

Examining the implementation of Blended Learning in the Engineering field

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Examining the implementation of Blended Learning in the Engineering field / Sala, R., Pirola, F., Pezzotta, G., Enoksson, F., Ljubic, S., Skoki, A., Francalanza, E., Zammit, J., Bonello, A., Podrzaj, P., Priarone, P.C., Antonelli, D., Minetola, P., Maffei, A., Boffa, E.. - ELETTRONICO. - (2023), pp. 83-84. (5th International Conference on Higher Education Learning Methodologies and Technologies Online - HELMeTO 2023 Foggia (Italy) September 13th - 15th, 2023).

Availability:

This version is available at: 11583/3009769 since: 2026-04-10T10:06:08Z

Publisher:

STUDIUM s.r.l.

Published

DOI:

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HELMETO 2023

UNIVERSITY OF FOGGIA

5th International Conference on
Higher Education Learning Methodologies and
Technologies Online

Foggia, September 13th - 15th, 2023

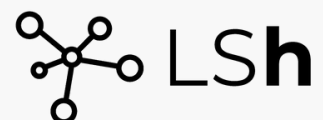


BOOK OF ABSTRACTS



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HELMeTO 2023 - Book of Abstracts
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Editore STUDIUM s.r.l. a socio unico
Prima edizione Settembre 2023

ISBN 978-88-99978-64-8

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Examining the implementation of Blended Learning in the Engineering field

Roberto Sala¹[0000-0001-7671-6927], Fabiana Pirola¹[0000-0003-4633-7568], Giuditta Pezzotta¹[0000-0001-7983-8356], Fredrik Enoksson²[0000-0002-5222-970X], Sandi Ljubić³[0000-0003-3456-8369], Arian Skoki³[0000-0002-7164-1994], Emmanuel Francalanza⁴[0000-0003-0317-5909], Joseph Paul Zammit⁴[0000-0002-9271-9682], Amberlynn Bonello⁴[0009-0006-8950-5268], Primož Podržaj⁵[0000-0002-9932-9521], Paolo Claudio Priarone⁶[0000-0003-4226-7697], Dario Antonelli⁶[0000-0002-0118-0424paolo], Paolo Minetola⁶[0000-0002-5917-5273], Antonio Maffei²[0000-0002-0723-1712] and Eleonora Boffa²[0000-0003-4847-3723]

¹ University of Bergamo, Department of Management, Information and Production Engineering, Viale Marconi, 5, Dalmine (BG), 24044, Italy

² Department of Production Engineering, KTH Royal Institute of Technology, 114 28 Stockholm, Sweden

³ University of Rijeka, Faculty of Engineering, 51000 Rijeka, Croatia

⁴ CERU, Department of Industrial and Manufacturing Engineering, University of Malta, Msida, MSD2080, Malta

⁵ Faculty of Mechanical Engineering, University of Ljubljana, 1000 Ljubljana, Slovenia

⁶ Department of Management and Production Engineering, Politecnico di Torino, 10129 Torino, Italy
roberto.sala@unibg.it

1 Introduction

Blended Learning (BL) is a pedagogical approach combining traditional in-person methods with remote activities to enhance student learning. In the Engineering field BL can be used to challenge students with demanding activities and industry-like problem-solving exercises within a controlled environment [1]. Before the COVID-19 pandemic, teachers had the freedom to consider using BL in their courses according to Constructive Alignment principles [2]. Instead, during the pandemic, teachers had to recalibrate the Intended Learning Outcomes (ILOs), i.e., expected achievements per unit of study and switch from face-to-face content to remote teaching [3]. This work explores the adoption of BL in the Engineering courses (also considering the pre, during, and post COVID-19 settings) from the technological, organizational (e.g., in presence vs remote), content (e.g., ILOs adaptation), and target (e.g., bachelor, master, PhD) point of views.

2 Methodology

A systematic literature review methodology was adopted. The research query built around the BL (“blend* learn*”) and Engineering (“Engineer*”) keywords, run in SCOPUS using the “AND” operator, searching the keywords in the “Title, Abstract, Keywords” fields, limiting the results to journal papers, and the Engineering Subject Area. The initial sample of 206 documents (at the beginning of 2023) was filtered

according to inclusion criteria to reach the final sample of 103 papers. Papers were classified according to six learning approaches: Face-to-Face, Rotation, Flex, Labs, Self-blend, and Online. The analysis further focused on classifying the papers according to Bloom's Taxonomy level (Remember, Understand, Apply, Analyze, Evaluate, Create) [4] based on the course ILOs.

3 Results

What emerged (Table 1) is a mix of in-person and remote activities in combination with the lower or medium levels of Bloom's taxonomy (from Remember to Analyze) but no clear pattern for in presence vs remote settings was found. There was a preference for addressing the lower and medium levels of Bloom's taxonomy. The analysis of the dataset revealed that only a small portion of the papers directly addressed the COVID-19 pandemic, with no significant increase in terms of publications compared to the general trend. A justification might be found in the time required to test the effects of the new BL setting, compare it with the old one, and publish about it.

Table 1. Table captions should be placed above the tables.

Category	Distribution
Learning approach	Rotation (31,4%); Face-to-Face (26,4%); Online (15,7%); Self-blend (9,1%); Flex (9,1%); Labs (8,3%)
Degree Level	Bachelor (67%); Master (24%); PhD (6%); Faculty (3%)
Bloom's Taxonomy (in presence)	Remember (16%); Understand (29%); Apply (34%); Analyze (13%); Evaluate (5%); Create (3%)
Bloom's Taxonomy (remote)	Remember (22%); Understand (32%); Apply (31%); Analyze (11%); Evaluate (2%); Create (2%)
COVID-related	Yes (7%); No (93%)

4 Conclusions

While a clear interest in a more comprehensive adoption of BL methods was found, only a few papers dealing with the COVID-19 pandemic were available, limiting the possibility to deepen the implication, and forcing researchers to speculate about its impact. Future research should deepen the impact that the COVID-19 pandemic had on BL adoption and the effect that this had on the post-pandemic setting.

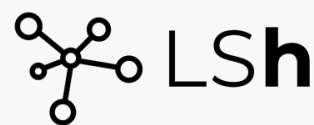
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