

# FLIPPED LEARNING IN CORPORATE CONTEXTS: A CASE STUDY

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## ABSTRACT

Flipped Learning is an active teaching methodology that consists of reversing learning times and spaces. It entails that the teacher prepares and provides in advance the content to be studied so that, during the lecture, there is more time to do exercises and practice the concepts learned during self-study. In this process, the feedback that the teacher provides to students on their level of understanding, as well as the learning outcomes and observations that students, in turn, provide to the teacher, play a key role to adapt the learning path to the learners' actual needs. The paper aims to present a first case study of the application of Flipped Learning in the corporate setting. The case study involved a small company that is one of the partners in the national project L.I.F.T. to measure the effectiveness of the approach and learner satisfaction.

## KEYWORDS

Flipped Learning, Professional Training, Corporate Learning

## 1. INTRODUCTION

Choosing Flipped Learning in corporate environments can be successful since this model increases the interest of the students by stimulating their motivation and increasing their engagement, involvement, and interaction (Zainuddin & Halili, 2016).

Although most of the experimental evidence of the application of Flipped Learning approach has been applied in school and academic contexts, its features highlight numerous advantages that might be interesting when applied to professional content due to its flexibility since it can be adapted to learners and different domain contexts (Nederveld and Berge, 2015).

Flipped Learning (FL) approach can be helpful in corporate training since it aids to advance problem-solving skills, which are always basic requisites in business scenarios (Karabulut-Ilgü et al., 2018). In addition, the use of self-learning in FL requires less change in the work organization than those required in the traditional classroom. FL allows for maximizing time in the classroom by focusing on specific topics or real case studies (Nel, 2017, Zainuddin et al., 2019).

However, some critical issues in the use of FL arise such as the low motivation of some students, who need the teacher's guidance, and the efforts required to produce effective teaching material. Moreover, students in FL must be well motivated to learn independently and to obtain all the benefits from this approach (Låg and Sæle, 2019). The lack of a teacher in the preparatory phase of Flipped Learning and self-paced courses can sometimes lead to confusion and increase the workload (Dimauro et al., 2019) in less motivated students or novice students, reducing the effectiveness of the method.

The other most critical issues concern the greater workload of the teacher. In FL the didactic content should be designed to be clear and helpful for learners without the teacher's guidance, it is harder than preparing slides to be used during the lectures. Also organizing and preparing case studies to be used during class time could be difficult since they have to exploit what learners have acquired during the self-learning step (Zainuddin, 2016, Karabulut-Ilgü et al., 2018). This aspect, however, in professional contexts, does not appear to be a critical issue but rather a strength, since vocational training, by its nature, requires the practical application to real cases that enable students to apply the knowledge and skills acquired.

The present work aims to measure the effectiveness of the introduction of Flipped Learning in the corporate setting in the national project L.I.F.T. Downstream of the study of the state of the art and the state of practice (Rossano et al., 2022), it could be stated that in the context of the L.I.F.T. project the Flipped Learning approach could be effective. To measure its effectiveness a first case study has been designed and implemented with a small sample of learners who need to acquire some basic IT skills.

## **2. THE L.I.F.T CASE STUDY**

The project L.I.F.T. (Learning Intelligent Factory based on information Technologies) aims at supporting medium and small companies in the digital transformation process. In particular, the final aim of the Technology Transfer Service is to support the design and development of an activity plan to transfer the knowledge and skills necessary to use digital services. To this end, an experiment has been planned to compare the delivery of a course using the traditional approach and flipped learning. Two groups of employees of a company, one of the partners in the LIFT project, have been involved in a training intervention aimed at consolidating digital skills. The aim is to measure any differences in the effectiveness of the two approaches, but also to check whether the new model is appreciated by students and teachers and to investigate the difficulties encountered in a real context.

### **2.1 Corporate Training Needs**

A training needs analysis was conducted by interview with the company contact person, who indicated the need to conduct a course on using a spreadsheet environment (MS Excel).

The company highlighted the knowledge to be acquired by workers:

- Design, create and manage complex files containing multiple worksheets, linking the data within them, and making use of available formatting tools.
- In the presence of complex and articulated data, evaluate all available types of graphs and diagrams, and generate those best suited to the goal, formatting them. If they are not available, know how to generate custom graphs and/or diagrams.
- Save processed documents, varying possible destinations and file types as required by the context of use.

Thus the following macro-objectives were defined:

- **Basic information:** to interact with the interface of a spreadsheet software, selecting and using common tools. Create a workbook, including many spreadsheets, and enter different types of data into cells.
- **Managing Worksheets:** understand that each file may contain several worksheets. Copy and move a worksheet within a spreadsheet, between spreadsheets. Link the contents of different cells and worksheets. Zoom in and out of content and apply different types of views, depending on the specific needs.
- **Formatting:** format cells to display numbers, date style, currency symbol, percentages, and text. Apply different colours to cell contents and cell backgrounds. Alignment.
- **Formulas and functions:** Create formulas using cell references and arithmetic operators (addition, subtraction, multiplication, division). Understand and use relative or absolute cell referencing in formulas.
- **Charts:** create different types of charts from spreadsheet data. Change chart area background colour, and legend fill colour. Change font size and colour of chart title, chart axes, and chart legend text.

## 2.2 Participants

The experimentation involved a group of company employees. Twenty-two administrative employees with various prior knowledge of MS Excel were involved. Information on the participants was obtained using a demographic questionnaire, aimed at acquiring data on their age, educational qualification, their role in the company, and the type of training courses (in-person, online, or blended), if any, they had attended in the past. In addition, to balance the proficiency of the groups, a pre-test containing a series of specific questions was administered to identify the participant's level of skills and expertise in MS Excel. The pre-test was composed of 15 questions 3 for each macro-objective identified in the training needs analysis.

For the experimental activities, the between-subjects design approach was applied. The participants were divided into two groups composed of 11 participants each:

- the Flipped Group (Experimental Group) in which training was provided using the flipped classroom approach
- the Lecture Group (Control Group) in which training was provided using the traditional approach.

## 2.3 Learning Activities

In both groups, all elements were the same: the activities, the topic of the lesson, the teacher, the teaching materials, and the number of students. The difference between the groups was exclusively the teaching methodology.

Group activities were carried out in parallel using as summarized in Table 1.

Table 1. Learning activity structure

Flipped Group		Lecture Group	
Time	Activity	Time	Activity
40 min	Conceptual framework challenge presentation and individual study (Anticipatory Moment - pre classroom)	20 min	Class with the teacher
	Problem solving/ Case study (Operational Moment - pre classroom)	40 min	Individual study
20 min	Flipped Lesson/ Hind-sight Lesson Teacher intervention for knowledge reworking (Restructuring Moment)		Exercise/case study
10 min	Assessment test	10 min	Assessment test

### Conceptual framework

The activity of presenting the conceptual framework was conducted by the lecturer/tutor who at the beginning of each meeting provided a brief explanation of the theoretical framework of the topic to be studied. In this first presentation, the challenge, i.e., the task to be completed, was also explained to the participants. Finally, the supporting teaching materials and the task to be solved were provided to the class.

### Problem-solving/case study

For the challenges, different exercise tracks have been developed, based on the specific needs expressed by the company. The number of exercises proposed for each teaching unit varies according to its content and complexity.

### Didactic content

The didactic content was provided in the form of multimedia presentations converted into sharable content objects, i.e., SCORM (Sharable Content Object Reference Model) packages that were published on Moodle platform. The material was organized in the form of checklists, using the titles of important topics to be used in addressing the case study, thus enabling the scaffolding approach.

### Assessment tests

For the evaluation of acquired skills, a questionnaire was defined for each didactic unit. Multiple-choice questions and open questions were used.

## 3. RESULTS

The measurement of effectiveness was carried out using a pre-test and post-test design. The students underwent a pre-test to measure their initial knowledge, and a post-test was administered downstream of the training intervention. At the end of the training step, both groups underwent a survey to evaluate their satisfaction with the methodology adopted. The comparison of the results allows verifying whether the performance of the control group differs from the experimental group. The experiment is ongoing, but the first results show that both groups gain knowledge and skills after the intervention, as expected. Figure 1 shows the average of the scores achieved in the pre-test and post-test by the members of each group (EG and CG) in each Learning Unit (the learning pathway consisted of 5 Units). The interesting result was related to the appreciation of the teaching approach, both the trainees and the teacher were satisfied with the flipped approach.

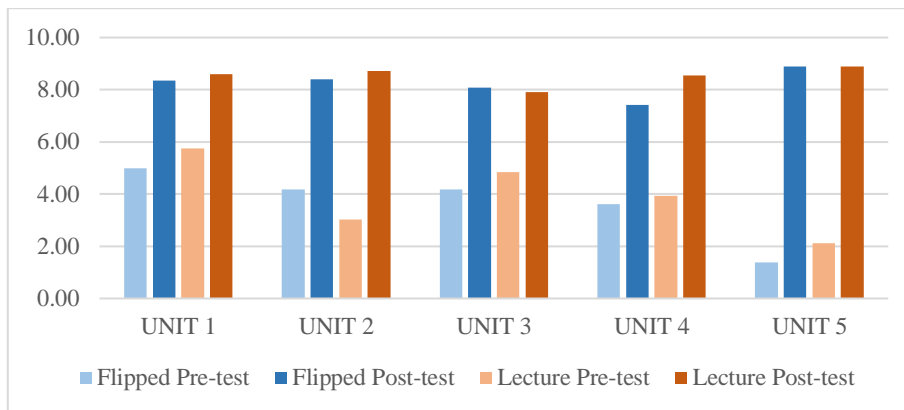


Figure 1. Pre-test and Post-test results for each learning unit in Flipped Group (EG) vs Lecture Group (CG)

For the evaluation of participants' satisfaction, a questionnaire was administered at the end of the training intervention to both groups. The survey consists of 7 questions, using 5-point Likert scale from 1 (unsatisfied) to 5 (very satisfied), to assess the following dimensions: organization of the course, course content, teaching approach and performances.

Both groups overall found the organization of the activities satisfactory, albeit with different percentages. The 67% of participants in the FlippedGroup rated the guidance provided as complete and clear, while for the same aspects in the LectureGroup only 55% rated it positively. In addition, the 56% of the FlippedGroup participants felt that the guidance provided was useful versus the 45% of the LectureGroup participants. Therefore, it can be specified that the FlippedGroup had a better perception of the organization of the activities.

The students' satisfaction with the course content provided was assessed in terms of the interest, usefulness and clarity of the content supplied. Based on the data obtained, it could be stated that the FlippedGroup appreciated the teaching materials provided, in fact, most of the respondents (88.89%) expressed a high evaluation (score 4 - 5) about the interest of the content, as well as its usefulness (Figure 2). On the other hand, regarding the clarity of the content, not all participants considered it clear and easy to use, only the 33, 33% gave a very positive opinion of it (score 5). Probably, respondents had some problems in using self-paced content. In the LectureGroup, the results were slightly lower (Figure 3) than in the FlippedGroup for both the interest and the usefulness, instead higher score was expressed for the clarity of the content. This corroborates the hypothesis that using a self-paced content could be more difficult.

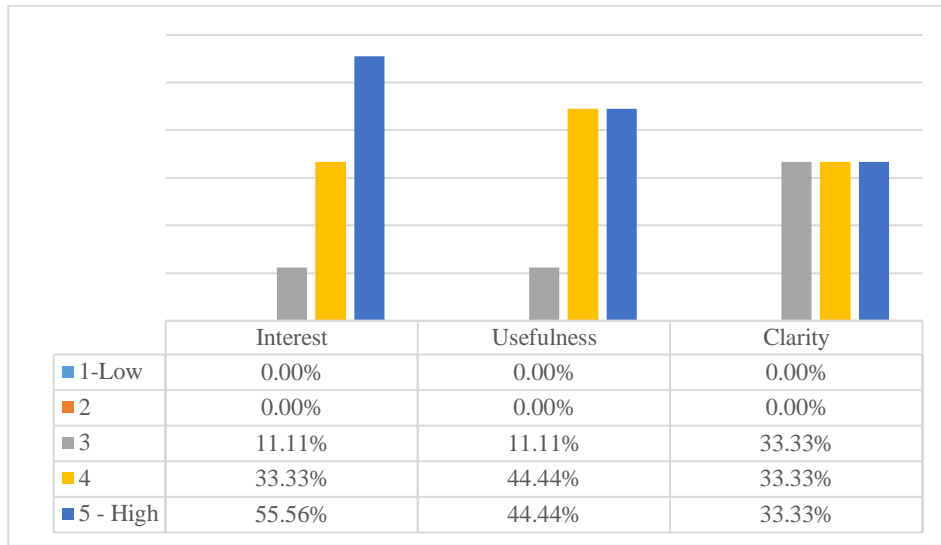


Figure 2. Users' appreciation of didactic content in the Flipped Group

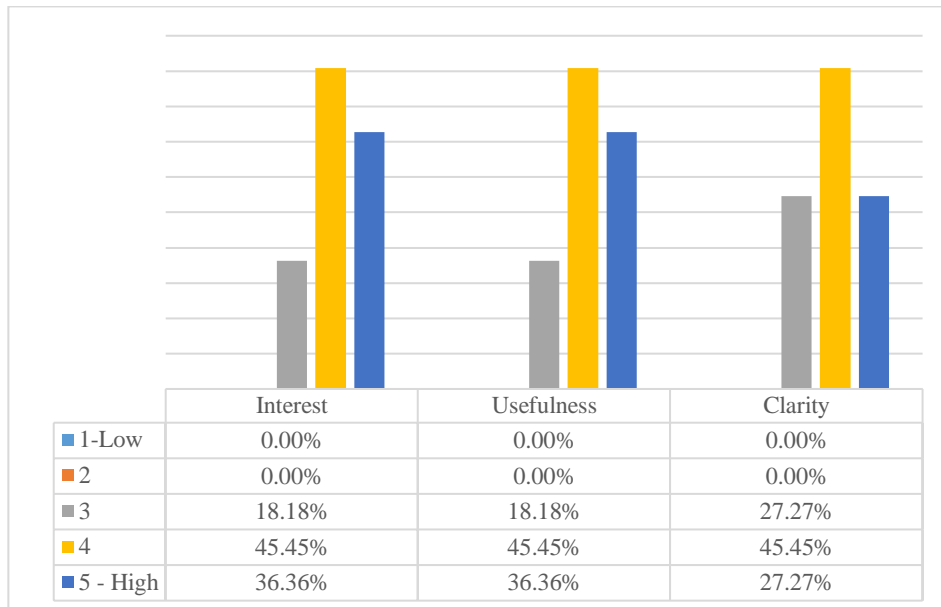


Figure 3. Users' appreciation of didactic content in the Lecture Group

The methodology used, flipped or traditional, was evaluated in terms of clarity, interest, usefulness, easiness, and effectiveness. As shown in Figures 4 and 5, the traditional approach was rated as more clear, useful, easy, and effective than the flipped approach. Although the flipped approach was interesting to learners, this evaluation is likely to change in the long term.

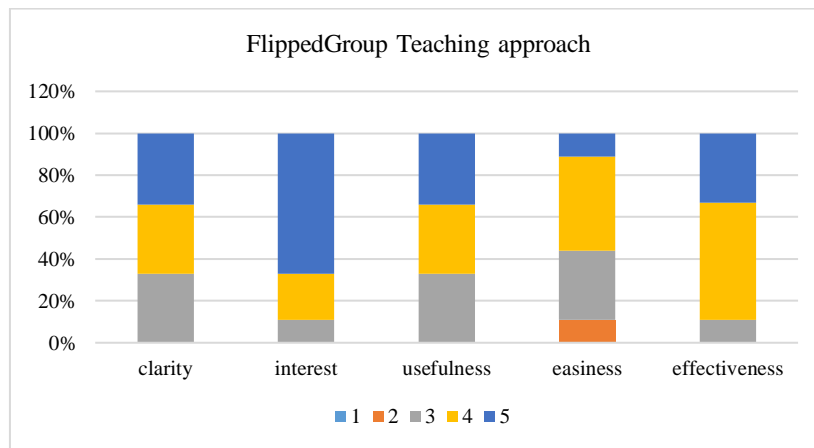


Figure 4. User's Satisfaction with the flipped approach in terms of clarity, interest, usefulness, easiness, and effectiveness

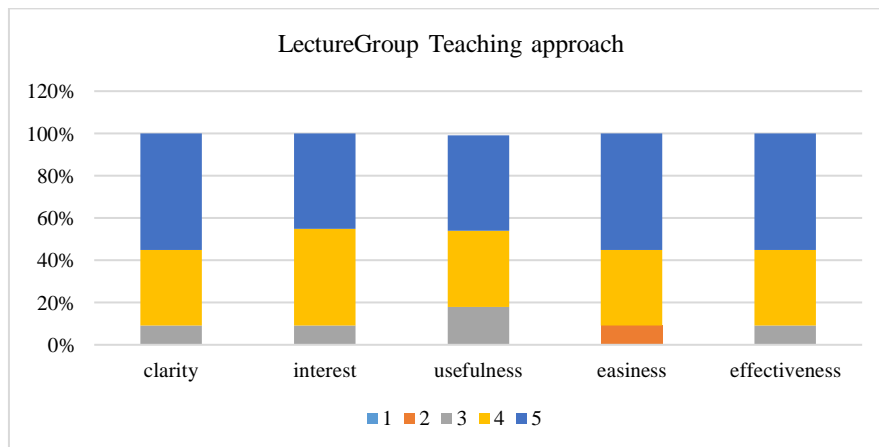


Figure 5. User's Satisfaction with the traditional approach in terms of clarity, interest, usefulness, easiness, and effectiveness

Analysis of the data about performance satisfaction shows that although both groups have achieved the learning objectives, it appears that FlippedGroup students lack awareness of their achievements. Only 33% of the FlippedGroup participants are convinced that they have achieved the learning outcomes and 11% declare they have not achieved the objectives, contrary to what was recorded by the post-test. In contrast, in the LectureGroup, students achieved their learning with greater awareness; in fact, 89% stated that they had achieved it. This situation brings out the fact that there is a need to strengthen feedback in the Flipped Classroom methodology.

#### 4. CONCLUSIONS AND FUTURE WORKS

Flipped learning is an interesting approach to apply in all contexts where it is important to develop problem-solving skills. The idea of this research as part of the L.I.F.T. project led to the evaluation of its application in the corporate context. In companies, using flipped learning can also be useful in leaving the student free to delve into the learning content as and when they see fit. The existing literature argues that Flipped Learning is a methodology with many positive aspects in terms of motivation to learn, the development of skills (social, digital, etc...), and the enhancement of the autonomy and responsibility of the learners.

The paper describes the first case study aimed at investigating the application of the Flipped Learning approach in the corporate context. The evaluation conducted, therefore, is a starting point for the introduction of the Flipped Learning methodology in professional and corporate training.

The results obtained from the trial are promising; the approach enables concrete and satisfactory learning outcomes. The participants expressed positive opinions about the methodology's acceptance, interest, and effectiveness. However, some critical issues have also emerged that need to be addressed, such as the importance of clear feedback and the low motivation of some participants.

The study has several limitations. First of all, the sample was composed of few people, so the analysis has limited statistical significance. Moreover, the learning activities were performed when employees were at home due to the Covid-19 restrictions, so they were required to attend the course and were poorly motivated. For the same reason, for researchers was not possible to reach the students and investigate more in details qualitative aspects.

In this regard, the next case study it would be investigated if the introduction of Gamification mechanisms can be useful to increase productivity, effectiveness, motivation and participation (Di Bitonto et al., 2014, Cassano et al., 2018).

## ACKNOWLEDGEMENT

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## REFERENCES

- Cassano, F., Piccinno, A., Roselli, T., & Rossano, V., 2018. Gamification and learning analytics to improve engagement in university courses. In *International Conference in Methodologies and Intelligent Systems for Technology Enhanced Learning*, Springer, Cham, pp. 156-163.
- Di Bitonto, P., Corriero, N., Pesare, E., Rossano, V., & Roselli, T., 2014. Training and learning in e-health using the gamification approach: the trainer interaction. In *International Conference on Universal Access in Human-Computer Interaction*, Springer, Cham, pp. 228-237.
- Dimauro G., Gentile E., Plantamura P., Scalera M., 2019. Experimentation of Flipped Learning in Higher Education Academy. *International Journal for Infonomics (IJ)*, Vol. 12 No.3, pp. 1891-1898.
- Karabulut-Ilgu, A., Jaramillo Cherez, N., & Jahren, C. T., 2018. A systematic review of research on the flipped learning method in engineering education. *British Journal of Educational Technology*, Vol. 49 No.3, 398-411.
- Låg, T. & Sæle, R.G., 2019. Does the Flipped Classroom Improve Student Learning and Satisfaction? A Systematic Review and Meta-Analysis. *AERA Open*, Vol. 5 No. 3, pp. 1-17.
- Nederveld A., Berge Z.L., 2015. Flipped learning in the workplace. *Journal of Workplace Learning*, Vol. 27 No. 2, p. 162-172.
- Nel, L., 2017. Students as collaborators in creating meaningful learning experiences in technology-enhanced classrooms: An engaged scholarship approach. *British Journal of Educational Technology*, Vol. 48 No. 5, 1131-1142.
- Rossano, V., Plantamura, P., Gentile, E., & Roselli, T., 2022. Flipped Learning in Corporate Training to Support Industry 4.0. In *EDULEARN22 Proceedings*, IATED press, pp. 10244-10251.
- Zainuddin Z., Halili S.H., 2016. Flipped Classroom Research and Trends from Different Fields of Study. *The International Review of Research in Open and Distributed Learning*. Vol. 17 No.3.
- Zainuddin Z., Haruna H., Li X., Zhang Y., Chu S.K.W., 2019. A systematic review of flipped classroom empirical evidence from different fields: what are the gaps and future trends? *On the Horizon*, Vol. 27 No. 2, pp. 72-86.