Chapter 19
A Proposal to Assess Student Learning on Math Exams as an Epistemic Community Applied in the Undergraduate Classroom by Modeling STEAM Education

Loreto Andrea Mora Muñoz
https://orcid.org/0009-0004-2259-1478
Instituto Profesional AIEP, Chile

ABSTRACT

This chapter, about an action research carried out in a university training, is presented here as a consequence of a process of innovation in undergraduate learning assessment, implemented in a statistics course in the risk prevention engineering degree. It accounts for university teaching with an assessment approach for learning, and not of learning, which allowed the competency-based teaching approach of the courses to be aligned with the institutional learning assessment guidelines, based on the STEAM education approach. The results raise a proposal to strengthen the formal evaluation processes, by virtue of the epistemic reality of community work among mathematics experts, also allowing to measure, compare, and justify the impact of the pedagogical interventions carried out, to report and project the results of the use of diversified evaluation strategies based on a mixture of modalities and instruments used in another mathematics courses.

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INTRODUCTION

This work is based on the updates applied to the evaluation processes during 2018 at the AIEP Institute (Chile), raising the needs of promoting an evaluation approach rooted in the current conception of authentic evaluation, with educational practices according to evaluation of learning from the characterization of the assesment process based on competencies (Gnahs, 2011; Rasmussen, Northrup, & Colson, 2016). In this implementation, an academic freedom protocol was produced, obtaining concrete evidence of learning and learning experiences is collected from the capabilities of the students themselves (Ahumada, 2003). For this purpose, this application of mixed-type instruments has been requested in the construction of questions when preparing a test for a theoretical evaluation as been math exams.

Faced with this demand from the institution and from the competency-based training of professionals itself, considering not only the successful or unsuccessful results, it has been proposed to carry out an innovation in learning assesment, with contest-type summative tests, in a mixture modality. This intervention was carried out in an "Applied Statistics" course for Risk Prevention Engineering degree, at Viña del Mar Campus. The *mixture modality* is defined in this work as the *mixture between a resolution of the test individually and another collectively*, which can do it in trios or in pairs. The main motivation for implementing this mixture of modality is that the learning evaluated from a conception of 'authentic evaluation' can be an integration of learning by the student himself with the learning of his peers (Condemarín and Medina, 2000), because this aspect is an ' …indispensable requirement of the process of construction and communication of meanings' (Condemarín and Medina, 2000). Yet, about STEAM basis, Bush & Cook (2019) said, with regard to the mathematics practices, students can had to make sense of learning situations based in problems and persevere in solving them, as well as construct viable arguments and critique the reasoning of others, and attend to precision (Bush & Cook, 2019).

In this context, the application of statistical methods and analyzes to review and to measure the impact of this innovative intervention in the assesment process. As a change of strategies for the purposes of improving the quality of teaching, this condition is presented not only as a criterion to review the effectiveness of changes made as an institutional commitment but also as a criterion of internal coherence, or integrity of the teaching model of the mathematics subject itself. Given that ultimately what is done is to apply statistics to provide robustness and systematization to the interpretation of the results about the innovation proposal, within the framework of a course that aims to promote and consolidate statistical analysis skills in university training (Parnell, 2023; Durak & Cankaya, 2023). An "Applied Statistics" is precisely what consolidates the professionalism of an analysis for every STEM profesional career and every STEAM model for training, given that