

REDUCING ABSENTEEISM IN THE CLASSROOM: TWO CASE EXAMPLES

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ABSTRACT

One of the most challenging situations in nowadays education at all levels is attracting and retaining the attention and motivation of the students. This situation has been deeply aggravated by the COVID situation, where the possibility of on-line lessons has led to new typologies of remote approaches. In this work, developed at the Barcelona School of Telecommunications Engineering (ETSETB) of the Universitat Politècnica de Catalunya (UPC), we describe the use of different methodologies to increase the student's attendance to the classes. We evaluate two different case scenarios. Case 1 is the change of teaching strategy in the Sustainability & Ethics (S&E) seminars in project-based courses of bachelor's degrees. And Case 2, is a core subject master's degree in Telecommunications Engineering. Case 1 scenario consists of introducing S&E competences in a bachelor-level Product Development Project course where students work in teams. These competences are taught through master-class-style led seminars. The seminars show a high absenteeism level, as most of the teams decided to send just one representative of the team to attend to them. The solution proposed to Case 1 scenario consists on reducing the master-class exposition time and substituting it by a hands-on workshop on how to develop the S&E report on the specific project topic of each team. This has increased the attendance to class, from 20% to 85% approximately in this track. The motivation has been also noticeably increased. Case 2 scenario analyses the subject Electronics Instrumentation and Optoelectronics (EIO). The subject has 80% contents of theoretical knowledge. The attendance to the theory lessons during the last few years was very low, especially after the COVID situation, roughly estimated to be a 35%, and the evaluation results showed that the final exam scores had decreased dramatically. With this starting point, the theory lessons have been changed by reducing the master-class part, including short individual open-book exams during the lessons and a final challenge-based (CB) activity related to the theory contents. The class attendance has increased from 35% to 95% and the motivation of the students attending to the class has been noticeably increased as well.

KEYWORDS

Absenteeism, Attendance, Motivation, Engagement, CDIO Standards 3, 4, 5, 7, 8.

INTRODUCTION

It is well known that absenteeism has negative impact on academic performance in higher education. It is also known that students with low performance are worse affected by absenteeism than the ones with high performance (Pani, P.K., 2016). It is a behavior that contradicts the basic premises of the EHEA regarding the students' role and drives to an inefficiency of the use of public resources. According to Méndez-Suárez (2021), absenteeism effect on the academic performance of university students decreases as students progress on their degree. It has the greatest impact on academic performance of first and second-year undergraduate students, a moderate effect on the one of third-year and fourth-year students, and a negligible effect on academic achievement of fifth-year students.

Several authors have performed multifactorial studies trying to identify the most important reasons that influence absenteeism in university classrooms from the students' perspective and all of them agree on the complexity of the topic and on that there is no a single reason for it nor a single way of facing it. Triadó-Ivern (2020) identifies five dimensions or reasons for absenteeism: students' own planning, teaching methodology, learning methodology, course characteristics, and availability of external sources. They also state that students' reasons that affect absenteeism differ with regard to their year and degree of study: in the first year, students mainly attribute absenteeism to external sources such as non-obligatory attendance. The second-year students are more focused on teaching methodology and on their own planning and, in the latter years, students put more accent on their learning methodologies.

In another study (Menendez Alvarez-Hevia, D., 2021) found that attendance is a situated decision that can be articulated in relation to two sets of factors. The first set refers to university imperatives, and which relate to discourses of performativity and accountability. The second set relates to the complexities of students' lives, and there is a tradeoff among them. S. Bakrania (2018) also describes this need to balance among opposing factors, such as study, family life, and financial commitments. The authors also identify the availability of recorded lectures as a determining factor for absenteeism.

López-Bonilla (2015) identifies seven determining factors of absenteeism: efficiency, teaching style, academic interest, teaching contents and format, classmates' influence and fears, imponderables and convenience, being 'Teaching Style' the factor which obtained the highest average score. In another paper R.J. Longhurst (1999) studies up to fifteen different types of reasons for student absenteeism. In partial contradiction with the previous authors, factors related to courses and teachers were found to be the least significant and the students' general degree of commitment to education was found to be the most important factor related to levels of absenteeism.

As expected, COVID-19 had a strong influence on both online absenteeism and post-COVID face-to-face absenteeism as stated by N. Jaftha (2022) in a literature review on the topic. The authors also state the complex and multifactorial nature of the phenomenon and that addressing absenteeism requires a combination of strategies and involves various actions and stakeholders. They conclude that evidence shows that a strong support system that shows interest in individual students' life and behavior can have a significant effect on students' attendance.

Socio-cultural factors can also play a role to determine which factors are more significant. In a study performed in India among Engineering students, I.S.P. James (2022) found that Distractions and Students' Health Conditions were more relevant than Teachers' Attitude and other factors, as regulatory conditions about attendance were stricter than in other countries.

About finding possible solutions, there is consensus in the complexity of this task. There is not a single way of facing the problem but all papers mention the need of increasing the motivation and engagement of students although not all of them put these factors at the forefront. The CDIO framework should be a good scenario to promote them and therefore, to reduce absenteeism. J. Early (2010) describes how an introductory module, Introduction to Aerospace Engineering, designed through the CDIO paradigm and using an active/interactive approach, improved the attendance up to virtually 100%, overcoming the absenteeism and lack of motivation which was endemic in Level 1 engineering classes. The students reported enjoying the class, and linked this to their attendance. Dewulf (2008) reported that team-dynamics in project-based courses according to the CDIO design-implement model (Standard 5) helps to reduce absenteeism. McCartan (2010) also verified that including active teaching methods improved results and reduced absenteeism in 1st year mathematics courses in engineering bachelor and Rodríguez-Rivero (2020) pointed out the importance of finding the balance between stress and satisfaction in CDIO experiences. They highlighted the importance of feeling valued and cared for by the ecosystem integrated by supervisors and colleagues to reach their satisfaction and about the value of doing exciting projects in a cooperative environment.

At the Barcelona School of Telecommunications Engineering (ETSETB) of the UPC, we are applying different methodologies to increase the student's attendance to the classes. In this work we evaluate two different case scenarios. The first one (Case 1) is the change of teaching strategy in the seminars of Sustainability & Ethics (S&E) in the project-based courses, which were already designed according to the CDIO standards. The other scenario (Case 2), is the change of methodology in a core subject with high theoretical content in the master's degree in Telecommunications Engineering, which had a classical lecture-problems-exam structure.

PROBLEM DEFINITION

In order to better analyze the implementation of different CDIO tools, it was decided to address two different subjects that are, in nature, very different. They are located in different degrees, at different educational levels and with very different technical and duration contents. This will define two scenarios, that will cover more contents and context areas. In both cases, a historical comparison of the subject or seminar was conducted, but there was no parallel implementation with different groups and methodologies to facilitate the comparison. In this section, the initial situation of the two case scenarios is shown.

Case 1 scenario: Bachelor's level seminar into a project-based course.

Case 1 scenario consists of introducing S&E competences in a bachelor-level Product Development Project (PDP) course. The PDP course addresses different technical projects that have to be solved by teams of 8 to 12 students each. The subject has 12 ECTS spread into 6 hours per week of hands-on design-build activities and 2 hours per week of seminars, plus autonomous work. Contents and methods about innovation and entrepreneurship, project management, intellectual property, critical and systems thinking and S&E tracks are taught in

the seminar sessions. The subject is located on the seventh semester (fourth year) of the four-year bachelor's degree in Electronic Telecommunication Engineering.

In this case scenario, only the S&E seminar is analyzed, consisting in two sessions of expository class of two-hours each. The contents are evaluated by developing a report and a presentation of the S&E analysis of the technical PDP project of each team. The first session was about the sustainability aspects and the second one about the ethical aspects. The sessions were mostly expository (master-led cl) but using frequent interactions through tools like Kahoot. These Sustainability Analysis seminar was introduced 6 years ago, and the Ethical Analysis seminar 2 years ago.

Attendance to the design-build lab sessions is virtually 100%. The teams' self-management does not allow absences that could delay the project milestones except in few and justified cases. Students are, however, a lot more tolerant with the attendance to the seminars as they do not perceive their usefulness for the project results. Most of the teams decide to send just one or two representatives to attend to the seminars in order to be able to fulfill the corresponding part in the Final Report. As a result, the attendance to the seminars was typically around 20% (See Table 1). Given the growing relevance that our institution is giving to the Sustainability and Ethics topic, two years ago it was decided to announce that the attendance to these sessions was mandatory, and attendance lists were distributed in each session. This led to a variable increase in the assistance that ranged from 51% up to 80%, but this did not mean that all students were attentive in the session, and the attendance to the other seminars was as low as usual. This last year, in order to measure the real interest of the students on the new hands-on methodology, the attendance was not mandatory, and the students came willingly and more committed to the task, increasing the attendance to an 85%.

Table 1. Case 1 scenario, showing the historical bachelor level seminar attendance.

Year-semester	Attendance (%)
< 21-22	20
21-22 (1)	29
21-22 (2)	21
22-23 (1)	51
22-23 (2)	80
23-24 (1)	85

The numbers in Table 1, as well as students' questioning and final results evaluated by different professors, draw the following conclusions:

- The average attendance is low (20% to 29%) on the first years.
- Asking the students, most of them refer that the expository description of the S&E contents in these seminars do not seem to add significant value compared to reading the material by themselves.
- Usually, only one person per group will attend in person, not sharing the information with the rest, that do not find necessary to learn the seminar part.
- The students do not have sufficient feedback till it is too late, so the learning process is not fully achieved.
- The analysis of the final presentations and reports shows that the students do not fully understand and therefore they do not really value the content of the work to be done.

Case 2 scenario: Master's level core subject.

Case 2 scenario analyses a core subject of the two-year master's degree in Telecommunications Engineering: Electronics Instrumentation and Optoelectronics (EIO). This is a 5 ECTS subject with 3 hours per week. The subject has 80% contents of theoretical knowledge. The master has particularities that might have influenced the attendance pattern:

- The 120 ECTS, two-years Master is mandatory for the Telecommunication Engineers which would like to have a national professional accreditation. This leads to a situation in which the content of the master has to be highly multidisciplinary. The contents of the subjects are specified by the Spanish Ministry of Education. Since 2019, the students that do not need or do not want this accreditation can choose more specialized and shorter masters (60 ECTS) This fact has modified the number and the origin of the students that enroll for the two-year master.
- The incoming students have different origins, thus having different background and motivation.

The subject has been taught since year 2013. The methodological approach all these years has been mainly expository master-led class, usually in combination with paused method (Fa'eza Adnan, 2019). As for the evaluation, the final score has always a 20% of practical work in the laboratory, developed in groups of two people. The other 80%, commonly taught in the expository-led-class approach, has faced different evaluation methods. In all of them, a Final Exam has kept a weight of 60% of the total subject score, whereas the remaining 20% has been assigned to the following assessment formats:

- A midterm exam developed individually in class.
- Short Quizzes developed individually in class.
- Exercises developed individually as homework.
- Individual research work developed individually as homework.

The midterm exams, final exams and quizzes have been also held in different formats: multiple choice and-or problems and with open-book or not open-book formats. No significant differences due to the format of the evaluation have been found. However, when the midterm exam or the quizzes were skipped, the final exam score used to be lower. Table 2 shows the historical information about the subject, including the methodological approaches, the assessment methods, the attendance and the average of the final score (from 0 to 10). The last file of Table 2 shows the results of the new methodological approach. In all cases, the attendance has not been thoroughly monitored, but it is a rough estimation.

Table2: Master's core subject historical information.

Year-semester	Methodological approach	Assessment Method	# Students	Attendance (%)	Average Final subject score
13-14 (1)	Expository-Paused	Exercises and Final Exam	6	90	5.7
14-15 (1)	Expository - Paused	MidTerm Exam and Final exam	24	70	7.9
15-16 (1)	Expository - Paused	Quizzes and Final exam	29	70	7.5

16-17 (1)	Expository- Paused	MidTerm Exam and Final exam	36	60	7.1
16-17 (2)	Expository- Paused	MidTerm Exam and Final exam	33	60	6.7
17-18 (1)	Expository- Paused	MidTerm Exam and Final exam	38	50	7
17-18 (2)	Expository- Paused	MidTerm Exam and Final exam	36	50	6.9
18-19 (1)	Expository- Paused	Exercises and Final Exam	31	50	7.4
18-19 (2)	Expository- Paused	Exercises and Final Exam	41	50	7
19-20 (1)	Expository- Paused	Exercises and Final Exam	26	50	7.0
19-20 (2)	Expository- sync. and async. videos	Exercises and Final Exam	18	COVID	6.7
20-21 (1)	Expository	Exercises and Final Exam	18	40	6.5
20-21 (2)	Expository	Exercises and Final Exam	19	40	5.9
21-22 (1)	Expository	Exercises and Final Exam	18	35	6.7
21-22 (2)	Expository	Research work and Final Exam	21	35	5.9
22-23 (1)	Expository	Research work and Final Exam	30	35	6
22-23 (2)	Expository	Research work and Final Exam	19	35	5.3
23-24 (1)	Expository- CB	Quizzes and CB and Final Exam	31	95	8.4

THE PROPOSED METHODOLOGICAL APPROACH

In this section, the proposed solution for the problems and limitations identified in the previous section is described. In both cases, the methodological approach is rooted in the need to engage students in their learning process to decrease absenteeism. Building on this foundation, two distinct implementations will be utilized, each tailored to the specific contents and context of the two defined scenarios. In both cases, the students were told that a different methodology would be used with the aim of having a better learning experience, explaining the limitations of the previous one and justifying the design of the new one.

Case 1 scenario: Bachelor's level seminar into a project-based course.

The analysis of the historical situation of the S&E seminar in the bachelor's level subject, led to the main conclusions described in the previous section. Summarizing, the students' attendance was very low and only a small part of each group developed the necessary work demanded on the S&E presentation and report. This last semester 23-24 (1), the methodological approach has been focused in substituting the two expository sessions by:

- In the first S&E two hours seminar session:
 - One hour of expository class, including active approximations to the audiences using Mentimeter.
 - One hour of hands-on work by teams, understanding the S&E report with the specific case of each team's project.
- Second S&E two hours session:
 - Developing the final S&E report with the specific case of each team's project.
 - Developing the final S&E presentation part, following an elevator pitch presentation orientation.
- Evaluation remains the same: S&E report and presentation.

This approach has led to the following conclusions:

- The absenteeism has been reduced to approximately 15% (85% attendance).
- Many of the students of the group have actively participated in the project and thus in the learning process.
- There is sufficient and timely feedback to the students about the report and presentation contents. Again, they participate and are more active in the learning process.
- The motivation of the students in the hands-on learning sessions was unexpectedly high.

Case 2 scenario: Master's level core subject.

Trying to diminish the subject drawbacks, this last year (2023-2024 (1), Fall term), a new methodological approach in addition to a new evaluation process have been implemented. Mainly, the theory lessons have been changed by reducing the expository part, including short individual exams during the lesson, and a challenge-based (CB) activity. Alternatively, the students may choose to score the 80 % on the final exam, if they decide not to attend to the class. The description of the novel path learning methods and evaluation processes introduced in the subject are listed below:

- In terms of the learning methodology:
 - The theoretical classes will be divided into eight master-class sessions and five CB work sessions.
 - The reduction of the expository sessions has not significantly reduced the contents. Some parts have been adapted for students to do the work at home.
 - The master-class sessions will include up to two short individual exams (quizzes).
 - The CB project is based on finding a technical solution, using the technologies described in the theoretical lessons, to one of the targets of a Sustainable Development Goal (SDG) goals. The SGD goal has been chosen by the professor, in this case is SGD 6: Clean water and sanitation.
 - The CB project is developed in groups of up to four people.
 - The CB project follows partially the design thinking methodologies.
 - The CB sessions have been daily guided and monitored by the teacher, helping to reach different milestones and evaluating the project process achievements.

- In terms of the evaluation methods of the theoretical part of the subject, which weights a maximum of 80%, the students can choose between two options:
 - Performing the individual short exams during the theory lessons (30%) and developing the CB project (20%) with a 30% of a final exam.
 - The whole theoretical score (80%) can be assessed with a final exam. So, in this case, they can decide not to attend to the class.

Examples of the CB projects developed by the students are listed below:

- Designing an Automated Water Sensing System for Remote Monitoring of Water Parameters in Venezuela.
- RAMAN spectroscopy and indirect drinking water treatment for groundwater sources.
- Microalgae detection using spectrophotometry.
- Measurement of salinity at Llobregat river by using Laser Induced Breakdown Spectroscopy (LIBS).
- Fluorescence Spectroscopy to detect dissolved organic matter (DOM).
- Hyperspectral imaging solution for microplastic detection in residual waters.
- Microplastics annihilation through laser targeting.
- Real-Time monitoring of fluorescent organic dyes at river pollution sources.

Some of the results found with this methodology were somehow not completely as expected:

- Attendance increased even in the expository classes (70%), reaching a 100% attendance in most of the CB project sessions. On average, the attendance was 95%.
- All the students decided to choose the continuous evaluation alternative including the short exams and the CB project work.
- The motivation of the students in the CB project sessions was unexpectedly high.
- The participation in the theoretical classes was, however, still low.
- First implementation of this method shows an increase in the average subject score, and all the students passed the subject.

DISCUSSION

In this work we have shown a methodological analysis of the absenteeism in two different subjects. One of them consists of a two-session Sustainability and Ethics seminar in a PDP subject at a bachelor level. The other is a core subject at a master's level. The bachelor's seminar had a low historical average attendance, of 20%. The master's core subject has experienced a monotonal decreasing attendance starting in an 70% and reaching a constant value of 35%. Although the reasons for the absenteeism in both cases may differ, they have in common the lack of motivation for the methodological learning approach: the students seem to believe that they can manage to acquire the knowledge without attending to the class or, even worse, that they do not need that knowledge to perform good results. This has been proven to be a mistake, as most of them get lower scores when not attending to the class sessions. The evaluation methods may also have an impact, but they are not the only driving force, as demonstrated in the Table 2 data, where different evaluation processes have been tested without finding a clear correlation with the attendance levels nor with a variation in the final average score. In the bachelor's level seminar, the approach of substituting the expository explanation by a hands-on work on the specific contents, has clearly increased not only the attendance to the lessons (from 20% to 85%) but also the interest and necessary feedback from the professors to the students in the learning process. The method will be transferred gradually to the other seminars, which are taught by other lecturers, gradually. In the master's

core subject, the inclusion of a CB project directly related to the theory contents has significantly increased the attendance to class from 35% up to 95%. The modification on the evaluation process, concentrating the short exams at the beginning has also increased the concentration of the students on the theory lessons, although there is still a long path to overcome the initial demotivation for the subject contents, and the quite steep learning curve of these theoretical contents. This may highlight one of the most challenging limitations of these methods: overcoming the well-established unidirectional teaching approaches, where the student is accustomed to being a passive receiver of the most difficult theoretical knowledge. Future work will be focused on introducing some modifications of the theoretical part so as to guide the learning process with introducing small milestones, that will be continuously evaluated. In attempting to extend these methodologies to other subjects, this work has demonstrated the importance of involving students in their learning process to decrease absenteeism levels. Although it is necessary to adjust the methodology to the context and the contents of each particular subject, there may be some generalizations in the approach: (i) Students must feel the necessity of attending class, not only due to assessment pressure. (ii) Continuous and guided work stresses the importance of attending to class; and (iii) Challenge-based approaches, such as real-world problem contexts, regardless of the subject's content, help increase the involvement and motivation of students in their learning process.

CONCLUSIONS

This work has faced the problem of absenteeism in two different case scenarios, one a two-session bachelor's level seminar in a Product Development Project subject, and the other a master core subject. Both of them have in common that they start with very low attendance levels (20% and 35%, respectively). Introducing experiential activities related with the project topic in the first case and a SDG-based challenge in the second one, with guided feedback from the supervisors has unexpectedly increased the attendance levels to 85% and 95%, approximately. Specifically in the master core subject, the introduction of a Challenge Based project directly related to the contents of the subject has been very well received by the students. And although there is still work to be done to get them to keep up with the more difficult theoretical parts of the subject, the students are clearly more engaged in the learning process, especially in the Challenge Based project, in which some of them are particularly committed.

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