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Hyflex use and its implications in higher education between 2014-2022: A Systematic Literature Review.

Rocío Vélez-Rivera[1][https://orcid.org/0000-0003-2758-4782], Diana Muñoz-Álvarez[2][https://orcid.org/0000-0002-1812-9289]

Priscila Leal-Orellana[3][https://orcid.org/0000-0002-3489-3631], Alejandra Ruiz-Garrido[4][https://orcid.org/0000-0003-0940-1583]

[1] Universidad del Desarrollo, Santiago, Chile
rociovelez@udd.cl

Abstract. This article presents a systematic literature review to identify the characteristics, benefits, and difficulties of using HyFlex in higher education, between 2014 and 2022. After a search process in Web of Science and Scopus, and the selection and extraction of data, from a total of 717 articles, 17 investigations were analyzed in depth. The Hyflex model emerged in 2006, but boomed during the pandemic between 2021-2022, with a concentration of 76% of the research between these years. Forty-seven percent of publications were generated in the United States, while the remaining 53% were distributed among 6 countries. This article contributes to an update of the elements linked to the application of the Hyflex model in higher education, considering its variations according to the institutional needs and the decisions linked to the formative management to maintain its use in educational institutions in post-pandemic training.

Keywords: Hyflex, higher education, technology, pandemic.

1 Introduction

Hyflex is understood as a pedagogical design model that allows for flexible student participation, enabling them to attend in-person and synchronous sessions or complete learning activities online (Beatty, 2019). Its origins in higher education can be traced back to 2006, but its primary utilization occurred during the COVID-19 pandemic (Yi et al., 2020), when the use of technological tools became essential to conduct classes while adhering to reduced capacity guidelines imposed by health protocols (Williamson et al., 2020). This model provided the opportunity to conduct in-person and synchronous classes in the classroom with a small group of students while also including the participation of another online group.

This article presents a systematic literature review (SLR) aimed at identifying the characteristics, benefits, and challenges of using HyFlex in higher education between

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2014 and 2022. Primary studies related to the utilization of HyFlex in higher education were collected using a rigorous and structured methodology, allowing for the identification, analysis, and interpretation of the gathered evidence (Carrizo et al., 2018).

2 Theoretical framework

The original design of HyFlex proposed by Brian Beatty in 2006 consisted of four essential elements: 1. Student choice, where students have the option to attend classes in-person or virtually, synchronously or asynchronously; 2. Equivalency, providing the opportunity to attend either in-person or virtually with equivalent activities in each case; 3. Reusability, allowing for the reuse of activities across different modalities; 4. Accessibility, granting students access and the necessary technological skills for their participation (Beatty, 2019).

Since the pandemic, a significant number of students started participating in online and hybrid classes, giving rise to various terms for these modalities (Margaret et al., 2021). Among these modalities, the Hyflex model, which allowed students to attend both in-person and remotely, emerged during this period (Rosillo and Montes, 2021).

3 Method

To conduct this SLR, an analysis protocol was developed, based on the work of Ramírez-Montoya and Lugo-Ocando (2020), to ensure objectivity and rigor in the study. The protocol consisted of the following phases: "1. research questions; 2. search process; 3. inclusion and exclusion criteria; 4. selection and data extraction process; 5. data synthesis" (p. 12).

The review was guided by eight questions that provided data on the identification of HyFlex implementation, description of the model in each case, origin, benefits, and challenges. The search was conducted in the WoS and Scopus databases using the keywords "HyFlex" and "education" for the period between 2012 and 2022. Only journal articles available in open access and in any language, were included.

For the selection and data extraction process, initially, 727 publications (285 from WoS; 442 from Scopus) were identified on the topic of HyFlex. After applying the first filter for education, 603 documents were excluded as most of the publications focused on a dental strategy with the same name. By applying additional filters, including the last 10 years (2012-2022), selecting only journal articles, and removing duplicate articles, 57 publications remained. These publications were analyzed to identify their relevance and pertinence, resulting in the selection of only those focused on higher education. Out of the total, 40 publications were discarded, leaving 17 articles for in-depth analysis.

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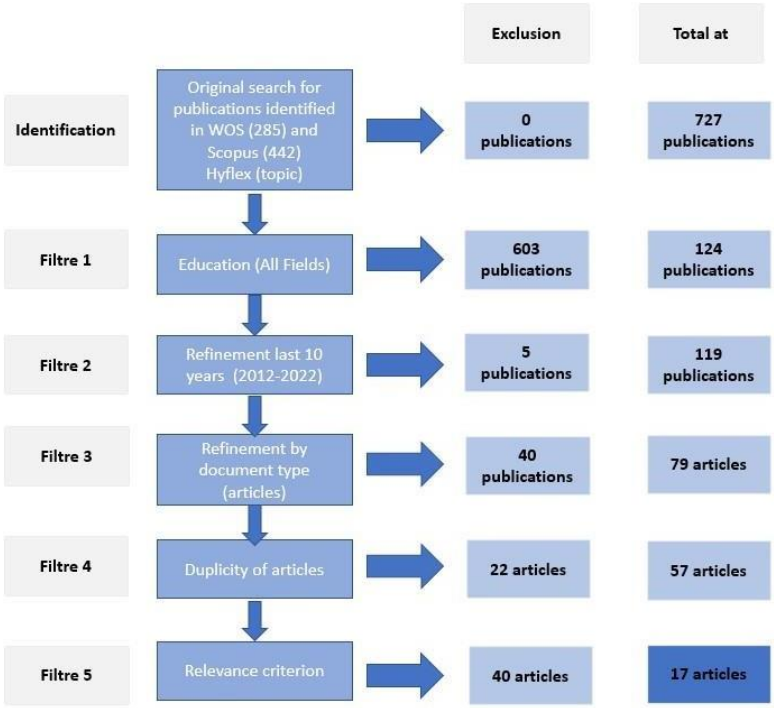

Fig. 1. Search and article selection process.

4 Results

Table 1 presents the results obtained for each of the questions that guided this review, grouped by categories.

Tabla 1. Results by research question.

Categorization of questions.	Research questions (RQ).	Key findings.
1. Identification data.	RQ1. Year of publication.	76% between 2021-2022.
	RQ2. Country of publication.	47% in the EEUU; 53 % remaining: Canada, China, England, Mexico, India, and Nigeria.
	RQ3. Level of HyFlex implementation.	41% undergraduate; 41% not reported; 12% postgraduate; 6% undergraduate-postgraduate.
	RQ4. Modality employed.	41% quantitative; 41% mixed; 6% qualitative; 12% not reported.

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2. Use of Hyflex.	RQ5. Modality employed.	100% in-person and synchronous online, of which: 41% asynchronous online; 94% student choice flexibility.
3. Origin, benefits, and difficulties with the use of HyFlex.	RQ6 Needs addressed by HyFlex implementation.	50% inability to attend classes; 15% maintaining social distancing; 15% increasing educational opportunities; 5% returning to in-person format; 5% avoiding learning loss; 5% promoting more student interaction; 5% enhancing student engagement, commitment, and support.
	RQ7 Reported benefits of HyFlex utilization.	25% Flexibility in selecting modality; 14% increased peer communication; 14% improved access to educational content and materials; 11% enhanced student participation and engagement; 3.5% flexibility in returning to in-person format; 3.5% greater engagement in learning; 3.5% use of Zoom tools; 3.5% student preference for online format; 3.5% improved academic performance; 3.5% increased technological literacy; 3.5% continuity of academic education; 3.5% academic and emotional support for students; 3.5% development of critical thinking and clinical judgment; 3.5% initial enthusiasm from teachers.
	RQ8 Difficulties reported with the use of HyFlex.	29% technical difficulties; 13% lack of teacher training; 8% less efficient than in-person format; 8% difficulty in conducting activities with online students; 8% issues with verbal and non-verbal communication; 4% increased uncertainty; 4% higher demands on teachers; 4% more distractions for teachers; 4% decreased interpersonal relationships; 4% dissatisfaction among online students; 4% low level of student commitment; 4% additional workload for teachers.

5 Discussion

The flexibility to choose the mode of class participation is undoubtedly the greatest contribution of the HyFlex modality. However, the difficulties revealed by this study cannot be overlooked, such as the lack of information due to the limited amount of available literature (Nelson, 2022). Despite having technological knowledge, teachers do not always successfully achieve the teaching-learning process (Díaz et al., 2021), highlighting the importance of combining the use of technology with appropriate pedagogy, as noted by Mantooth et al. (2021).

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Furthermore, a well-designed HyFlex class does not guarantee a successful session, as students' experience could be affected by technical issues or their limited understanding of digital literacy in educational environments, despite their proficiency in using technological tools and social media (Hémbuz et al., 2021).

6 Conclusions

This review identified various uses of HyFlex, acknowledging its use prior to the pandemic and its widespread adoption to address the restrictions imposed by the health emergency. The reporting of different nomenclatures and modalities, beyond the basic option of in-person and synchronous online, demonstrates how the model adapted to the diverse academic realities of universities.

Primarily, the analyzed studies focus on participant perception, mainly exploratory and descriptive, revealing differences between pre- and post-pandemic research. Further research is necessary to assess the impact of HyFlex in higher education and the decision-making associated with educational management to sustain its use in educational institutions after the pandemic has ended.

7 Limitations and Future Research

A limited number of articles were analyzed due to the recentness of the topic and open access restrictions. It is expected that this research can be replicated in 2024 to make further contributions to knowledge.

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