

Current Trends in Blended and Online Learning*

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Blended Learning (BL) combines the advantages of both in-person and online learning while allowing students to affect their learning schedules and take responsibility. The capabilities of online education took worldwide interest during the COVID-19 pandemic, with the need to better understand online education's impact on educational achievements and how technical environments could provide learning experiences to replace face-to-face sessions at the campus. We examine the trends towards online learning on the recently published articles during the COVID-19 pandemic, comparing them to a learning survey conducted in the European Union in 2021. The study's objective is to identify the current trends and the effect of the COVID-19 pandemic on online education. This paper compares our findings from a systematic literature review against the trends observed from qualitative survey data collected from six European countries. Our mapping study identified several trends, such as that long-distance education had become a long-term strategy in higher education compared to the pre-COVID-19 era and that fully online education can be very exhausting for students, causing retention problems with those who need more skills for independent studies. The BL methods engage students and allow them to design their learning schedules, and after COVID-19, these methods are becoming long-term strategies for education. However, these approaches also require skills in the course design to ensure that other aspects and needs, such as social inclusiveness to motivate students, are sufficiently addressed due to the need for classroom interactions and peer support from shared campus experiences.

Keywords: blended learning; online learning; engineering education; software engineering

1. Introduction

Blended learning is more than just combining face-to-face and online teaching. Finding the proper blend of suitable learning venues and instructional techniques to fulfil the learning goals is the most challenging issue. Many instructors need to familiarise themselves with blended learning, a twenty-first-century term. Despite its importance, many commercial and public organisations viewed the rise of technological applications with suspicion [1].

This paper investigates current trends in BL and assesses student and faculty satisfaction at selected universities in target countries, including Finland, Germany, France, Hungary, and Spain. The study's secondary goal is to identify students' social and technological challenges regarding the survey results. The authors compare the survey results from the partner universities. The survey is a part of the Erasmus Training Faculty on Blended Learning (FABLE) project funded by the European Commission. FABLE's goal is to assist higher education teaching staff in designing and implementing blended learning programs that fully utilise the benefits of this approach. The FABLE project seeks to achieve the following objectives: Developing a knowledge bank to better recognise the requirements and expectations of students and trainees on the one hand and professors, educators, and trainers on the other, in terms of blended learning and blended learning training. Creating

and evaluating a technique for transforming in-class courses into blended learning courses that use the benefits of this type of teaching, including a guide to distance learning technologies. Designing, building, and deploying a tool to teach faculty about blended training to assist them in designing courses for blended learning. Preparing a white paper to assist educational systems in steering the digital transformation of their teaching through effective performance metrics. The method combines face-to-face teaching, live videoconferencing, online accessible recorded courses, micro-learning, and online self-training.

2. Background

The main four areas of research literature are blended learning concepts, approaches, student engagement in blended learning, and teacher practices to enhance student engagement in blended learning. Student involvement is grounded in action and is recognised as a complex and multifaceted construct [2]. Student involvement has three interconnected dimensions: behavioural, emotional, and cognitive. Student behavioural engagement in a course refers to their participation in activities and adherence to rules or standards. Following that, student emotional involvement relates to their emotional responses to activities, classmates, and the teacher, as well as their sense of belonging in the class. Finally, student cognitive

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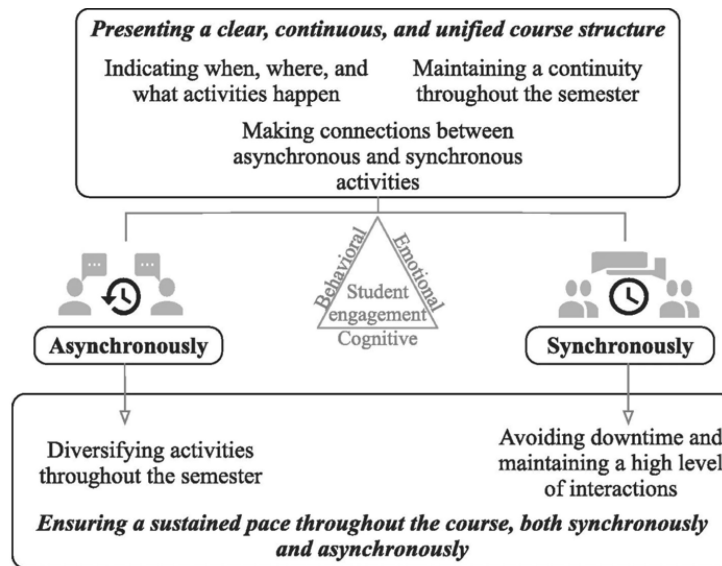


Fig. 1. Teachers' strategies in BL course structure [7].

engagement refers to their emotional interest in activities that help them acquire detailed knowledge and use learning or meta-cognitive methods [3]. Given the goal of BL to combine the benefits of synchronous interactions with the flexibility of online learning and taking into account advancements in digital technologies, new BL environments that allow synchronous activities to take place online instead of face-to-face for all or a portion of the students have emerged in the last 15 years. The literature defines three types of BL environments: Traditional Blended, Blended Online, and Blended Synchronous courses [4, 5]. Traditional Blended courses integrate face-to-face with asynchronous online teaching and learning (T&L) activities [4]. Blended Online courses contain online T&L activities that are both synchronous and asynchronous [20]. Blended Synchronous courses blend asynchronous online with synchronous face-to-face/online activities in which on-campus and distant learners participate simultaneously [4]. Traditional blended Student engagement in blended learning can improve by bringing together diverse teaching and learning activities while supporting differentiated and individualised training through asynchronous and synchronous modes [6].

The professors prioritised students' emotional, behavioural, or cognitive engagement using semi-structured interviews and course platform content analysis based on their perspective of their role in the course. Following that, the findings revealed that some lecturers had separated their course content into synchronous and asynchronous modes with no genuine reflection or integration of activities. On the other hand, other professors created asynchronous activities focused on trans-

mitting topic information that was then integrated into synchronous sessions. Such a method, according to the teachers, increased student interaction. Regardless of the initial findings, most professors supported synchronous student involvement online using quizzes, discussion forums, videos, and other news articles. Furthermore, the authors emphasised the significance of student-content interactions in boosting learner engagement. Teachers' strategies in Blended Learning are demonstrated in Fig. 1 [7].

3. Research Method

This research is divided into two parts: the first part of the study is the systematic mapping study, and the second part is the survey study.

3.1 Systematic Mapping Study

Systematic mapping research is an excellent way to study blended learning trends. A mapping study is a type of literature review that examines a primary issue by identifying, evaluating, and organising the goals, methods, and contents of prior research. As a result, current research, research gaps, and matured sub-areas may be recognised and explained [8].

Evidence-Based Software Engineering (EBSE) should focus on the gathering of empirical data, and Systematic Literature Reviews (SLRs) should be used as a technique for undertaking an unbiased collection of experimental findings. A systematic method for reviewing research literature known as Systematic Literature Reviews (SLRs) is one of the primary technologies supporting EBSE. SLRs are used to identify, critically assess, and collect all relevant research publications on a given research issue or topic. The technique makes the literature

review accurate, comprehensive, and accessible. Mapping studies follow the same fundamental approach as SLRs, attempting to discover and categorise all relevant research to a general software engineering issue. They are designed to give a broad overview of a subject area and determine whether there are subtopics with enough research papers to perform traditional SLRs and sub-topics where more relevant studies are required [9]. The leading scientific literature digital libraries listed below were chosen based on previous studies: Springer Link, Google Scholar, [national database], and IEEE Xplore.

The number of hybrid/blended learning subjects that have been published has steadily grown. According to Google Scholar, three thousand sixty scientific papers have been published since 2020. The focus of these papers remains on software engineering, with topics addressed including hybrid learning models, blended learning models, and trends.

A systematic mapping study is an objective technique for evaluating the kind and scope of the available research to address a specific research question. These types of studies can assist in determining research gaps and suggesting topics for additional analysis. As a result, they offer a structure and framework for future research efforts to be appropriately designed [8]. The systematic mapping study's primary objective is to offer an overview of a research field and determine the quantity and type of accessible research and findings. Plotting the frequency of publication through time is a systematic way to detect patterns. Another goal may be to discover where research on the topic has been published [10]. A systematic map for software engineering is a way to create a categorisation scheme and structure in a software engineering field of interest. The frequency of publications for categories within the system is the focus of analysing the results. The scope of the research field can then be determined. Various system parts may be combined to answer more specific research topics [10].

3.2 FABLE Project Survey

As a part of Erasmus Training Faculty on Blended Learning, the FABLE project mission is to assist higher education faculty in developing and executing blended learning programs that entirely use this method's benefits. The FABLE project seeks to achieve the following objectives to attain this ultimate goal:

1. Developing a knowledge bank to better recognise the requirements and expectations of students and trainees on the one hand and

professors, educators, and trainers on the other, in terms of blended learning and blended learning training.

2. Creating and evaluating a technique for transforming in-class courses into blended learning courses that use the benefits of this type of teaching, including a guide to distance learning technologies.
3. Designing, creating and deploying a tool to teach faculty about blended training to assist them in designing courses for blended learning.
4. Preparing a white paper to assist educational systems in steering the digital transformation of their teaching through effective performance metrics.

The survey participants are from Finland, France, Germany, Hungary, and Spain, as presented in Table 2. Germany has the most significant survey participants, while Spain has the smallest share.

The majority of the respondents, 61 percent, were from FH Münster University (Germany), others from Institut de Préparation à l'Administration et à la Gestion (France), LUT University (Finland), Széchenyi István University (Hungary), Haikara (France) and Innogate To Europe (Spain).

Germany contributes 61 percent of all responses. Hungary ranks second with 13 percent of the participants, followed by France with 12 percent. Only 9 percent of the participants are from Finland. Spain, with 5 percent, had the lowest percentage of responses. According to the survey results, more than a quarter of administrators are either indifferent to or satisfied with online or blended learning. However, 21 percent of people are dissatisfied, and 21 percent are frustrated with online or blended learning. In the Staff group, more than 41 percent of participants are highly pleased or satisfied with online or blended learning.

However, 27 percent of employees are dissatisfied, and 8 percent are frustrated with online or blended learning.

3.3 Research Questions

This paper aims to answer the following research questions (RQs):

- RQ1. What is blended learning?
- RQ2. What are the current trends in blended learning regarding the studies?
- RQ3. Are there any differences in the level of satisfaction between students and faculty?
- RQ4. Are there any differences in the level of satisfaction of faculty regarding countries?
- RQ5. Are the survey findings significantly related to students' social and technological challenges in blended/online learning?

The literature review and systematic mapping study answer the first and second questions. The results of the survey response to the other questions.

3.4 Research Process

The research process is broken into four sections: The Systematic Mapping Study is briefly reviewed first. The research strategy, study selection criteria, and pilot search are then addressed. A total of 44 primary studies were found from 3060 publications in the blended learning trends. Studies unrelated to answering the research questions are excluded using selection criteria. Because the research aim was to find current trends in blended learning, articles including blended learning, online education, and best practices published after 2020 were recognised as meaningful regarding the research questions. The papers were skipped if they were not about blended learning or were about blended learning outside of the software engineering area. The eligibility criteria were used systematically, beginning with removing irrelevant publications based on title and abstract. After that, all articles were reviewed thoroughly to decide whether they should be included or excluded.

The pilot search was created with “blended learning and online education and best practices,” “blended learning models and online education and best practices,” and “blended learning and e-learning and online education and distance learning” in 2020, 2021 and 2022. The pilot search results are displayed in Table 1.

3.4.1 Inclusion Criteria

The papers, including blended learning, online education, and best practices, were identified as

meaningful regarding the research questions. The following criteria were used to choose the articles: The title or abstract of the article discusses blended learning explicitly. The title or abstract of the article mentions hybrid learning explicitly. The article’s abstract discusses the blended/hybrid learning topic at the higher education level.

3.4.2 Exclusion Criteria

Regarding the research questions, the papers were skipped if they were not about blended learning or were about blended learning outside of the software engineering area. The following were the article’s exclusion criteria: The paper was about blended learning but not related to software engineering. The paper was not accessible as a whole. The paper was written in a language other than English. The article’s abstract does not discuss the blended/hybrid learning topic at the higher education level.

3.5 Research Method

Following the study goal to investigate the blended learning concept, approaches, the current trends and meanwhile assess the higher education students and staff satisfaction from BL, the first part of the results concentrate on takeaway points from the systematic literature review results. Reading the approved papers and analysing how they presented issues linked to the study questions helped categorise the articles. The title, publication year, and the most critical topic of interest were taken from each paper.

Aligned with the FABLE project goals and the objectives of this paper, the second part of the results concentrates on the outcomes of the FABLE project and students’ and staff points of view regarding the benefits and efficiency of BL at universities of Finland, Germany, France, Hungary, and Spain, to assist higher education teaching staff in designing and implementing blended learning programs that fully utilise the benefits of this approach. The survey study goal was to develop a knowledge bank to better recognise the requirements and expectations of students and trainees on the one hand and professors, educators, and trainers on the other, in terms of blended learning and blended learning training. The survey participants by country are displayed in Table 2.

Table 1. Pilot search results

| Source | Search string | Results |
|----------------|--|--|
| Google Scholar | Blended learning & online education & best practices | 2020 → 3060 papers 2021 → 2050 papers 2022 → 485 papers |
| | Blended learning models & online education & best practices | 2020 → 5430 papers 2021 → 3650 papers 2022 → 876 papers |
| | Blended Learning & e-learning & online education & distance learning | 2020 → 7400 papers 2021 → 5210 papers 2022 → 1410 papers |

Table 2. Survey participants by country

| Country | Students | Faculty | Administrative | Total |
|---------|----------|---------|----------------|-------|
| Finland | 5 | 18 | 7 | 30 |
| France | 1 | 13 | 29 | 43 |
| Germany | 162 | 49 | 6 | 217 |
| Hungary | 3 | 30 | 13 | 46 |
| Spain | 4 | 4 | 11 | 19 |
| Total | 175 | 114 | 66 | 355 |

4. Results

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4.1 The Systematic Literature Review Results

Reading the approved papers and analysing how they presented issues linked to the study questions helped categorise the articles. The title, publication year, and the most critical topic of interest were taken from each paper. After reading carefully, based on the criteria, the total number of accepted articles is reduced to 36 unique studies. Based on the SLR, the study results include the definition of Blended Learning and the applied approaches, The current trends in blended learning, Students' and Faculty members' satisfaction with BL, and Social and technical challenges students confront in BL, which are elaborated in the following parts.

4.1.1 Blended Learning Concept and Approaches

Researchers commonly use the phrase blended learning. However, what precisely do we imply when we state Blended Learning? Blended Learning generally refers to using technology to allow students to learn multiple times, places, and speeds. BL falls between face-to-face and online learning [4]. In

other more precise definitions, BL is defined as a decrease in face-to-face meetings, such as 30 to 79 percent of online learning. Although it is not often mentioned clearly in the literature [2, 11]. This term includes several approaches that describe how blended learning occurs in the classroom. There are various blended learning methods in today's schools [12]. Blended learning is an online learning experience that assists students in engaging in meaningful learning through flexible online information and communication technology, less classroom overcrowding, and a structured teaching and learning approach [13]. Blended learning, often known as hybrid or mixed learning, can take various forms depending on the definition used. There is not just one definition of blended learning in literature [14].

Blended learning can be termed blended learning even if it takes place entirely in the classroom because a component of class work is completed by students utilising online resources in classrooms [15, 16]. Blended learning combines traditional and online learning [17]. Combining traditional and online learning collects the benefits of each, ignoring the disadvantages of each. Blended learning reduces face-to-face class time [18]. BL attempts to expand thought and discourse beyond time and place and is specifically oriented to enhance student involvement by combining the benefits of synchronous and asynchronous communication [19] while taking advantage of digital technologies in a learner-centred methodology [6].

Blended learning definitions are gathered in Table 3.

Teachers' tactics in BL to encourage students are reviewed in a few studies. Concentrated on traditional BL, the effectiveness of online collaborative learning tools in increasing first-year undergraduate student engagement and achievement was stu-

Table 3. Blended learning definitions based on SLR

| Author | Blended Learning Definition |
|------------------------|---|
| Driscoll, 2002 | Blended learning can be termed blended learning even if it takes place entirely in the classroom because a component of class work is completed by students utilising online resources in classrooms [15]. |
| Graham, 2006 | Blended learning combines traditional and online learning [17]. |
| Halverson et al., 2014 | Blended learning attempts to expand thought and discourse beyond time and place and is specifically oriented to enhance student involvement by combining the benefits of synchronous and asynchronous communication [19]. |
| Bates, 2018 | Blended learning is defined explicitly as a decrease in face-to-face meetings, such as 30 to 79 percent of online learning, even though it is not often mentioned clearly in the literature [11]. |
| Taylor et al., 2018 | Blended learning takes advantage of digital technologies in a learner-centred methodology [6]. |
| Abusalim et al., 2020 | Blended learning, often known as hybrid or mixed learning, can take various forms depending on the definition used. There is not just one definition of blended learning in literature [14]. |
| Lakhal et al., 2020 | Blended learning bridges face-to-face and online learning by allowing students to learn at different times, locations, and speeds [4]. |
| Kumar et al., 2021 | Blended learning is an online learning experience that assists students in engaging in meaningful learning through flexible online information and communication technology, less classroom overcrowding, and a structured teaching and learning approach [13]. |

died. According to the findings, such applications increased student engagement [20]. There are numerous blended learning approaches in the existing literature, including Station Rotation Blended Learning (SRBL), Lab Rotation Blended Learning (LRBL), Flex Blended Learning (FBL), Flipped Classroom-Based Learning (FCBL), Individual Rotation Blended Learning (IRBL), and Project-based Blended Learning (PBL). SRBL is the student's rotation between the learning stations. These rotations are either pre-determined on a set timetable or are flexible in the teacher's opinion. If at least one of the learning stations is online, SRBL can be called a blended learning paradigm. SRBL has been discovered to be simple to implement [21]. LRBL is a rotating model as well. In this approach, a teacher or expert can choose a pre-defined rotation model or a dynamic one based on their understanding of the situation and changes in the environment. One station should be dedicated to online learning in this arrangement, while the other can choose from various learning possibilities. Different experiments to implement this paradigm in real-time settings are mentioned in the literature [22]. Online learning is the core of student learning in Flex Blended Learning (FBL). Face-to-face help from teachers is offered through various activities, including small-group project-based interactions, one-to-one tutoring, group discussions, and classroom activities. The teacher is on-site for any help, and the student has a well-planned timetable for their study in this form of learning [23]. In Flipped Classroom-Based Learning (FCBL), students are instructed at home and then exposed to the assignment model in the classroom [24]. The flipped classroom is an innovative learning concept that differs from traditional face-to-face learning. Students learn their lectures anytime and anywhere they choose before attending the class. As a result, teachers typically prepare their lesson content using digital assets and make these materials available to their students prior to sessions. Students access the linked lecture contents through their teachers' guidelines, and the contents are delivered to them before classes [64].

In Individual Rotation Blended Learning (IRBL), students rotate stations according to a pre-determined timetable created by an instructor using the software. Most of these conversations are basic and do not use IRBL in real-world scenarios.

However, investigations on IRBL have revealed that this technique uses a pre-programmed collection of playlists. This playlist is pre-programmed, and the learner may switch between stations and learn at their own pace [25]. The PBL technique engages two or more students at a certain level in the planning, delivery, and collaboration process

and primarily evaluates students via reflective discussion and sharing of learning knowledge. The PBL technique has been shown to give beginner students a valuable learning experience and a wide variety of information and support their professional and personal development. Working as part of a group allows individuals to progress from "experts" to "expert learners." Learners can also participate with professors in the classroom, sharing authority and knowledge on various topics and sharing the research process [26].

The most popular blended learning method is Whole Group Rotation, with 27 papers. The following popular approach is Individual Rotation, with 23 articles. Next, Flipped Classroom is discussed in 11 reports. The least popular blended learning method is Lab Rotation, with only four articles. Fig. 2 demonstrates the distribution of the articles in each category.

In another study, the Instructional System Design (ISD) model was created to guide lecturers when developing a course using the blended learning model called PEDATI. PEDATI stands for PELajari (learn), DALami (comprehend), Terapkan (apply), and EvaluasI (evaluate). PEDATI, as an ISD model, offers interconnected components or processes. The study's findings demonstrated that PEDATI and its aspects were practical and useful. PEDATI and its components were related to learning theories and e-learning ideas, providing an organised, systemic framework, easy to follow, and offers practical guidance for users. The study's findings also revealed that the lecturer's ability to create a course using PEDATI increased. As a result, PEDATI may be a guideline for lecturers to develop high-quality blended learning courses. This research also offers recommendations for lecturers or instructional designers who want to create a blended learning course. First and foremost, it is critical to establish precise, practical, and

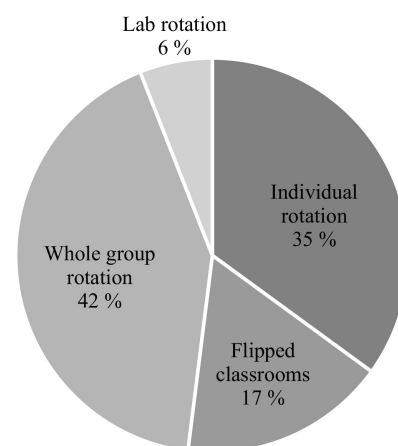


Fig. 2. Papers in each category.

quantifiable learning objectives from the start. Second, breaking down the material into as many fragmented learning points as feasible is crucial. Third, depending on the features of the aims, materials, and state of an existing learning environment, it is essential to identify which learning aspects are appropriate to be provided via synchronous or asynchronous learning activities. Finally, utilising the Label-Distribution-Agnostic Ensemble (LDAE) framework to design the learning route, i.e., learning, deepening, applying, and evaluating activities, is critical to make the learning more interactive, engaging, and effective [27]. Two external factors, such as the institution's desire and intent, affect management's decision to embrace BL. As a result, managers adopting BL must approach the task with sufficient information that addresses the institutions' stated goals and plan to execute BL. When this is done, it should go a long way toward addressing stakeholder concerns and facilitating adoption at the organisation's macro and micro levels [28]. The three factors of blended learning models that organise the data are instructional resources, assessment, and communication. They demonstrate how teachers have used synchronous and asynchronous techniques based on each mode's advantages. For example, teachers can use asynchronous instructional tools to manage and produce learning materials for their students. Students can interact with the resources on their own time or with the help of their parents. On the other hand, asynchronous technology may limit the number of times students and professors engage in real-time and communicate regularly. As a result, teachers used Video Conference Systems (VCS) to arrange synchronous online classes to allow real-time engagement. The professors applied the VCS's several multi-modal capabilities to help their teaching during these live sessions. In addition, teachers used asynchronous and synchronous technology to assist them in assessing students, delivering feedback, and developing real-time and asynchronous communication channels [29]. Essential components of teaching and learning stay the same for all despite the significant differences in language, culture, methodology, technology infrastructure, government, and other aspects of international education. A set of international standards has been developed based on the feedback gathered over years of working with various global communities with very diverse teaching conditions in terms of culture and teaching methods. These standards can be implemented and modified by any educational institution or organisation to help them achieve their goals in student-centred learning in their locally current delivery formats [30]. The technical and legal procedures for

adopting online learning and the infrastructure enabling its access and delivery had to change swiftly due to the COVID-19 epidemic. Considerable resources have been invested, and methods established to link students with course activities and materials, promote communication between instructors and students and handle online learning administration. At the same time, many people still struggle with access. As a result, greater access and possibilities to online education have now been established, and the next era of online education adopters has a clear path ahead of them [9]. While courses are structured in the blended learning model, students in soft disciplines do better than classmates in complex fields. Therefore, to develop the most efficient blended learning courses, discipline distinctions should be taken into account. Furthermore, after adjusting for gender and past learning accomplishment, the findings show that clear objectives and expectations, material quality, and interactive learning strongly influence students' performance. These critical aspects represent the effort of teachers' assistance, feedback, and facilitation, despite their statistical non-significance in the study [31].

During the quarantine, students studied the following DLCPA strategy: (1) Asynchronous learning with video lectures allowed learners to participate at their own pace because they could watch the videos again at any time; (2) Checklists such as success trackers and weekly guidance allow individuals to plan and manage their tasks; (3) Asynchronous analyses were effective in identifying issues [29]. The technical and legal procedures for adopting online learning and the infrastructure enabling its access and delivery had to change swiftly due to the COVID-19 epidemic. Considerable resources have been invested, and methods established to link students with course activities and materials, promote communication between instructors and students and handle online learning administration. At the same time, many people still struggle with access. As a result, greater access and possibilities to online education have now been established, and the next era of online education adopters has a clear path ahead of them [9].

Participating in team-based online learning activities aimed at improving learning quality and reasoning ability has a substantial positive link with the critical thinking abilities of undergraduate engineering students. The quality of learning has a stronger relationship with critical thinking abilities than reasoning abilities [32].

Scholarships and students' enrolment status have a substantial impact on critical thinking. Interactivity and active collaborative learning have a favourable impact on critical thinking. A social

media-based learning environment is critical for improving students' soft skills [33].

4.1.2 Current Trends in Blended Learning

For studying the current trends in blended learning, the papers published since 2020 are considered. Due to the research's start in July 2021, most articles are from the beginning of 2020 to the second quarter of 2021, and only two papers were found for the third quarter of 2021. The papers are mainly found in the five digital databases, including IEEE Xplore, Springer Link, Elsevier, Sage Pub, and Emerald Insight. Fig. 3 shows the distribution of articles by publication date in each category.

The use of technology in the classroom is increasing, and the opportunities for boosting student learning are endless. Blended learning can increase options for learning by integrating the most acceptable practices of in-class education with the most effective online tools. However, more studies are needed to determine the optimal way to create and apply this new learning base [34]. Online distance learning has been adopted as the best option for continuing education while keeping a safe distance to avoid coronavirus transmission and adhering to the guidelines. In a study about the effectiveness of BL from 112 students, 71 percent of (80 students) believe online learning at their university is effective. Most respondents preferred blended learning, a combination of system synchronous and asynchronous learning. In terms of learning media, the usage of Google Meet is the most popular since it is a medium for synchronous learning and can also be used for synchronous learning through Google Classroom [35]. E-learning is now widely regarded as a long-term strategy by many of the world's most prominent higher education institutions [36]. Following the shift in instructional delivery, higher education institutions offer more e-learning degree programs [37]. Since E-learning has developed from

an experimental element to an established organisational one, several institutions have incorporated it into their strategic planning process [38]. More undergraduate, graduate, and non-credit students enrol in online courses as e-learning becomes more widespread [39].

The current trends in Blended Learning show that the number of papers on BL is increasing, indicating the subject's value and the need for further research. BL increases inclusion and access for those who cannot pay to study; besides, it improves the outcomes of those who already have access to other resources, among other benefits mentioned by various researchers. Despite the topic's evolution, further study is needed on many fronts and beyond the educational field [40].

More recent studies after Covid-19 experiences show that: 1. The respondents' preferred device is a cell phone, while the least preferred is a personal computer or desktop computer. 2. Students in mixed learning modalities have a high degree of preparation, with an overall mean of 2.92 which consisted of 4 measurement scales, where 4 = "strongly agree", 3 = "agree", 2 = "disagree", and 1 = "strongly disagree". Five of the six dimensions have a high degree of preparation; however, online learning is the only dimension with a modest level of readiness (mean = 2.33). The best practices identified by the teacher-respondents were the preparation of video lessons, online quizzes and tests, use of the Learning Management System, accessibility of asynchronous teaching materials for all students, consideration of differences in the availability and speed of internet connection of the students, and the provision of activity after lessons [41].

The takeaway points after covid 19 outbreak highlight the need for some practices regarding online education. Quick and short notice shift to online education is not the same as planned online

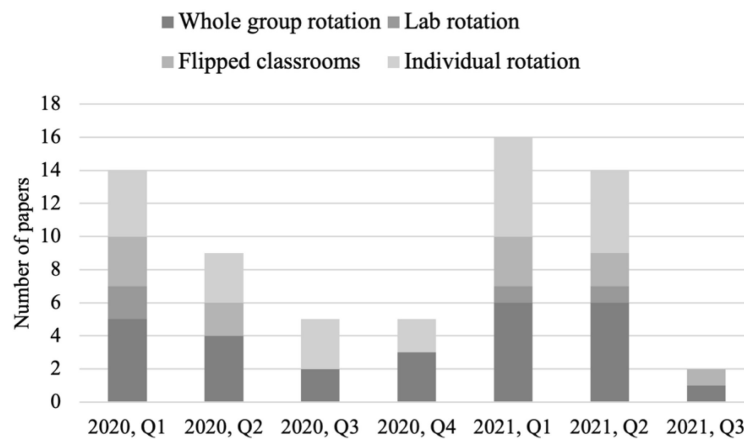


Fig. 3. Number of Papers in each category, sorted by date of publication.

education. To tackle such a situation: 1. The lectures need to be supported. 2. Management should also be dynamic by considering the following points: weekly webinars, centralising licenses for tools, allowing space for piloting tools, and a guide for tools that aren't GDPR-authorized or approved. 3. Online social components or social learning environments should be provided [42].

To identify the current trends in blended learning, 36 unique articles were studied in this paper. Next, the articles are categorised into four groups. Whole-group rotation, lab rotation, flipped classrooms, and individual rotation are possibilities. By far, the most prevalent techniques are whole group rotation and individual rotation. The Whole group rotation was discussed in 27 articles. It was the first widely used blended learning strategy. The next one is Individual rotation which has 23 papers. Current trends in blended learning highlight the role of educational technologies. Blended learning is a teaching and learning environment that combines face-to-face and computer-assisted learning [43]. Mobile learning, webinars, and virtual classrooms are a few novel solutions teachers may collaborate on and distribute learning resources. Blended learning is a teaching style that combines face-to-face instruction with suitable technology. The internet, interactive whiteboards, and language laboratories, among other things, fall under the category of technology. Unlike the traditional classroom, the new BL consists of multiple learning experiences, the majority of which are interactive visual and web-based training material. Learning on the go, using smartphones, tablets, and other trendy devices, Bring Your Own Device, BYOD, emphasises the importance of technological devices. Online environments have displaced traditional classes, resulting in virtual classrooms. Teachers and students in virtual classrooms log in to the same online portal simultaneously, allowing for greater flexibility, convenience, and interactivity. Assessment, measurement, and practical application by Identifying KPIs and assessing the impact of learning initiatives on learner performance and measurable business outcomes. In business simulations, learning happens in a risk-free environment to practice concepts and acquire new habits. For instance, designers can use simulations more frequently in corporate learning and development programs. Blended learning is thus the outcome of combining the best qualities of face-to-face contact between professors and students with a purposeful and systematic approach to technology employment [44]. Considering the education context, the other current blended learning trends include Activity-level blending, Course level blending, Program-level blending, and even Institutional-level blend-

ing. At the same time, designers and instructors take a role in prescribing at the course and activity level, which integrates new concepts and environments under the blended learning umbrella, following the goal of turning undesirable environments and experiences into more practical and desirable ones [45].

4.1.3 Satisfaction of Students vs Faculty Members from BL

Online courses are popular among students for several reasons, including convenience, learning style, and other factors. At the same time, the results and statistics show that students who take all their classes online are much less likely to succeed than students who take face-to-face classes in addition to or entirely (re-enrolment in the next semester or graduation). These outcomes remain independent of gender, colour, ethnicity, or age often used to identify various student populations. Existing research on student achievement in courses taught in multiple modalities suggests that face-to-face education may have benefits, consistent with the findings. At the same time, the results contrast previous studies that show that the online course load has different effects on student performance as assessed by grades dependent on student demographic groups. In addition, when it comes to retention statistics, students taking all their classes online are less likely to re-enrol in a subsequent term. These varied results indicate the need for more studies to understand better the elements that influence student achievement in various contexts and demographic groupings [46].

A good learning experience is essential but not enough for an excellent overall student experience. The former refers to activities related to learning and teaching, such as attending seminars and other contacts with tutors and peers for the goal of education and evaluation. The entire student experience is the whole university environment where learning occurs. Tutors play a crucial part in both. Students feel the importance of the support of the tutors as vital to boost student engagement with education and a sense of belonging. While these findings are institution-specific, they imply that practical techniques that include students as collaborators in learning and teaching might enhance institutions. Students want practical experiences in various learning environments, including the classroom. They will attend sessions that are beneficial to their learning, while many will avoid those that are not. Consistent synchronous and asynchronous engagement with classmates, instructors, and content are generally facilitated by continuous educational design and the correct implementation of digital tools, which students

highly value. Students want meaningful interactions prior to, during, and after sessions, whether held in person or online. Students attribute their satisfaction mainly to the personality and quality of their teachers. They consider assistance to be comprehensive that includes both academic and non-academic components. The differences among various forms of assistance are seen as arbitrary and even harmful. Instructors that provide every type of help those students may seek are valued by them [47].

A broad and complete assessment of instructors' techniques in this aspect, based on a massive data collection done in several areas, at the undergraduate and graduate levels, in four higher education institutions. Students' participation in BL courses was discussed in detail, with asynchronous and synchronous modes used when suitable. They were also connected to student behavioural, emotional, and cognitive involvement when applicable. The outcomes of this study underlined the significance of fully utilising and combining both modalities in BL to maximise student involvement. To help researchers and practitioners increase student involvement in BL settings, whether asynchronously or synchronously, strategies were divided into three meta-categories and eight categories and concretely shown in various scenarios. Professors suffering from the online form of conventional BL classes and are unsure how to arrange their courses, advise students, and improve the sense of closeness between students and teachers asynchronously online might benefit from the findings [19]. The study's outcomes add to the idea that students' SRL competence, online activities, and attitudes significantly impact their continued desire to learn online after finishing a blended course. There were found to be mediated connections between these variables. Aside from the participants' views about online learning, their attitudes toward face-to-face learning significantly influenced their desire to attend online courses in the future. It'd be necessary for teachers to consider enhancing social connections and promoting students' capacity to regulate their learning and employ SRL techniques while designing online courses. Students' online learning experiences may improve as a result of this practice, and their attitudes about online education may enhance their desire to engage in online learning in the future. More significantly, supporting students in active learning toward a long-term goal will improve students' self-development, whether during their university studies or after graduation [48]. The blended learning model, which was applied for ten weeks in the experimental group, had a more beneficial impact on teachers' academic success and long-term learning than the traditional

teaching techniques used in the control group. According to the effect size, the blended learning model significantly impacts students' academic success and long-term learning. Several studies have shown similar outcomes when it comes to the effects of blended learning on academic success. According to studies, students in the experimental group who participated in the blended/online learning process had higher post-test results than those who just went through the face-to-face learning experience. In addition, several studies have found that the blended learning approach increased students' interest and engagement in class and their learning, self-efficacy, self-regulated and self-directed learning abilities, and long-term learning [49]. In a study in 2021, the overall satisfaction of online/blended learning among students was 41.3 percent and faculty 74.3 percent [54]. The goal of re-attracting students to contact hours in class was only partially met, as only a minor increase in the number of present students was noted. The study demonstrates that attempts to use a blended teaching technique benefit both students and faculty [55]. Students will gain the most from a return to on-campus in-person studying when it is safe to do so or from a blended learning style. Students will also benefit from changes to present teaching techniques, such as enhanced flexibility in learning alternatives and access to online additional learning materials [56]. Evidence suggests that many learners prefer both the richness of in-person contacts and the flexibility, convenience, and lower costs associated with online learning. This combination might explain why most studies report high student satisfaction with BL alternatives [60]. According to the findings, 54 percent of students were eager to attend another blended course [62]. According to the University of Central Florida, 88 percent of teachers were happy with teaching blended courses, with 81 percent "absolutely" willing and 13 percent "possibly" willing to teach another mixed course in the future. In comparison, 87 percent of professors are satisfied with teaching just online courses. However, only 67 percent are "certainly" eager to teach solely online again [59]. Researchers realise that, as with online learning, BL faculty workloads may rise, particularly for inexperienced professors, due to the time necessary to master new technologies and teaching methodologies, build and manage online resources, and contact students via email and other ICT channels [61].

4.1.4 Social and Technological Challenges Students Confront in BL

The list of challenges teachers experienced as universities transitioned to online teaching at the start of the UK's COVID-19 national lockdown. The

challenges range from technical challenges, privacy issues, and education (facilitating) group activities in synchronous meetings to student interactivity, video duration, and extra time to prepare for teachers in asynchronous sessions. Students found it considerably more challenging to participate in online learning due to a combination of these issues. Another issue was that students were frequently overlooked throughout the shift to an online LMS, causing a further drop in student involvement. The suggestions include offering short instructional or walkthrough videos for students to access the LMS and often unstructured learning resources. Assigning group leaders or using teaching assistants to perform online group activities is also recommended. Also, selecting proper recording software and capturing shorter videos is suggested. They should avoid recording student discussions for privacy issues and participation instead of providing short informational or walkthrough videos for students to access the LMS and often unstructured teaching materials [50]. The study's outcomes add to the idea that students' Service Learning Requirement (SRL) competence, online activities, and attitudes significantly impact their continued desire to learn online after finishing a blended course. There were found to be mediated connections between these variables. Aside from the participants' views about online learning, their attitudes toward face-to-face learning significantly influenced their desire to attend online courses in the future. It'd be necessary for teachers to consider enhancing social connections and promoting students' capacity to regulate their learning and employ SRL techniques while designing online courses. Students' online learning experiences may improve as a result of this practice, and their attitudes about online education may enhance their desire to engage in online learning in the future. More significantly, supporting students in active learning toward a long-term goal will improve students' self-development, whether during their university studies or after graduation [48]. Students and educators shared the majority of positive and negative viewpoints; The opposing views outnumber the favourable ones, with instructors being more critical than students. The most positive group is 'Perceived usefulness.' In contrast, the most negative one is 'Technology.' Positive attitudes were related to the quality of one's life rather than one's studies [51]. As a result, PEDATI may be a guideline for lecturers to develop high-quality blended learning courses. This research also offers recommendations for lecturers or instructional designers who want to create a blended learning course. First and foremost, it is critical to establish precise, practical, and quantifiable learn-

ing objectives from the start. Second, breaking down the material into as many fragmented learning points as feasible is crucial. Third, depending on the features of the aims, materials, and state of an existing learning environment, it is essential to identify which learning aspects are appropriate to be provided via synchronous or asynchronous learning activities. Finally, utilising the LDAE framework to design the learning route, i.e., learning, deepening, applying, and evaluating activities, is critical to make the learning more interactive, engaging, and effective [27]. Connecting to the Internet, preparing learning materials, delivering lessons, engaging students in the class, and addressing individual student challenges are challenging tasks for the teacher-respondents. The following are the teacher respondents' worst experiences teaching via blended learning: students disregarding their messages, difficulties delivering the lesson, lack of resources for the experiment, and student academic dishonesty. The teacher respondents' actions as a result of the difficulties they have encountered are: Looking for a better internet service provider. Learning how to record video lessons. Using substitute materials for the experiment. Messaging the learners individually. Including a variety of activities for the learners. Maximising the use of the textbook. Reminding students to stick to the class schedule. The teacher-respondents took the following steps to deal with their worst experience teaching science using blended learning modalities: Addressing the current situation by providing students with their needs through video lessons, downloading videos from the Internet to understand the lesson better, reminding students that learning is the goal of education and that having scores that do not reflect their learning is a reflection of their personality. The best practices identified by the teacher-respondents were the preparation of video lessons, online quizzes and tests, use of the Learning Management System (LMS), accessibility of asynchronous teaching materials for all students, consideration of differences in the availability and speed of internet connection of the students, and the provision of activity after lessons [41]. Students were happy with all aspects, although the level of satisfaction varied by gender, and the majority of students were pleased with the technology utilised in blended learning [57]. Students' satisfaction and engagement levels did not meet the specified cut-off point for high commitment/satisfaction, indicating that student satisfaction and commitment levels were only in the centre of the range. The findings revealed a strong negative link between student happiness and GPA but a large positive correlation between student commitment and GPA [58].

4.2 FABLE Project Survey Findings

4.2.1 Insights About BL: Administration, Staff, and Students

Regarding the level of satisfaction with online/blended learning, admins are the most satisfied group (very satisfied and satisfied), 48 percent, followed by students, 46 percent, and faculty, 41 percent. The admins are the least unsatisfied (very unsatisfied and unsatisfied), 23 percent. The students and the faculty are more unsatisfied, 34 percent.

Regarding employing different interfaces for online learning, 31 percent of German respondents are neutral. Only 3 percent of respondents say these interfaces are complicated. Seventy-four percent of respondents believe using different online learning interfaces is easy. Overall, 86 percent of students stated that arranging diverse online materials and resources is simple, while 12 percent believe it is challenging.

Regarding faculty's level of satisfaction with online/blended learning in different countries, the most satisfied group, 71 percent (satisfied and very satisfied), is from Finland. The least satisfied group, 44 percent (very unsatisfied and unsatisfied), is from Hungary.

Next, the faculty's perspective on the effectiveness of online/blended learning in different countries, the most confident group, 71 percent (Confident and very confident), is from Finland. The least confident group, 61 percent (very sceptical and sceptical), is from France.

Next, the faculty's perspective on the needed time for online teaching in contrast with traditional instruction in different countries is studied. There

are 17 faculty from Finland, 13 from France, 41 from Germany, 28 from Hungary, and 40 from Spain. Twelve percent of Finnish faculty believe that blended learning is less time-consuming (less time-consuming and way less time-consuming). One hundred percent of French faculty consider that it is more time-consuming. Even there was not a single reply regarding "Way less time-consuming."

Considering the faculty's perspective about the benefits of the students in online teaching in different countries, 43 percent of survey participants from Finland believe there is no particular benefit in online/blended learning compared the traditional teaching. The advantages of BL, by viewpoints of admin, faculty and student are displayed in Fig. 4.

4.2.2 Level of Satisfaction with BL: Students vs Faculty vs Admin

The satisfied group is defined regarding the satisfaction level. The "satisfied" and "very satisfied" groups are considered satisfied. Fig. 5 contains the results concerning the student's and faculty's satisfaction levels. As the results indicate, there is no meaningful difference in satisfaction levels among students, faculty, and admins regarding the differences among these groups' satisfaction levels.

4.2.3 Level of Satisfaction with BL: Faculty by Country

The satisfied group is described regarding the satisfaction level. The "satisfied" and "very satisfied" are recognised as the pleased groups. Finnish faculty satisfaction level is 71 percent, respecting 65 percent of faculties in Finland are satisfied, and 6 percent are delighted. French faculty satisfaction

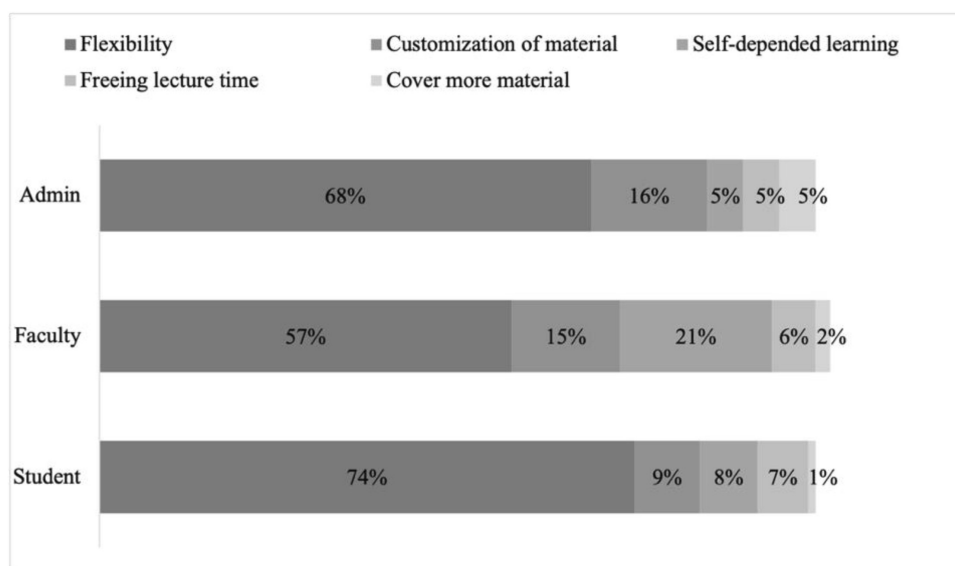


Fig. 4. Viewpoints of Admin, Faculty, and Student on the advantages of BL.

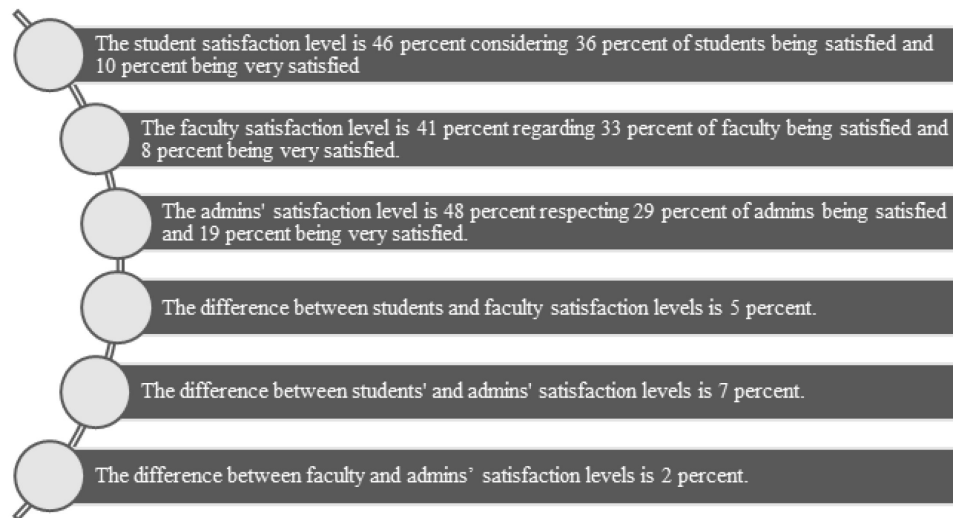


Fig. 5. The satisfaction level of students and faculty.

level is 23 percent, with 23 percent of faculty in France being satisfied and 0 percent being very satisfied. German faculty satisfaction level is 34 percent, with 27 percent of faculties in Germany being satisfied and 7 percent very satisfied. Hungarian faculty satisfaction level is 44 percent considering 37 percent of faculties in Hungary are satisfied, and 7 percent are very satisfied. Spanish faculty satisfaction level is 36 percent, respecting 24 percent of faculties in Spain are satisfied, and 12 percent are very satisfied. Finnish faculty, with a level of satisfaction of 71 percent, is undoubtedly the most satisfied, and French faculty, with a satisfaction level of 23 percent, is the least happy, Fig. 6.

4.2.4 Blended Learning Challenges

Regarding online/blended learning, the problematic issues are divided into social problems and technological obstacles. Online social presences, motivation, and procrastination are examples of

social problems. Among the technological hurdles are numerous interfaces, time management, and multiple resources. The survey findings explain that for 79 percent of students, the social challenges are the most challenging aspects of blended/online learning, compared to 27 percent of students who consider the social challenges the least challenging ones. Conversely, 73 percent of students responded that technological challenges are the least challenging features in blended/online learning, comparing 20 percent who believe that technical challenges are the most challenging ones. The survey findings emphasise that students' social challenges in blended/online learning are more significant than technological challenges, Fig. 7.

4.2.5 Faculty Perspectives on the Advantages of BL for Students

There are five benefits categories respecting faculty survey findings: (1) Better project work. (2) Better

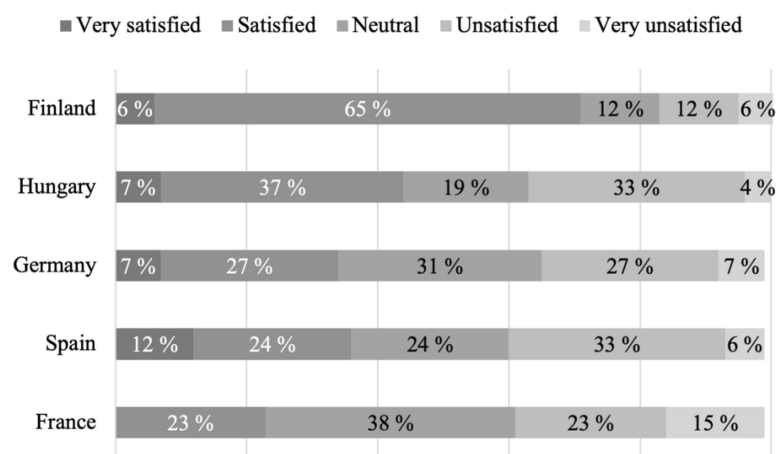


Fig. 6. The satisfaction level of faculty by Country.

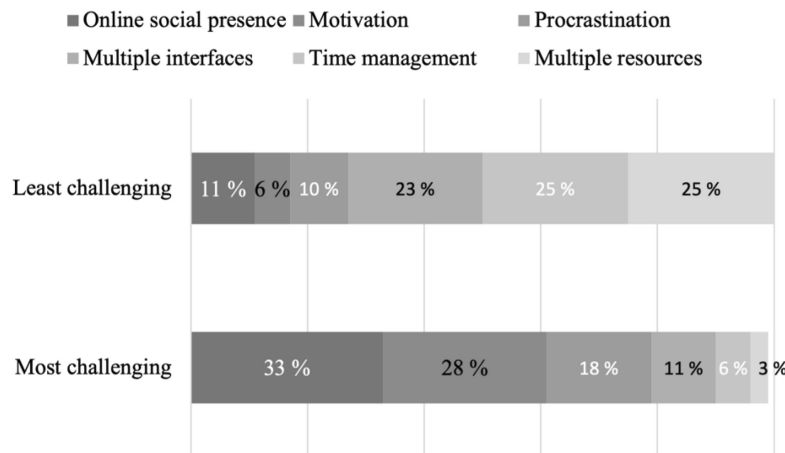


Fig. 7. Students' challenges in online/blended learning.

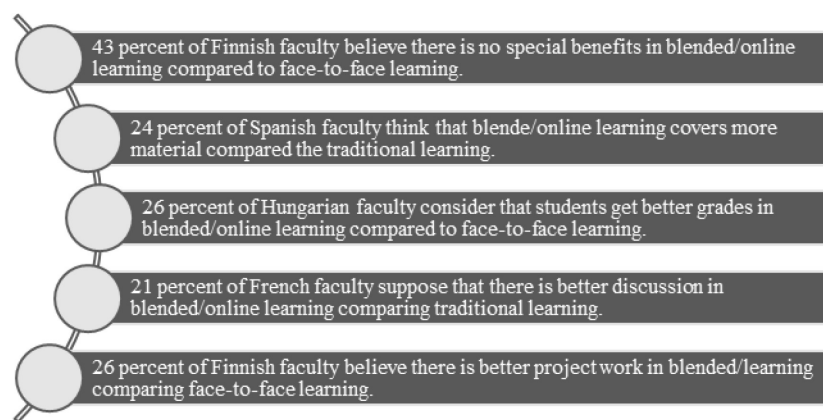


Fig. 8. Viewpoints of faculty on the advantages of blended learning for students.

discussion. (3) Better grades. (4) It covers more material. (5) No particular benefit. Fig. 8 shows the faculty's perspective on the benefits of blended learning for students.

5. Discussion

5.1 Summary and Discussion of the Main Findings

5.1.1 RQ1: Blended Learning Definitions

Researchers commonly use the phrase blended learning. However, what precisely do we imply when we state Blended Learning? Blended Learning generally refers to using technology to allow students to learn multiple times, places, and speeds. BL falls between face-to-face and online learning [4]. The definitions of Blended Learning are gathered in section 4.1.1, Table 2.

5.1.2 RQ2: Current Trends in BL

The papers published since 2020 are considered for studying the current trends in blended learning. Due to the research's start in July 2021, most articles are from the beginning of 2020 to the

second quarter of 2021, and only two papers were found for the third quarter of 2021. The most popular blended learning method is Whole Group Rotation, with 27 papers. The following popular approach is Individual Rotation, with 23 articles. Next, Flipped Classroom is discussed in 11 reports. The least popular blended learning method is Lab Rotation, with only four articles.

5.1.3 RQ3: Level of Satisfaction with BL: Students vs Faculty vs Admin

The FABLE survey results indicate no meaningful difference in satisfaction levels among students, faculty, and admins. However, the admin is the most satisfied, and the faculty is the least satisfied group. The survey results demonstrate that 46 percent of students are satisfied with BL. Previous papers support the study result with students' satisfaction levels of 41.3 percent and 54 percent [54, 62]. The study results illustrate that the faculty satisfaction level is 41 percent. Earlier studies do not support the paper's finding with a satisfaction level of 88 percent [59]. Based on the survey results,

the admin satisfaction level with BL is 48 percent, and we could not find any similar studies regarding the admin satisfaction level. Previous studies mainly focused on students' and instructors' satisfaction levels.

5.1.4 RQ4: Level of Satisfaction with BL: Faculty by Country

The survey findings point out that Finnish faculty, with a level of satisfaction of 71 percent is undoubtedly the most satisfied, followed by Hungarian faculty, with a satisfaction level of 44 percent, following Spanish faculty, with a 36 percent satisfaction level, German faculty satisfaction level of 34 percent, and French faculty with a satisfaction level of 23 percent is the least satisfied group. There are a few studies regarding faculty satisfaction levels by country. A study in India indicated that 36.9 percent of the instructors stated they were satisfied with the online teaching experience [63].

5.1.5 RQ5: Social and Technological Challenges Students Face in BL

The survey findings explain that for most students, the social challenges are the most challenging aspects, and technological challenges are the least challenging features of blended/online learning. The survey findings emphasise that students' social challenges in blended/online learning are more significant than technological challenges. The previous studies indicated most students were pleased with the technology utilised in blended learning [57].

5.2 Limitations

Several limitations to this study need to be addressed to consider the findings more objective. The selection of primary studies and data extraction might have been affected by researcher bias. The primary studies' selection may have been affected due to an incorrect interpretation of the inclusion criteria. Next, four primary general educational research databases with a worldwide scope were searched, including Springer Link, Google Scholar, LUT Primo, and IEEE Xplore. However, because this review was based on papers published in English, research published in languages other than English was excluded. Because most of the respondents in this study are German students, staff, and faculty members, there is a chance that the opinions of German university faculty substantially influence the study's findings. Since the current study only included six European countries, the findings may not apply to larger populations or other non-European countries.

5.3 Feature Work

Additional research may be carried out by concentrating on other countries, universities, and faculties. Comparing study results with fresh interviews and surveys might be used to further research. The leading scientific literature digital libraries listed below were chosen based on previous studies: Springer Link, Google Scholar, LUT Primo, and IEEE Xplore. Other digital libraries might be utilised in future research. Further research is recommended for broader insights, in which a more homogeneous number of individuals from various countries and universities participate.

6. Theoretical Contribution and Practical Implication

The study reviewed recent articles regarding blended learning trends. Here are four popular approaches in blended learning: Whole group rotation, Lab Rotation, Flipped classrooms, and Individual rotation. The Whole group rotation and Individual rotation are the most popular approaches. Regarding the FABLE project survey's findings: There is no significant gap between student and faculty satisfaction levels. Respecting faculty satisfaction levels in different countries, the Finnish faculty is undoubtedly the most satisfied, and the French faculty is the least happy. The administrative choice to adopt BL is influenced by two external elements, including the institution's ambition and intentions. According to the study survey results, slightly less than half of the faculty members believe there is no particular benefit in blended online learning compared to face-to-face learning. This is while a quarter of Spanish faculty believe that BL covers more material compared to traditional learning. A similar share of Hungarian faculty mentioned that students get better grades in BL than in traditional learning. In France, almost one-fifth of the faculty believe that discussions in blended learning are better than online learning. Nearly a quarter of Finnish Faculty mentioned that proper work outcome in blended learning is better than in face-to-face learning.

This research provides administrators and instructors with practical suggestions for addressing the need for improving the students' satisfaction level in blended learning environments. Even though technological issues appear to be the most challenging aspects of blended learning, social problems are the most challenging facets of blended learning. The instructors could concentrate on social issues such as online social presence, motivation, and procrastination while still considering technological challenges, for instance, numerous interfaces, time management, and multiple resources.

7. Conclusions

The paper examined recent articles regarding current blended learning trends by systematic mapping studies, parallel to the Erasmus Training Faculty on Blended Learning (FABLE) project surveys' findings from administrators, professors, and students in six European universities across Finland, Germany, France, Hungary, and Spain to analyse how online learning affects faculty and students. The study's secondary goal was identifying students' social and technological challenges regarding the survey results, which were part of the FABLE project. The authors compared the survey results from the partner universities.

A set of worldwide standards has been produced regarding culture and educational techniques. Any educational institution or organisation can use these criteria to assist them in accomplishing their goals in student-centred learning in their present delivery format. Discipline distinctions should be considered while developing the most effective blended learning courses. After controlling for gender and prior learning achievement, the data suggest that clear objectives and expectations, material quality, and interactive learning significantly impact students' success. Despite their statistical non-significance in the study, these crucial components indicate the instructor's support, feedback, and facilitation effort. Teachers use asynchronous and synchronous technologies to test pupils, provide feedback, and create real-time and asynchronous communication channels. Blended learning combines the advantages of both in-person and online learning.

In synchronous meetings, instructors face technological challenges, privacy concerns, and education (facilitating) group activities, whereas in asynchronous sessions, teachers face classroom interaction, video duration, and more time to prepare. Considering students' challenges in blended learning, social challenges such as low motivation, poor socialisation, and high procrastination are the most challenging aspects. Previous research has found that online course load has varying effects on student performance as measured by grades depending on student demographic categories. Furthermore, students who take all their classes online are less likely to re-enrol in the following term, according to retention data. This is while these research results are not entirely aligned with previous studies, and the findings highlight the need for greater research to understand better the factors that impact student accomplishment in diverse circumstances and demographic groups. According to survey data, virtual schools outperform traditional schools in fostering active learning, effectively communicating, managing a classroom, and providing high-quality education. When building online courses, professors should consider boosting social connections, promoting students' right to control their learning, and employing SRL strategies. As a result of this technique, students' online learning experiences may improve, and their views about online education and motivation to engage in online learning in the future may improve. Supporting students in active learning toward a long-term goal, whether during their university studies or after graduation, will boost their self-development.

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