Application and Evaluation of a Technique for Reducing the Dropout Rates in Early Tutoring

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ABSTRACT: In the current university environment, national accreditations within the field of engineering serve as a continuous improvement tool for educational programs. These accreditations contribute to increased completion rates and a reduction in school dropout rates, underscoring the utility of tutoring throughout the educational process. High school students adapting to the new pace of university work often undergo significant changes in their school performance habits. Therefore, the initial group tutoring sessions aim to address issues and undertake specific activities that help students learn about their attending university, its organization and work areas, the program they are enrolled in, and the need for psychological support and specialized counseling, among other elements. This work presents an analysis and evaluation of the application of a technique designed to reduce dropout rates in Tutoring 1 for first-semester engineering students.

Keywords: Tutoring, failure rate, Accreditations.

ABSTRAK: Di lingkungan universitas saat ini, akreditasi nasional dalam bidang rekayasa berfungsi sebagai alat peningkatan terus-menerus untuk program pendidikan. Akreditasi ini berkontribusi pada peningkatan tingkat kelulusan dan pengurangan tingkat putus sekolah, menekankan pentingnya bimbingan selama proses pendidikan. Siswa SMA yang beradaptasi dengan kecepatan kerja universitas sering mengalami perubahan signifikan dalam kebiasaan kinerja sekolah mereka. Oleh karena itu, sesi bimbingan kelompok awal bertujuan untuk mengatasi masalah dan melakukan aktivitas khusus yang membantu siswa mempelajari tentang universitas yang mereka hadiri, organisasi dan area kerjanya, program yang mereka ikuti, dan kebutuhan akan dukungan psikologis dan konseling khusus, antara lain. Penelitian ini menyajikan analisis dan evaluasi dari penerapan teknik yang dirancang untuk mengurangi tingkat putus sekolah dalam Bimbingan 1 bagi mahasiswa teknik semester pertama.

Kata Kunci: Bimbingan, tingkat kegagalan, Akreditasi.

INTRODUCTION

The university tutoring process is oriented toward improving professional training processes through student-centered services. Numerous national organizations are responsible for evaluating the quality of educational programs as part of this continuous improvement process. One aspect of this evaluation process involves monitoring tutoring throughout students' academic training. Badillo (2007) presents conclusions drawn from a course offered by the National Association of Universities and Institutions of Higher Education (ANUIES) at six

national universities. The course's objective is to showcase the ideal organization, planning, evaluation, and operation of a tutoring system.

In 2015, Vasquez et al. (2015) conducted a quantitative study involving engineering students at the Polytechnic of Sinaloa. The study involved the administration of a questionnaire to evaluate the impact of tutoring on students' academic progress. The findings allowed identifying areas where tutors would benefit from specialized training, as well as recognizing the students' need to enhance their study skills and strategies for addressing learning disabilities. Permanent conferences were subsequently employed for this purpose.

Gómez et al. (2017) conducted an observational and descriptive study involving the administration of a survey to 818 biological chemistry students at the Facultad de Estudios Superiores Zaragoza (Zaragoza College of Higher Studies) of the UNAM. The study was designed to identify areas for improvement in their tutoring process.

In the same year, at the Autonomous University of the State of Mexico (UAEM), Rodriguez (2017) generated a diagnostic based on tutor reports for 2016 graduates. This diagnostic was intended to identify problems in order to restructure the tutoring program and its web platform. However, it's important to note that these changes had not been implemented or evaluated at the time of the article's publication.

The following year, Astudillo and Chévez (2018) presented the results of a study conducted on the tutoring program at the Autonomous University of Chiapas. This study found that students and tutors considered the program beneficial in helping students navigate the Computer Systems degree curriculum. The study involved interviews conducted at three stages of students' academic training: at the beginning, in the mid-term, and at the end of the program. Additionally, it identified students' economic situations as a contributing factor to school dropout rates.

Meanwhile, Arreola et al. (2019) administered 227 surveys to high school students in the city of Celaya, Guanajuato, Mexico, to identify the reasons for school failure and dropout rates, together with the effects of tutoring. The study concluded that high failure rates were due to a lack of student preparation before taking exams, with mathematics and exact sciences showing the highest incidence. Students expressed that tutoring follow-up significantly improved their academic performance, leading to program restructuring that emphasized tutors investing more time on activities focused on continuous improvement for this purpose.

In a similar vein, Sánchez et al. (2020) designed questionnaires that were administered to tutors at the Universidad Autónoma del Carmen (Autonomous University of Carmen) to identify indicators that would allow restructuring the institution's course monitoring program. The objective was to promptly recognize academic problems in students that affect completion rates in educational programs.

Likewise, Bautista et al. (2022) presented the operation of the tutoring program at the Universidad Autónoma de San Luis Potosí, Tamazunchale campus, highlighting areas of opportunity during the 2020-2021 school year, marked by the

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SARS-COV2 pandemic period. During this time, the majority of students lacked access to reliable internet services, with tutors covering the costs through the use of platforms such as Zoom, Teams, and WhatsApp. This revealed the need for the development of computer software to automate this process.

For this research, a tutoring group was analyzed during the August-December 2022 semester, with the failure rate serving as the index for considering the implementation of a group interaction methodology.

METHODOLOGY

ITSON's Electrical and Electronics Department includes the following majors: Electromechanical Engineering, Electronics Engineering, Manufacturing Engineering, Mechatronics Engineering, and Industrial and Systems Engineering. These university programs continually undergo restructuring and receive support from external engineering quality accrediting agencies. For instance, the Electromechanics, Mechatronics, and Electronics majors utilize CACEI for international accreditation, and the tutoring program is one of its evaluation requirements. During the 2016 restructuring process, Tutoring 1 and Tutoring 2 were officially introduced as part of the institutional framework. While these programs do not contribute to academic credits in the syllabus, they are crucial for the degree process. Tutoring 1 utilizes the SIGA web platform, where activities are organized by system. Students receive accreditation upon completing at least 11 of the 14 activities on the platform on the scheduled dates. However, approval rates may vary depending on the program facilitator.

For the case study, the same instructor has maintained a performance record since commencing Tutoring 1 in the August-December 2020 semester. A high failure rate was observed during this period due to challenges in motivating first-semester students to complete platform activities promptly and accurately. Therefore, coffee and cookies were introduced during the corresponding period in the August-December 2022 semester. The analytical procedure for Tutoring 1 is shown in Figure 1.
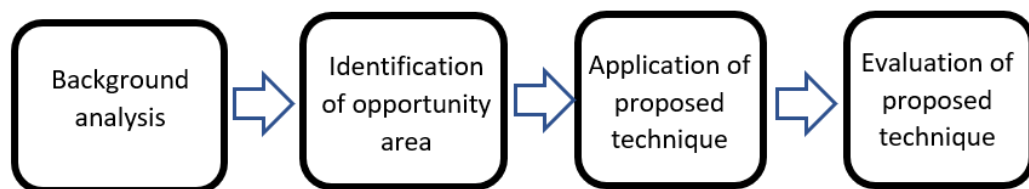

Figure 1. Analytical method for Tutoring 1

Figure 1 depicts the different stages of analysis described below:

Background analysis: The Tutoring 1 sessions, utilizing the ITSON-owned SIGA platform (https://apps9.itson.edu.mx/SIGA/Index.aspx), were conducted by the same tutor with groups of students in the areas of Mechatronics, Electronics, Electromechanics, and Manufacturing. Pass rates for different class periods were recorded from 2020 to 2022. The sessions

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occurred on Fridays from 8:00 to 9:00 am in the Tutoring building of the Náinari unit in Ciudad Obregón.

Identification of opportunity area: Analysis of the historical data revealed a high failure rate, signifying an opportunity to propose different techniques to improve the group's pass rate.

Application of the proposed technique: In response to the high failure rate and the Friday schedule from 8:00 to 9:00 am, the introduction of a snack, consisting of coffee and cookies, was proposed for every session of the August-December 2022 semester. This was aimed at improving students' confidence in the facilitator and fostering group integration.

Evaluation of the proposed technique: The number and percentage of students who successfully completed the Tutoring 1 course will be computed at the conclusion of the August-December 2022 semester and contrasted with the data from 2020 to 2021 to evaluate the resulting impact. The course evaluation will also include student observations.

The section below presents the results obtained after applying the above procedure.

RESULT AND DISCUSSION

Figure 1 shows the analytical stages for the first tutoring talk given at ITSON. The numerical results for this analysis are presented below.

Background analysis: A historical study was carried out on the course, considering the corresponding pass and fail rates. This information is shown in Table 1.

Table 1. Historical Data on Tutoring 1 Failure Rates

Semester	Students	Failed	Failure %
August-December 2020	22	10	45.5
January-May 2021	15	9	60.0
August-December 2021	20	9	45.0
January-May 2022	15	8	53.3

Table 1 shows a historical average failure rate of 50.9%, using the same scheduled activities and teaching techniques. Therefore, the behavior pattern shown in Figure 2 is graphically generated from the data presented in Table 1.
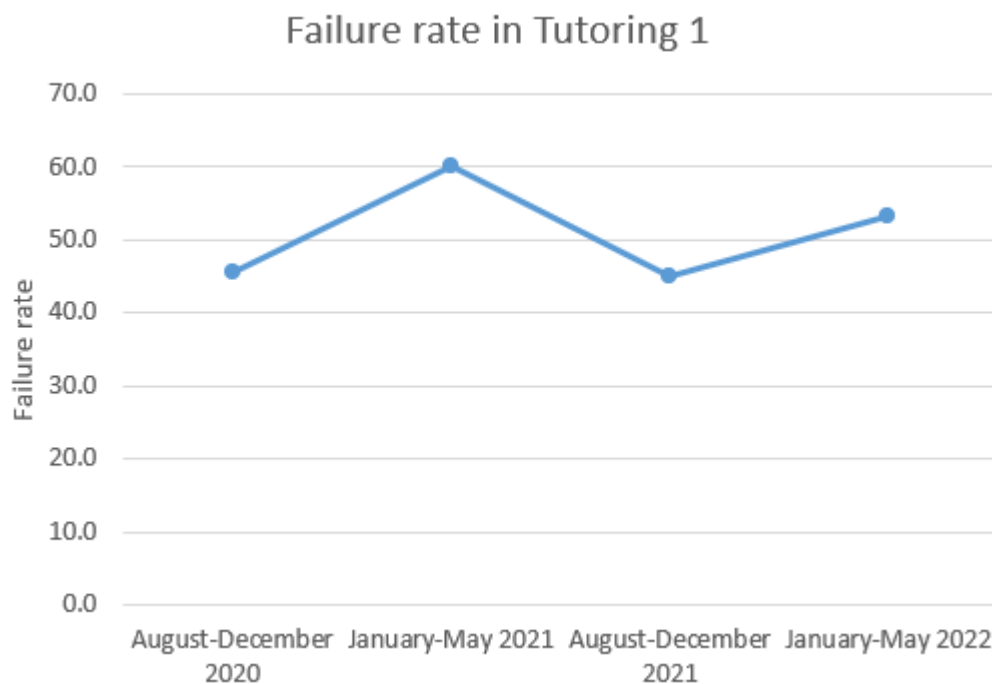
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Figure 2. Failure rate behavior pattern from August-December 2020 to January-May 2022

Figure 2 shows a near-constant behavior for the four semesters presented, indicating stability. The high failure rate in Tutoring 1 prevents students from progressing to Tutoring 2 and has a negative impact on the corresponding course when students are close to completing their degree, as it is an institutional requirement for graduation.

Identification of opportunity area: Table 1 reveals an average failure rate of 50.9% based on historical data, which the course instructor deems high. Consequently, the study proposes implementing different techniques to motivate students to successfully complete the course. A group integration technique is implemented in this study.

Application of the proposed technique: During the August-December 2022 semester, the tutoring facilitator brought coffee and cookies to class to share with the students. This was done with the aim of improving students' confidence in the facilitator and fostering their integration into the group. The materials used are shown in Figures 3 and 4.
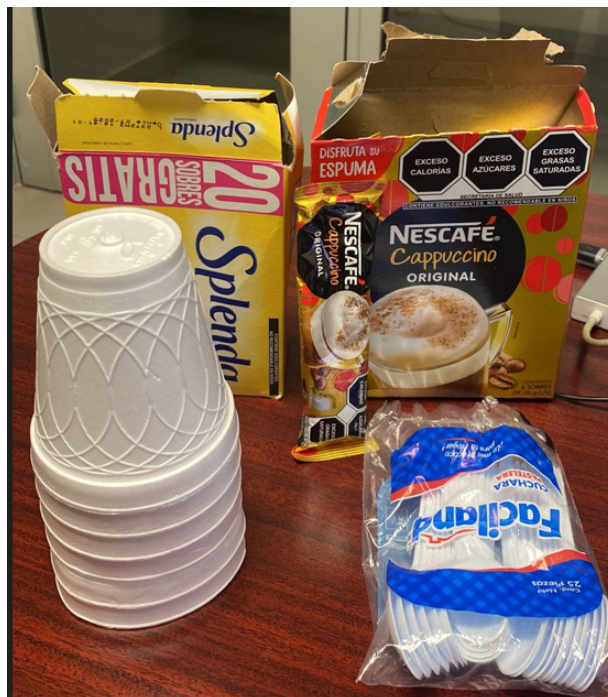
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Figure 3. Instant coffee with condiments

Figure 3 shows the condiments used for the instant coffee provided as well as the pastries. Splenda was used as a sweetener based on a verbal group survey.

Figure 4. Commercial pastries used in the applied technique

Therefore, the approximate cost per week is estimated from Figures 3 and 4, as shown in Table 2 below.

Table 2. Elements cost

Material	Cost (MxN/week)
Coffee	112
Condiments	25
Cookies	120
Total	257

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The table above illustrates that approximately 257.00 MXN (approximately 14.86 dlls) was spent per week, representing an investment of 3,855.00 MXN (222.96 dlls) over the 15 weeks of the course. This investment was covered by the tutor.

Evaluation of the proposed technique: The impact of the proposed technique on failure rates was evaluated at the end of the August-December 2022 semester. The results obtained are presented in Table 3.

Table 3. Impact failure with methology proposed

Semester	Students	Failed	Failure %
August-December 2022	17	4	23.5

Considering an average failure rate of 50.9% in Table 2 and of 23.5% in Table 3, it is evident **that** there was a positive impact since the pass rate increased to 76.5%.

CONCLUSION

ITSON's Electrical and Electronics Department encompasses fields such as Electromechanical Engineering, Electronics Engineering, Industrial and Systems Engineering, and Manufacturing Engineering. The first field is subject to evaluation and international accreditation by the CACEI, which includes an assessment of the tutoring follow-up provided during students' academic training. Currently, Tutoring 1 and Tutoring 2 courses are offered, with the former utilizing the institutional SIGA system designed for this purpose. However, during the August-December 2020 to January-May 2021 semesters, a particular course witnessed a high failure rate primarily due to students not completing activities within the SIGA system, which have specific start and end dates. In the August-December 2022 semester, the provision of coffee and pastries was introduced as a method to measure their impact on student failure rates. Historically, the same subject, taught by the same instructor, exhibited an average failure rate of 50.9%. However, in the August-December semester when the proposed technique was implemented, the failure rate dropped to 23.5%, indicating a positive impact on the parameter under study.

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