Covid-19's impact on virtual education: Directions for future research

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Abstract: The presented paper systematically explores the virtual education domain considering the ongoing Covid-19 pandemic. The major aim is to provide information about current key factors in virtual education and reveal gaps for future research. To define the conceptual structure of the virtual education domain, we used bibliometric analysis, together with multiple correspondence analysis and clustering of a bipartite network. The results showed key factors that are addressed in virtual education at the time of the Covid-19 pandemic. The analysis also showed three major clusters of key factors in the virtual education domain - virtual education factors, virtual education organisation and platform selection. It has also revealed gaps in current research, such as changes in curricula considering virtual education, the role of platform selection, verification of factors identified in this paper (e.g., a meta-analysis of factors that affect virtual education), teachers' perspectives on virtual education and focus on lower levels of education.

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Introduction

Like any other sector, Covid-19 noticeably affected education (Abidah et al., 2020). Many countries suspended face-to-face education and examination. Traditional ways of education were overnight transferred to the virtual environment (Gonzalez et al., 2020) and it led to a digital revolution in education (Sutton and Jorge, 2020).

The Covid-19 influence on virtual education in various fields is very topical. In the last year, there has been an increasing amount of literature on virtual education. However, none of the current researches have mapped the entire virtual education domain. So far, only Rodrigues, Franco and Silva (2020) concerned with mapping the scientific literature in education, management of business and similar areas, and how teaching institutions have adapted to Covid-19, but their bibliometric analysis is narrowly focused. To fill a research gap related to key factors addressed in virtual education, our major research question is: what are the key factors addressed in virtual education at the time of the Covid-19 pandemic? The paper systematically reviews the domain of virtual education, aiming to provide information about current key factors in virtual education and reveal gaps for future research. From this perspective, we are the first addressing this issue.

Materials and methods

Searching

We used the bibliometric analysis to cover important factors in the virtual education during the current pandemic. This method is particularly useful in science or domain mapping, to show the underlying factors and connections between them (Aria and Cuccurullo, 2017). First, we got records from the Web of Science (WOS). We retrieved the data on February 23rd, 2021. To obtain references we used the following search query:

TS = (teaching OR learning OR studying OR education) AND TS = (virtual*) AND TS = (covid 19 OR pandemic OR covid OR coronavirus) AND PY= (2019-2020)

The initial search returned 1,151 references. The process of selecting records can be seen in the Figure 1.
We removed articles without abstract and non-English articles. To bibliometric analysis, we included records indexed only in selected categories. We chose these categories to better describe virtual education from the perspective of education research (to eliminate the impact of health, medicine, etc. publications).

Figure 1: PRISMA diagram, based on Moher et al., (2009)

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Records identified through WOS
database searching
(n = 1,151)

Excluded Records:
Non-English articles (n = 99)
Article without abstract (n = 36)

Records only in the WOS categories:
Education Scientific Disciplines
Education Educational Research
Psychology
Psychology Multidisciplinary
Psychology Educational
Behavioral Sciences
Multidisciplinary Sciences
(n = 220)

Records included in bibliometric
analysis B
(n = 220)
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Bibliometric analysis

We conducted the bibliometric analysis in RStudio using the Bibliometrix package by Aria and Cuccurullo (2017). To begin this process, we load and convert the data, created a bibliographic data frame, ran the bibliometric analysis, and extracted WOS keywords plus. To analyse conceptual structure, we used a multiple correspondence analysis and K-means clustering of a bipartite network of terms extracted from WOS keywords plus (Aria and Cuccurullo, 2017).

Accompanying materials

To contribute to the transparency, reproducibility and robustness of this paper, all accompanying materials are open (e.g., data, script, poster, full text and figures in better resolution). Scan QR code to access accompanying materials at Open Science Framework (OSF) - https://osf.io/3snk7/.
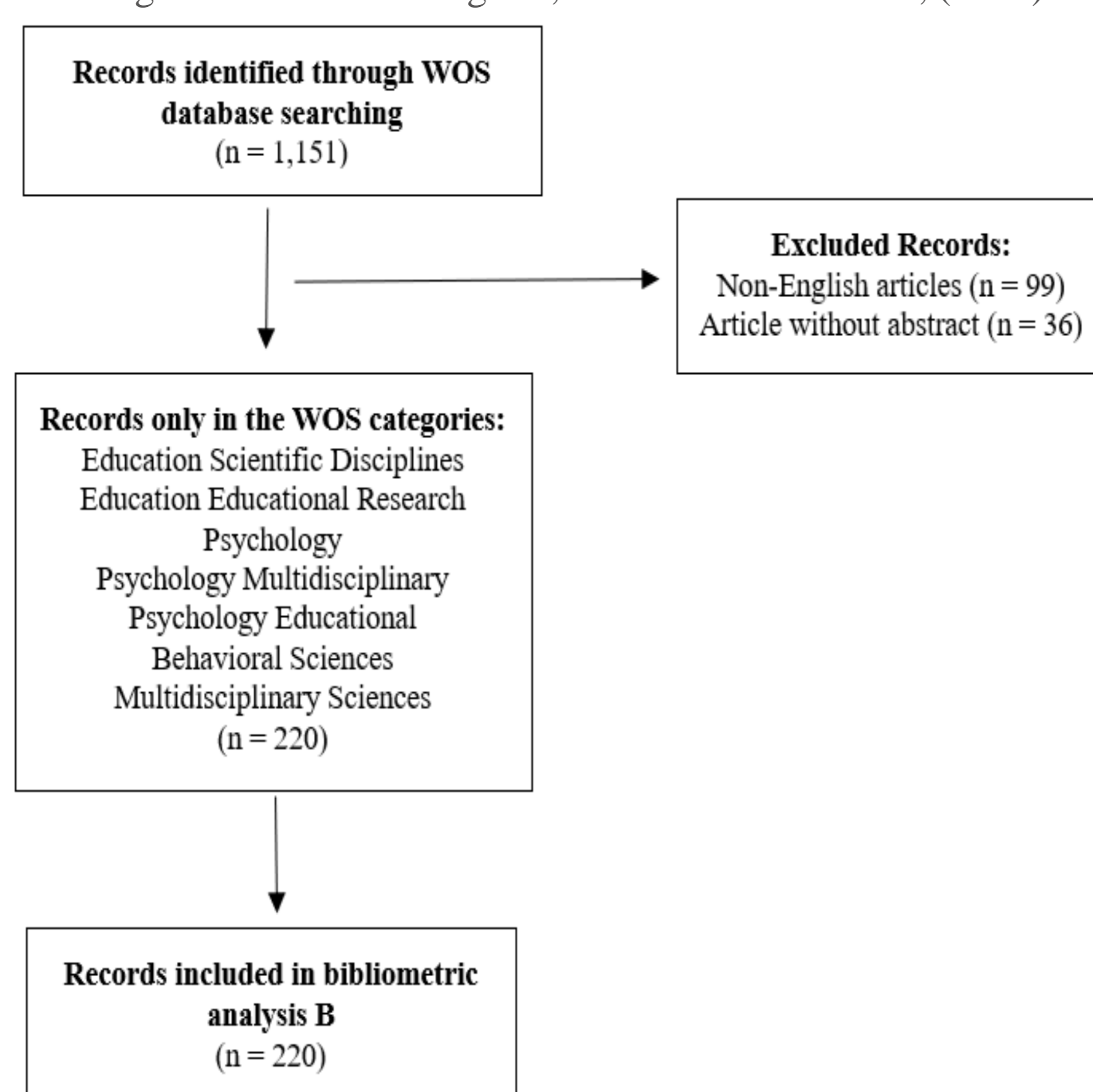
Figure 2: QR code

Results

Multiple correspondence analysis and clustering generated three clusters of the virtual education domain (Figure 3). Clusters represent key factors addressed in the virtual education domain at the time of the Covid-19 pandemic.

In the blue cluster, called virtual education factors, are the most popular factors in the virtual education domain. The red cluster show factors connected to virtual education organisation. Within that cluster, scientists dealt with factors related to curriculum, educational programs, organisation of classrooms and lectures, and the overall future of virtual education. Finally, the green cluster relates to platform selection. Scientists within that cluster paid attention to a platform selection for transferring knowledge to students.

Figure 3: Topic dendrogram of virtual education domain (own calculation)
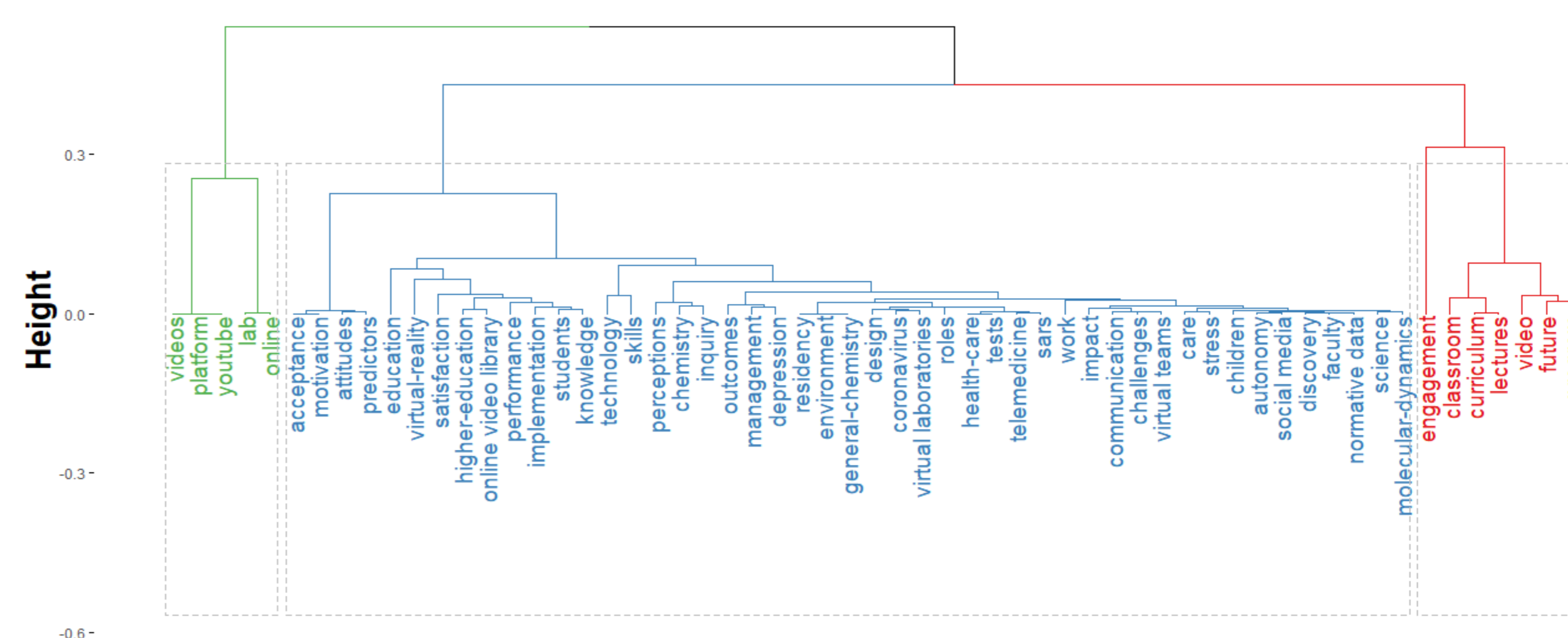
Conclusion

The results of this paper showed the key factors that are addressed in virtual education at the time of the Covid-19 pandemic. We detected three major clusters in the virtual education domain in the last year - virtual education factors, virtual education organisation and platform selection.

Further researches should explore: (1) what changes are necessary in the organisation of virtual education (for example curricula change), (2) what role does platform selection play in virtual education, (3) find whether there is an effect between factors identified in this paper and determine whether the effect is negative or positive (e.g. a meta-analysis of factors that affect virtual education) (4) investigate factors identified in this paper to determine how they affect the acquisition of knowledge, performance and satisfaction of students and teachers, (5) study the effect of previous experiences in virtual education on outputs, results and well-being, (6) focus on the teachers' perspective on virtual education, (7) focus on lower levels of education.

The limitation of this paper is the bibliometric approach itself. We used only articles indexed in WOS for the bibliometric analysis and for multiple correspondence analysis and clustering used only keywords-plus. While considering these limitations, this paper lays the basis for future research in virtual education.

References

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