitutes the foundation of quality in production processes, especially in the metal-mechanic industry, where precision and traceability are essential to ensure compliance with international standards [1][2]. Various studies show that the lack of adequate technical training in the use of measuring instruments directly affects operational efficiency and the reduction of scrap [3]. In the company under study, deficiencies were identified in the interpretation of blueprints and tolerances, as well as gaps in the criteria for uncertainty estimation, which caused delays in part release and increased costs. Competency-based training, according to Tobón [4], enables the development of observable and measurable skills that ensure the

practical application of knowledge. Therefore, the purpose of this study was to design a metrology training module to strengthen the technical competencies of quality personnel, aligned with the principles of continuous improvement and the Official Mexican Standards [5].

II. METHODOLOGY

The methodology employed was based on the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), recognized for its systematic nature and adaptability to organizational contexts [6].

During the analysis phase, the training needs of metrology personnel were diagnosed, identifying deficiencies in the use of precision instruments,

interpretation errors, and the absence of instructional materials. In the design phase, the objectives, content, and course assessments were established, considering the competency criteria defined by Tobón [4].

The development phase included the creation of technical manuals, illustrated guides, and interactive assessments integrated into Google Classroom, a platform that enables the management and monitoring of digital learning [7]. The implementation phase consisted of applying the course to five metrologists who participated in hands-on practice with instruments such as the vernier caliper, micrometer, pin gauges, and roughness tester. Finally, in the evaluation phase, the results of diagnostic and final tests were compared, showing an average improvement of 32% in their technical performance [3].

III. RESULTS AND DISCUSSION

The results obtained confirm the effectiveness of the training module in strengthening the technical competencies of the personnel. The average improvement of 32% in the scores demonstrates greater accuracy in the execution of measurements and a reduction of human errors in dimensional verification [8]. Table 1 presents the comparative results before and after the training, expressed as percentages of improvement.

IV. FIGURES AND TABLES

Table 1
Results of the evaluations before and after the training course.

Metrologo	Antes del curso	Después del curso	Duración (horas)	Mejora (%)
A	66	92	10	35%
B	72	95	12	32%
C	65	88	9	35%
D	70	90	11	29%
E	74	96	10	30%

Note: Author's elaboration based on the results of the Level 1 Metrology training course.

The results are consistent with those reported by [9], who indicate that training in industrial metrology can reduce inspection times by up to 25% and increase the reliability of results. Likewise, the use

of digital platforms enabled full traceability of evaluations and continuous monitoring of individual progress, thereby strengthening the organizational.

V. CONCLUSION

The design of the metrology training module based on the ADDIE model proved to be an effective tool for optimizing technical training in the metal-mechanic sector company. The integration of digital resources such as Google Classroom facilitated accessibility, continuous assessment, and content updating [7]. The results show tangible improvements in operational efficiency, reduction of part release times, and strengthening of the career development plan for technical personnel [2]. In line with [4], competency-based training generates a direct impact on productivity and work quality, contributing to professional development and business sustainability. It is recommended to extend the model to other training levels by incorporating new Metrology 4.0 technologies to consolidate a comprehensive system of continuous training [1].

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