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Review

Scientific Review and Annotated Bibliography of Teaching in Higher Education Academies on Online Learning: Adapting to the COVID-19 Pandemic

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Abstract: Since COVID-19 first appeared, e-learning has become more and more common. In order to understand gender disparities in e-learners' self-efficacy, satisfaction, motivation, attitude, and performance globally, this study will look at these variables. Many educational institutions have been forced to close due to the sudden COVID-19 outbreak, and many students have been forced to stay at home and take online courses. With the recent COVID-19 pandemic underway, there were challenges with STEM (Science Technology Engineering and Mathematics) modules and other teaching contents due to practical laboratory sessions and workshops required. Thus, the need to understand teaching style, online learning and its role in promoting a variety of desirable academic outcomes, such as increased achievement and decreased dropout rates, as well as various well-being and life outcomes, has advanced significantly. In this paper, the scientific review on teaching in Higher Education Academies (HEA) for online learning is presented with their frontiers towards sustainable education. The current work also gives an annotated bibliography that aims to consolidate and synthesise the literature on student engagement, online learning, social media, and teacher learning/training. Some conclusions and recommendations were also made on the study.

Keywords: teaching; higher education academy (HEA); learning; COVID-19; STEM; online learning; sustainability; systematic review; annotated bibliography; education; cultural difference; group

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1. Introduction

Since COVID-19 first appeared, e-learning has become more common [1–7]. In order to understand disparities in e-learners' self-efficacy, satisfaction, motivation, attitude, and performance globally, an annotated bibliography on related studies that looks at these variables is necessary. Many educational institutions have been forced to close due to the sudden COVID-19 outbreak, and many students have been forced to stay at home and take online courses [8–14]. With the COVID-19 epidemic underway, there were challenges with STEM (Science Technology Engineering and Mathematics) modules due to practical laboratory sessions and workshops required [15–20]. Without regard to their physical location, e-mentoring enables teachers to communicate with students via email, online chat, and bulletin boards. As a result, when students feel engaged in an activity, they are better able to develop their own knowledge. The need to have better teaching styles, teaching tools, and effective teachers globally that will continue to foster quality education is the bedrock of any Higher Education Academy (HEA). To ensure that learners can benefit from mentoring, it is crucial to comprehend learners' attitudes regarding online mentoring. Feedback can come from both the mentors and the students. Reflecting on student feedback and the use

of e-study as digital tools for teaching, such as e-boards, projectors, public address systems, and state-of-the-art lecture e-kits, are highly emphasized in Higher Education Institutions (HEI). Having these teaching aids, the student can download teaching notes as electronic files or use their mobile phones to record the lecture notes so they can be revised as their own files later.

One of the primary challenges that educational institutions and libraries face is the availability of annotated bibliographies that cover teaching methods in HEAs. Annotated bibliographies could be used to identify knowledge gaps, such as understanding student engagements by using studies on the lack of participation against high-level participation of students. However, some other annotated bibliographies present different levels of course-based teaching in English [21–27], but there is a gap for general teaching in HEAs. Also, there are other annotated bibliographies on different fields ranging from areas of teaching [28], virtual exchange [29], STEM teacher education [30,31], gender bias [32], digital library [33], plagiarism in engineering [34], online learning [35], technical education career [36], curriculum design [37], engaged learning [38], group works [39], business models [40,41], economics of education [42], scheduling [43], forecasting [44], algorithms [45], distance learning [46,47], sociology [48,49], greedy randomized adaptive search procedure (GRASP) optimisation [50], geological lineation [51], to health [52]. However, there is a need to sustain the quality of teaching in HEAs. To address this challenge, the authors outlined strategies for communicating the purpose and value of the discussion, setting clear expectations for responses, and designing a structure for the discussion. Another aspect of teaching is online learning, which has recently increased globally due to the COVID-19 pandemic [20,52]. Higher education institutions started using the internet as an alternate learning environment in addition to traditional teaching and learning methods in front of classes about 30 years ago [53]. For students and educators that actively participate in online courses, this type of environment continues to provide significant obstacles, thus, there is a need to include these themes in an annotated bibliography. Some studies reviewing best practices adapting to the COVID-19 pandemic in teaching also presented some lessons learnt [53–57]. The pandemic has availed us to have new perspectives, and lessons have been learnt by institutions as well as their teacher educators during COVID-19 [58–62]. Despite the enormous hurdles during the pandemic, there are positives that will endure over the long term. Due to COVID-19, our entire educational system and organisational structure had to transition to fully remote communication and online learning [63–67]. This means that all the teachers, instructors, and students have to understand that technological improvements need to urgently and significantly help address our sustainability challenges given how swiftly they have spread around the world. It is pertinent that the teachers understand student engagement and determine how learners feel about teaching. This could be adaptable, from having blended learning, online mentoring, to group learning studies. However, the latter is covered in another publication [67] of this annotated biography on teaching in HEAs.

In this paper, the scientific review with an annotated bibliography on teaching in HEAs covers themes on teaching and learning, presented with their frontiers towards sustainable education. Section 1 introduces the study and covers related studies on student assessments, teaching curriculum, and online learning, while Section 2 presents the methodology for the annotated bibliography. Section 3 presents the scientific literature review with scientometric review on teaching in HEAs and lessons from the COVID-19 pandemic. The current work, an annotated bibliography that aims to consolidate and to synthesise the literature on teaching style, is presented in Section 4. Section 5 presents the conclusions on the study. The study presents literature on learners' attitudes toward online learning to enable teachers to achieve better understanding of the students and it will serve as a reference guide for educators.

2. Materials and Methods

This section covers the materials and methods adopted for this annotated bibliography on the teaching style in Higher Education Academies (HEA). To obtain this data, the search was obtained from existing repositories from various institutions from annotated bibliographies and from the Scopus database. Scopus was selected because it has broader range of coverage, it is faster in indexing processes, and it has more recent publications on the literature search. Using the Scopus database, 88 documents were obtained and included in this annotated bibliography in this subject area. The search syntax used in Scopus was "teaching AND higher AND education AND academy AND online AND learning OR COVID-19", as shown in Figure 1 showing the methodology for obtaining the data used, and the search results from the Scopus database are shown in Figure 2.

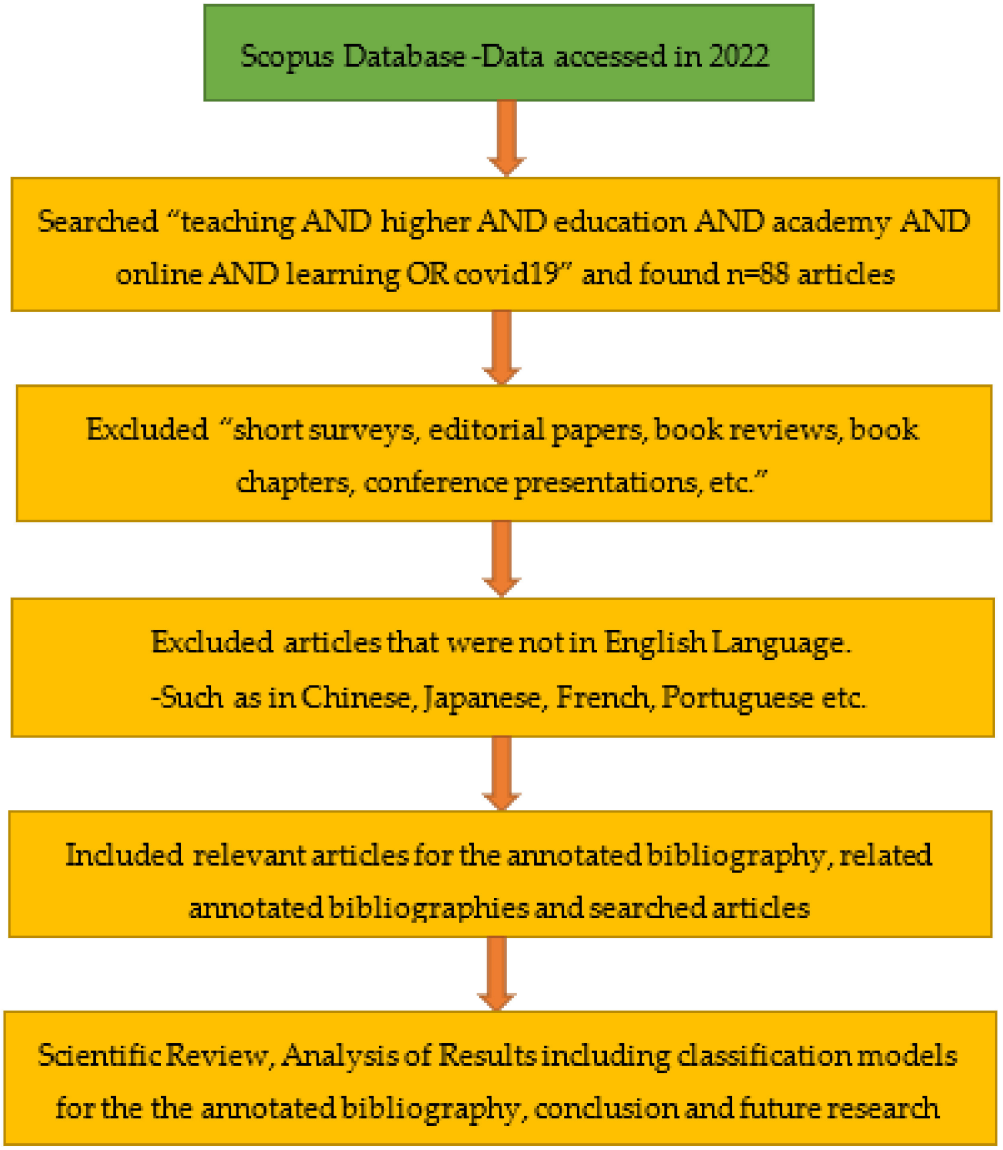

Figure 1. Methodology for the annotated bibliography on the search phrase "teaching AND higher AND education AND academy AND online AND learning OR COVID-19".

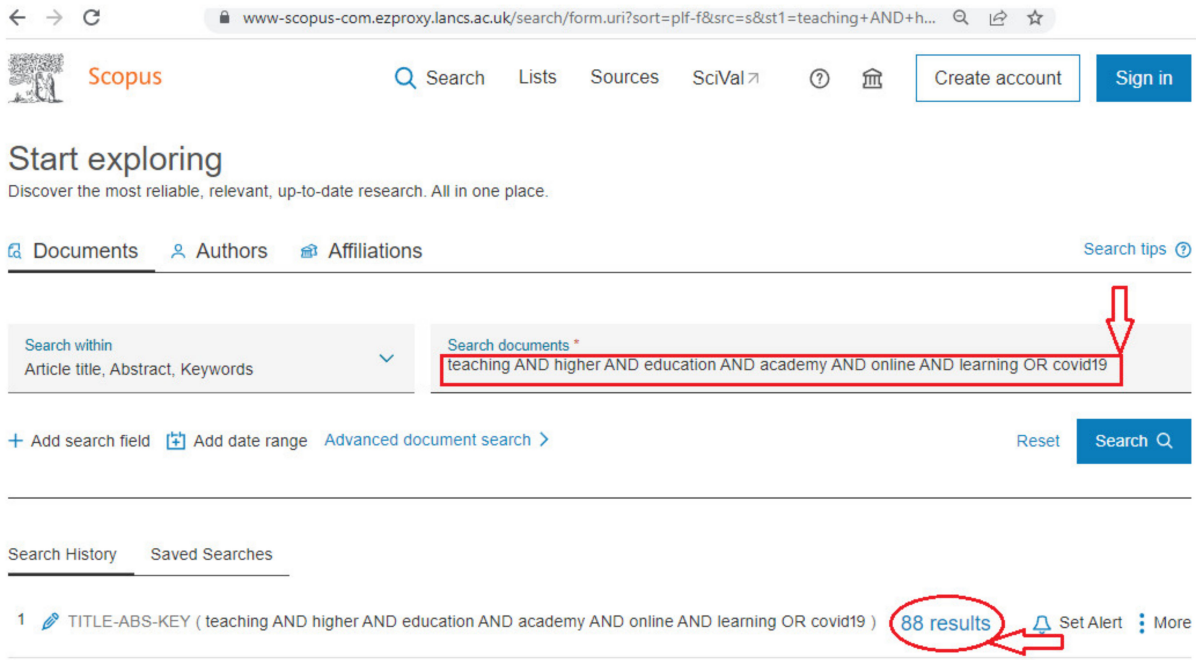

Figure 2. Scopus database supplied by Lancaster University UK showing the search phrase "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" for the annotated bibliography on the meta-analysis of 88 publications.

3. Scientific Review and Scientometric Analysis on the Annotated Bibliography

In this section, the scientific review and scientometric analysis were conducted for the annotated bibliography on teaching in higher education academies based on the research themes. In this study, the research trends were investigated from the publication history, the publication classification, the subject area, the publication by country, journal range, the author keywords, and the publication by affiliations. To understand the research pattern on teaching in HEAs, data were retrieved from Scopus and are presented in the findings in Figures 3–10.

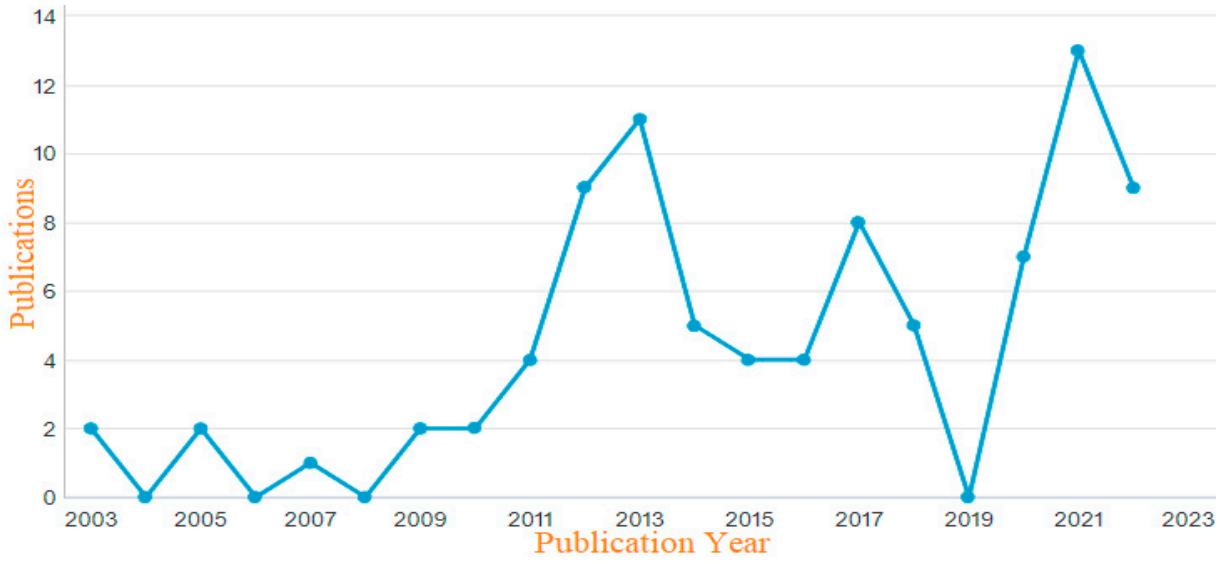

Figure 3. Results of publication records for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022).

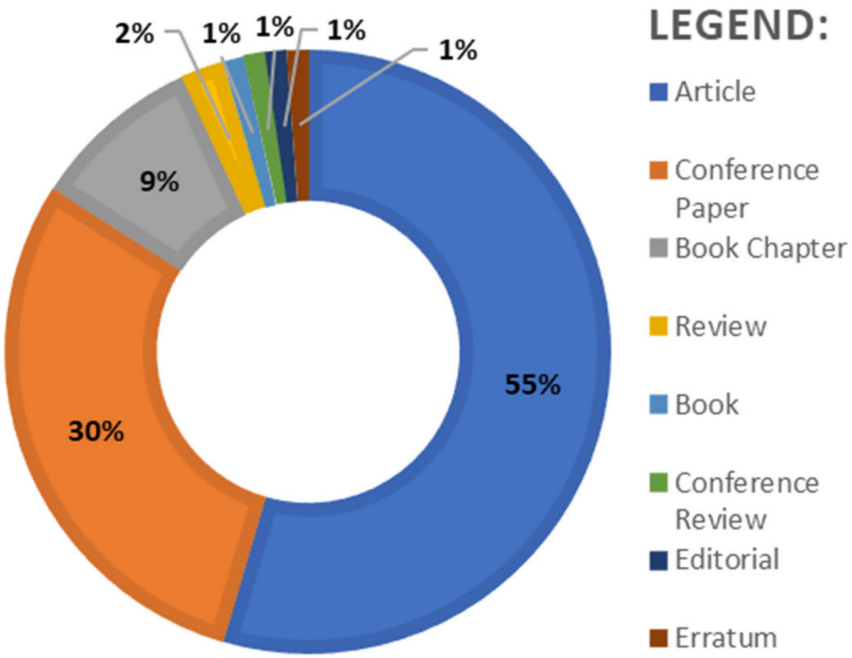

Figure 4. Results of publications by subject area for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022).

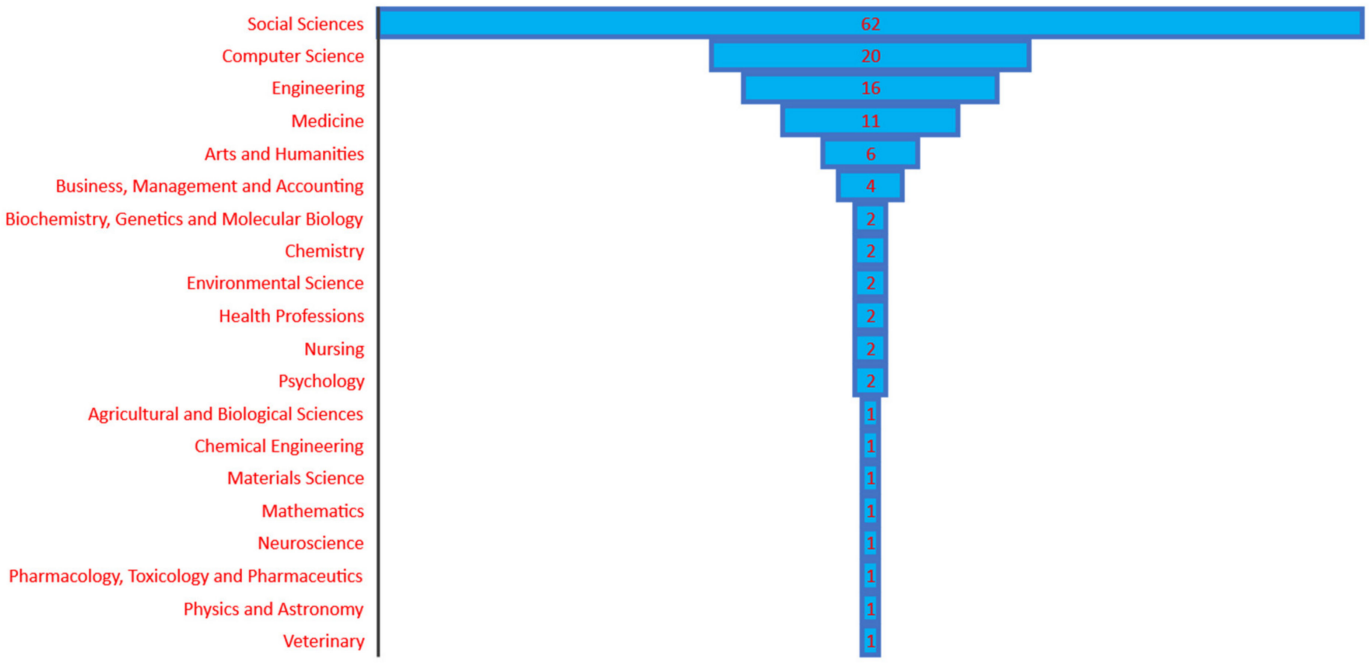

Figure 5. Results of publications by classification (or type) for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022).

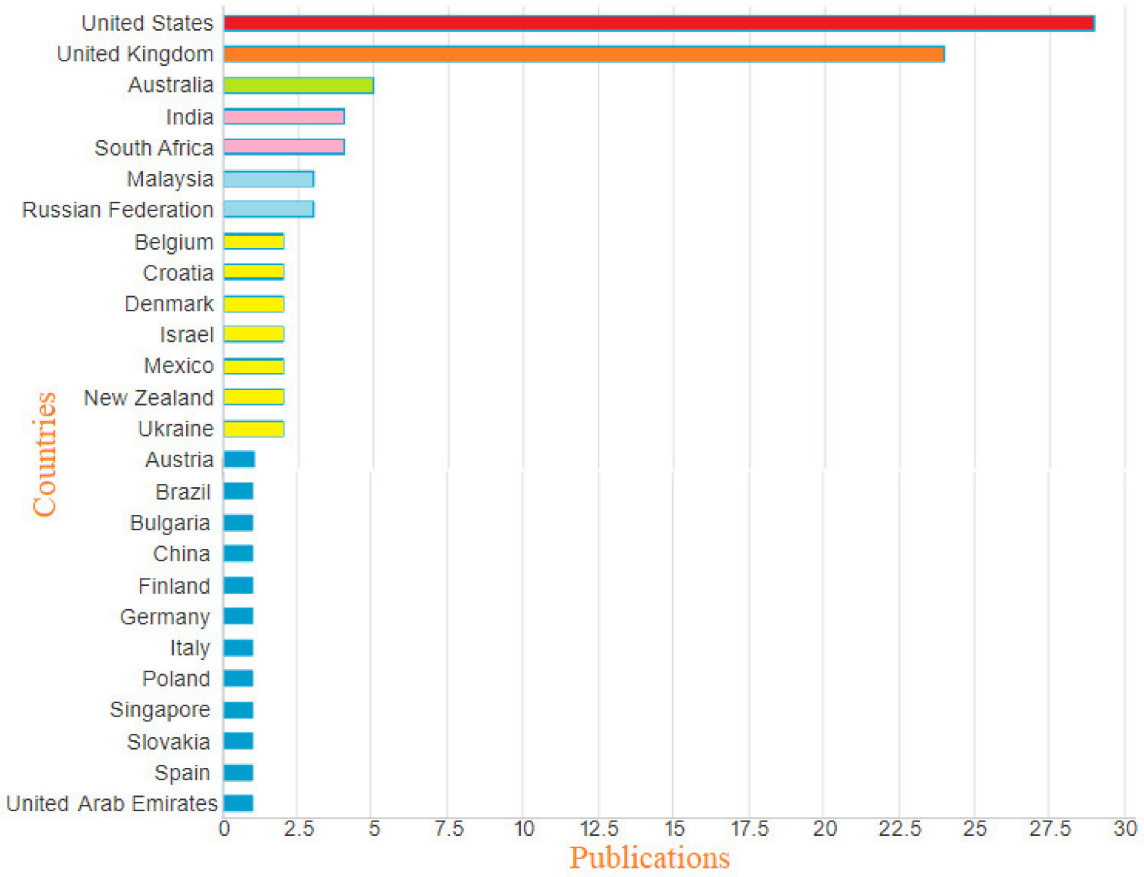

Figure 6. Results of publications by countries for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022).

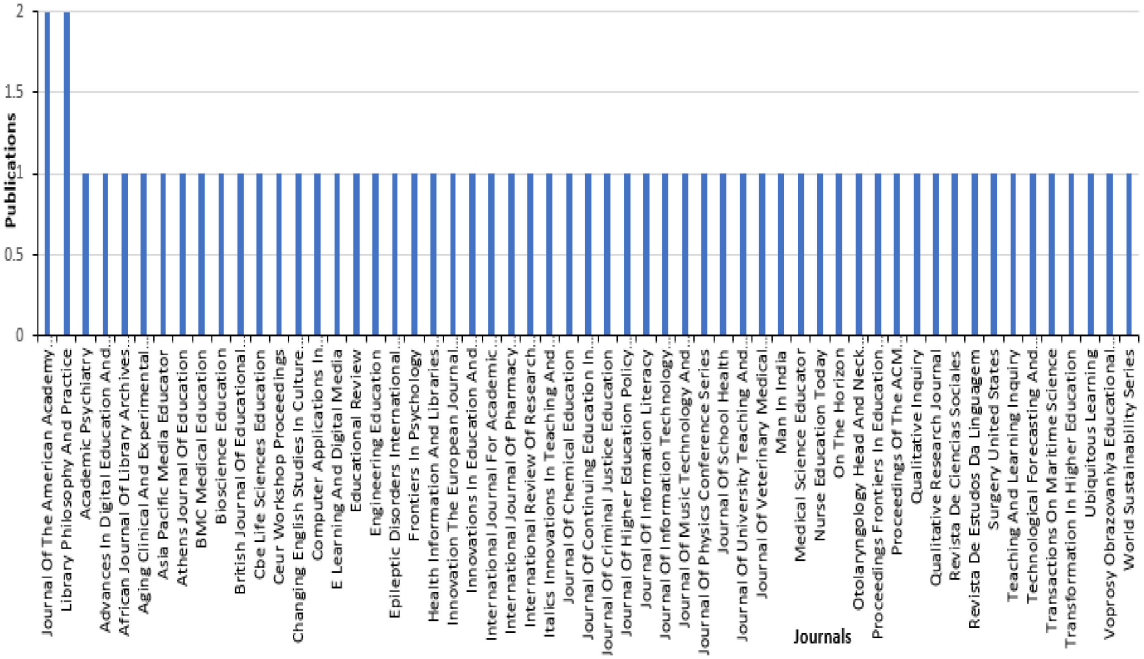

Figure 7. Results showing range of journal publications for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022). See details in Supplementary Materials.

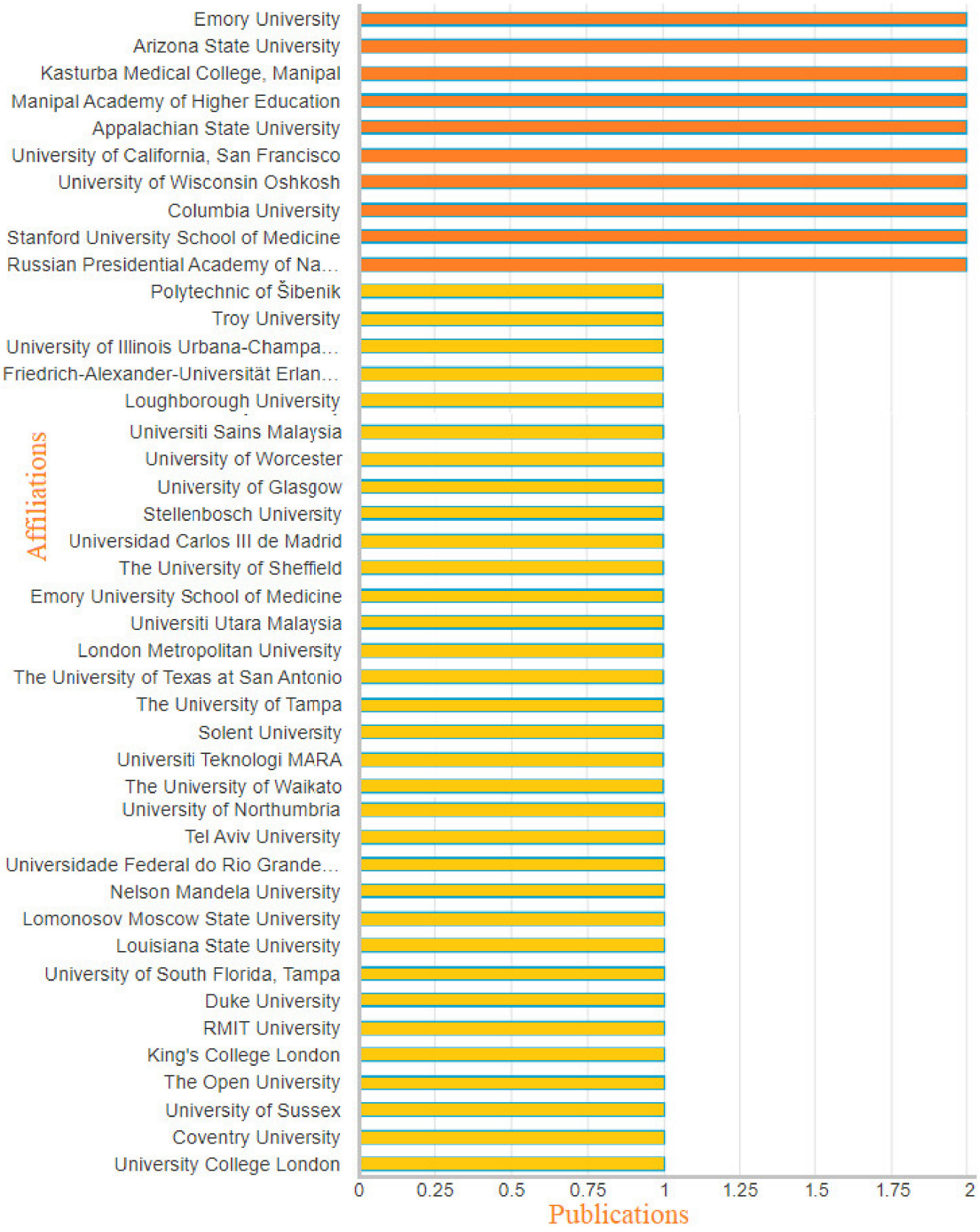

Figure 8. Results of publications by affiliation for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" (data retrieved from Scopus database on 22 August 2022).

Figure 9. Word cloud for the author keywords research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19" using Voyant tools.

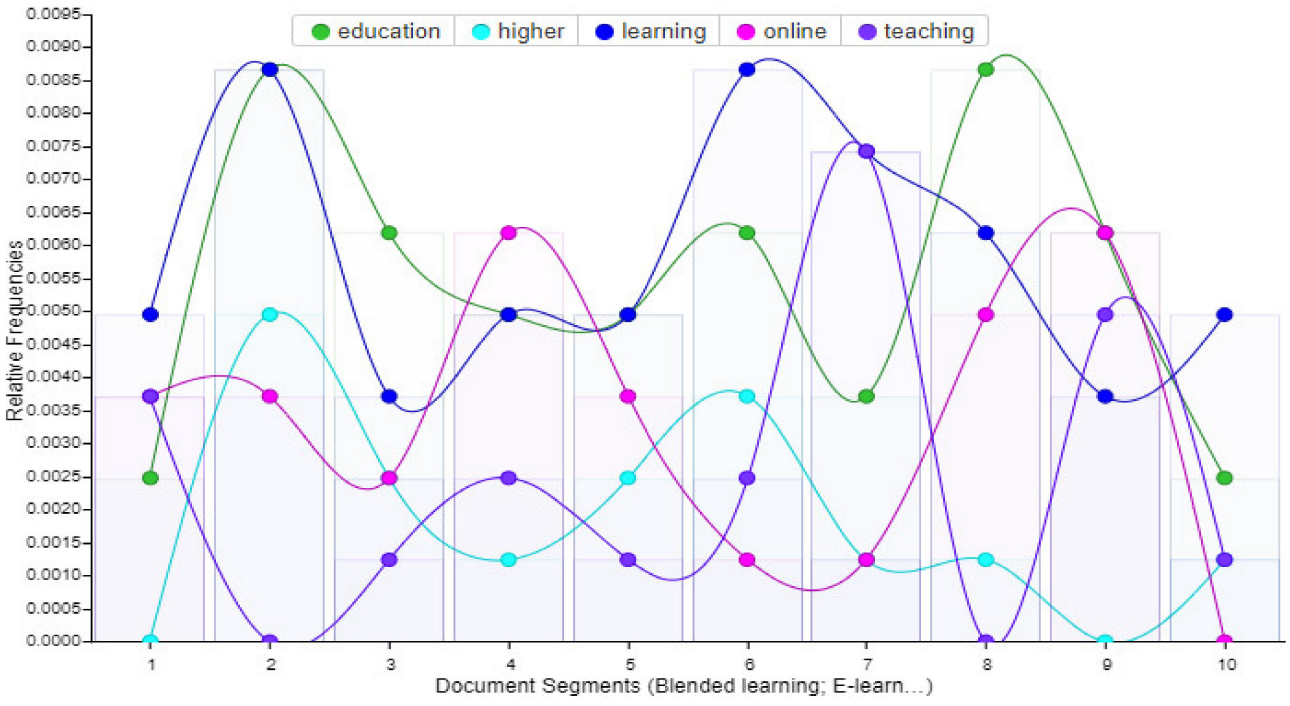

Figure 10. Results of relative frequency and trend from the most frequent author keywords generated using Voyant tools.

From Figure 3, it was observed that there were different shifts in this subject area as seen in the pattern of the publications from 2003 to 2022. The highest number of publications was 13 publications in 2021, followed by 11 publications in 2013, followed by 9 publications in 2012 and mid-2022, followed by 8 publications in 2017, followed by 7 publications in 2020. The highest occurrence by year was two publications, which appeared four times in 2003, 2005, 2009, and 2010. The second highest occurrence by year was four publications, which appeared three times in 2010, 2013, 2020, and 2021. It was observed that different global occurrences could have affected the research trends noticed in this subject area, such as the 2008 global economic recession, the 2016 drop in oil price, and the COVID-19 pandemic that hit the global world in 2020. It was observed that the publications did not increase around these times, but further evidence is required to support this pattern. With the increase in online learning, publications rose from 7 publications in 2020 to 13 publications in 2021, showing a sharp increase of 65% between both years.

From Figure 4, it was observed that the publications from the search were mostly journal papers or articles (55%), which covered 48 publications, followed by conference papers (30%), which covered 26 publications. It was then followed by book chapters (9%), which covered 8 publications, followed by reviews (2%) which covered 2 publications. There was also one publication that was a full book, one editorial, one erratum, and one conference review paper, which were each the least prevalent (1%). This shows that most publications on this subject area were available as articles or journal papers.

From Figure 5, it was observed that the subject area from the search with the highest publications was Social Sciences (45%) with 62 publications, followed by Computer Science (14%) with 20 publications, then by Engineering (12%) with 16 publications. It was followed by Medicine (8%) with 11 publications, followed by Arts and Humanities (4%) with 6 publications, followed by Business, Management, and Accounting (3%) with 4 publications. The next set each produced two publications—Health professions (1%), Chemistry (1%) Environmental Science (1%), Nursing (1%), and Psychology (1%)—followed by the last set, which produced one publication each—Materials Science, Neuroscience, Pharmacology, Mathematics, Physics, and Astronomy.

From Figure 6, it was observed that the country with the highest publications is the United States of America (U.S.A.) with 29 publications, followed by the United Kingdom (U.K.) with 24 publications. The next pair of publications was much lower as Australia had 5 publications, followed by the pair whereby each nation had four publications, India and South Africa, followed by the next set of publications whereby each nation had three publications, Malaysia and the Russian Federation. The next set of publications whereby each nation had two publications included Belgium, Croatia, Denmark, Israel, Mexico, New Zealand, and Ukraine. The smallest set of publications by country had one publication each (Austria, Brazil, Bulgaria, China, Finland, Germany, Italy, Poland, Singapore, Slovakia, Spain, and United Arab Emirates). However, there were five publications that were undefined from the Scopus data retrieved from this search. It was also observed that the U.S.A. and the U.K., which are both developed countries that make significant investments in educational research, are the study's top two countries.

Another aspect of the research trend is seen from the publications where these articles were published as given in Figure 7. Also, the range of publications in this subject area is spread across different areas, and the highest number of publications (two articles) in this area was published in the journals called *"Journal of the American Academy of Dermatology"* and *"Library Philosophy and Practice"*. The second set of publications had one article each, which include: *"Academic Psychiatry"*, *"Advances in Digital Education and Lifelong Learning"*, *"African Journal of Library Archives and Information Science"*, *"Aging Clinical and Experimental Research"*, *"Asia Pacific Media Educator"*, *"Athens Journal of Education"*, *"BMC Medical Education"*, *"Bioscience Education"*, *"British Journal of Educational Technology"*, *"Cbe Life Sciences Education"*, *"Ceur Workshop Proceedings"*, *"Changing English Studies in Culture and Education"*, *"Computer Applications in Engineering Education"*, *"E-Learning and Digital Media"*, *"Educational Review"*, *"Engineering Education"*, *"Epileptic Disorders International Epilepsy Journal with*

Videotape", "Frontiers in Psychology", "Health Information and Libraries Journal", "Innovation inthe European Journal of Social Science Research", "Innovations in Education and Teaching International", "International Journal for Academic Development", "International Journal of Pharmacy Practice", "International Review of Research in Open and Distance Learning", "Italics Innovations in Teaching and Learning in Information and Computer Sciences", "Journal of Chemical Education", "Journal of Continuing Education in Nursing", Journal of Criminal Justice Education", "Journal of Higher Education Policy and Management", Journal of Information Literacy", "Journal of Information Technology Education Research", "Journal of Music Technology and Education", "Journal of Physics Conference Series", "Journal of School Health", "Journal of University Teaching and Learning Practice", "Journal of Veterinary Medical Education", "Man in India", "Medical Science Educator", "Nurse Education Today", "On the Horizon", "Otolaryngology Head and Neck Surgery United States", "Proceedings Frontiers in Education Conference", "Proceedings of the ACM Conference on Computer Supported Cooperative Work", "Qualitative Inquiry", "Qualitative Research Journal", "Revista De Ciencias Sociales", "Revista De Estudos Da Linguagem", "Surgery United States", "Teaching and Learning Inquiry", "Technological Forecasting and Social Change", "Transactions on Maritime Science", "Transformation in Higher Education", "Ubiquitous Learning", "Voprosy Obrazovaniya Educational Studies Moscow", and "World Sustainability Series".

The next aspect looked at was the results of publications by affiliation for the research on "teaching AND higher AND education AND academy AND online AND learning OR COVID-19", as represented in Figure 8. It can be observed that the highest amount of publications by affiliation was two publications. These affiliations were "*Emory University", "Arizona State University", "Katurba Medical College", "Manipal Academy of Higher Education", "Appalachian State University", "University of California", "University of Wisconsin", "Columbia University", "Stanford University", and "Russian Presidential Academy of Economy and Public Administration*". It was followed by a set of affiliations that produced one publication, which included "*University of Illinois", "Loughborough University", "University of Northumbria", "University of Worchester", "Tel Aviv University", "University College London", "Trop University", "University of Sussex", "Duke University", "Louisiana State University", "Solent University", "Coventry University", "Kings College London", "The Open University", "University of Glasgow", "University of Tampa", "University of Sheffield", and "Nelson Mandela University*". These affiliations are from different locations, which shows that research on education with an emphasis on teaching in higher education academies is being conducted globally. However, the rates of production are not very high, which could imply low funding in this research area.

The last parameter looked at is the author keywords from the search using data retrieved from Scopus. It was identified that the most frequent keywords in the corpus for the word cloud using Voyant tools were *"learning (47)"; "education (44)"; "online (27)"; "teaching (20)"; "higher (15)"*. This can be identified in the word cloud depicted in Figure 9, which was developed using 808 words and 400 unique word forms. From the cirrus on Voyant tools, the word cloud was generated and identified to have a vocabulary density of 0.495, a readability index of 30.999, and an average word per sentence of 808.0. Using the most frequent words, a trend was identified as depicted in Figure 10, showing that learning is the keyword with the highest relative frequency.

4. Annotated Bibliography

In this section, the annotated bibliography on teaching in Higher Education Academies (HEA) is presented in this paper based on different frameworks of sustainable education. One of the key findings is the adjustments that were made with the intention of creating and promoting accessible education, involving the use of resources and tactics that were methodologically diverse during COVID-19. One of the most significant tools for school reform today in response to the recent COVID-19 pandemic is blended learning, which combines the advantages of face-to-face and technologically assisted learning. With blended learning, there are significantly more opportunities for teachers and students to comprehend how we send and receive information, engage with others in educational

settings, acquire knowledge, and evaluate what we have taught or learned. Tables 1–6 present different publications listed and classified based on different categories by themes.

Table 1. Some studies related to the literature review on teaching in HEAs.

Author	Year	Title	Summary	Ref.
Morss, K. and Murray, R.	2005	*Chapter 5: Your First Laboratory or Fieldwork Practicals*. In: Teaching at University: A Guide for Postgraduates and Researchers	The chapter gives guides on the first laboratory, fieldwork, and practicals for teaching at university.	[68]
Morss, K. and Murray, R.	2005	*Chapter 1, Theory and Practice*. In: Teaching at university: a guide for postgraduates and researchers	This chapter offers straightforward, applicable information in an approachable manner as a guide.	[69]
Forster, F., Hounsell, D. and Thompson, S.	1995	*Chapter 5: Demonstrating*. In: Tutoring and Demonstrating: A Handbook. University of Edinburgh.	This chapter highlights the role of a workshop tutor and lab demonstrator, and the need for student feedback.	[70]
Sachs, J. and Parsell, M.	2014	*Chapter 2: Collaborative Peer-Supported Review of Teaching.* In: Peer Review of Learning and Teaching in Higher Education	This chapter presents teaching development, inclusive teaching processes, and peer-supported strategy on teaching in higher education (HE).	[71]
Brookfield, D.S.	2006	*Chapter 4: What students value in teachers*. In: The skillful teacher: on technique, trust, and responsiveness in the classroom.	This chapter looks into the behaviours of a successful teacher, to have credibility, experience, skill, knowledge, conviction, and justification.	[72]
Strawson, H.	2012	*Chapter 4: Encouraging students to participate*. In: 53 Interesting Things to Do in Your Seminars and Tutorials	The chapter guides instructors and teachers on how to support students and encourage them.	[73]
Biggs, J. and Tang, C.	2011	*Chapter 1: Effective teaching and learning for today's universities.* In: Teaching for Quality learning at University.	This chapter examined some ways that teachers might influence a student's learning outcomes in HE and successful teaching in HE.	[74]
Ramsden, P.	2004	*Chapter 9: Teaching strategies for effective learning*. In: Learning to teach in Higher Education	This chapter looks at teaching methods in HE that enhance student learning for small groups, online learning, textbooks, and practical work.	[75]
van Kuijk, M.F., Deunk, M.I., Bosker, R.J. and Ritzema, E.S.	2015	Goals, data use, and instruction: The effect of a teacher professional development program on reading achievement.	This paper presents teaching involvement of teachers in a professional development programme to enhance the reading comprehension of students.	[76]
Zwart, R.C., Korthagen, F.A. and Attema-Noordewier, S.	2015	A strength-based approach to teacher professional development	The paper looks at professional development aimed at boosting the sentiments of self-efficacy, autonomy, and competence for teachers.	[77]
Ronfeldt, M., Farmer, S.O., McQueen, K. and Grissom, J.A.	2015	Teacher collaboration in instructional teams and student achievement	This paper examines the extent of collaboration between instructional teams to identify the types of cooperation and collaboration quality.	[78]
Zhu, H., Trowbridge, A., Taylor, K. and Laxman, D.	2021	Online Sharing Platform for Course Modules: Understanding Materials Use and Effectiveness	The paper examines the utilisation and efficacy of open access online course modules shared with academics and administrators from various institutions.	[79]
Shaw, M.	2013	"Open Education in Practice", Openness and Education	This chapter argues for the use of open education (OE) in practise, school-related materials and informally for the HE level.	[80]
Bell, M. and Farrier, S.	2007	Measuring success in e-learning-a multi-dimensional approach.	The study looked at the metric for achieving e-learning from the pick and mix approach.	[81]
Dunn, S.C.; Jasinski, D. and O'Connor, M.	2005	A process model for educonsulting.	The paper gives the educonsulting (EC) model for companies to collaborate and connect their investment in educational initiatives using their corporate strategies	[82]
Heard-Lauréote, K. and Buckley, C.	2021	"To be relied upon and trusted": The centrality of personal relationships to collaboration in HE, in a successful cross-team institutional change project.	The paper considers trust both as an opportunity and a necessity to alter how to operate in HE, trending from a conventional stance with prioritised roles and hierarchy towards competencies and skills.	[83]

Table 2. Some studies related to the online learning, e-learning, and blended learning.

Author	Year	Title	Summary	Ref.
Alam, G.M. and Parvin, M.	2021	Can online higher education be an active agent for change?—comparison of academic success and job-readiness before and during COVID-19.	The paper examines academic achievement and employability before and after COVID-19 for online education using technology-mediated education.	[84]
Dziuban, C., Picciano, A., Graham, C. and Moskal, P.	2017	*Conducting research in online and blended learning environments: New pedagogical frontiers*	This book can be useful for planning research in online and blended learning environments. It was discovered that few articles investigate evaluations of student participation, as well as this book based on Faculty Learning Community. This book may be useful for designing future research in such a scenario.	[85]
Kalashnikova, L. and Chorna, V.	2021	Effectiveness of distance and online education services in the context of the coronavirus pandemic: experience of empirical sociological research in Ukraine, Innovation	The paper examines the findings of three empirical sociological studies with search-related research conducted by randomly selecting Internet users for the study.	[86]
König, J., Jäger-Biela, D.J. and Glutsch, N.	2020	Adapting to online teaching during COVID-19 school closure: teacher education and teacher competence effects among early career teachers in Germany	The paper looks at the adaptation to Online Teaching During COVID-19 School Closure, by Early Career Teachers for teacher education and Teacher Competence Implications (TCIs).	[87]
Adedoyin, O.B. and Soykan, E.	2020	Covid-19 pandemic and online learning: the challenges and opportunities	The paper examines online learning during the COVID-19 pandemic, which is different from emergency remote teaching because it is more sustainable, and gives hybrid instructional activities.	[88]
Urem, F., Jureković, D. and Ban, E.	2020	Online and in-class computer science teacher training-Oracle Academy program experiences	The article examines the experiences with online and in-person computer science teacher training from the Oracle Academy program, an information technology tool.	[89]
Babinčáková, M. and Bernard, P.	2020	Online Experimentation during COVID-19 Secondary School Closures: Teaching Methods and Student Perceptions.	The study discusses the closure of secondary schools during the COVID-19 pandemic with online tests using student attitudes and teaching approaches.	[90]
Tsegay, S.M., Ashraf, M.A., Perveen, S. and Zegergish, M.Z.	2022	Online Teaching during COVID-19 Pandemic: Teachers' Experiences from a Chinese University.	This study examines the COVID-19 pandemic experiences of Chinese university lecturers with a focus on the approaches used for instruction and learning as well as their advantages and drawbacks.	[91]
Chen, R.H.	2022	Effects of Deliberate Practice on Blended Learning Sustainability: A Community of Inquiry Perspective.	This study looked at how online learning communities and intentional practise are implemented in a mixed-learning environment to increase English as a Foreign Language (EFL) students' learning performance and engagement.	[92]
Peñarrubia-Lozano, C., Segura-Berges, M., Lizalde-Gil, M. and Bustamante, J.C.	2021	A Qualitative Analysis of Implementing E-Learning during the COVID-19 Lockdown	The goal of the study was to evaluate the practical implications of using this type of approach during the COVID-19 lockdown to offer cutting-edge knowledge about e-learning's suitability for institutions offering pre-university education to the scientific and educational communities.	[93]
Auf, T.A. and Hamdi, O.A.	2022	Adoption of Online Learning during the Covid19 Pandemic Lockdown by Universities in Garowe.	The research shows that universities in Garowe adopted online education as a crisis management strategy since administration, faculty, and students were not prepared and had no prior experience with this pedagogical learning platform.	[94]
Rodríguez, M.L. and Pulido-Montes, C.	2022	Use of Digital Resources in Higher Education during COVID-19: A Literature Review.	This study's goal is to look into the digital resources used in higher education institutions, with a focus on the types and usage patterns of those resources.	[95]

Table 2. *Cont.*

Author	Year	Title	Summary	Ref.
Kaqinari, T., Makarova, E., Audran, J., Döring, A.K., Göbel, K. and Kern, D.	2022	A Latent Class Analysis of University Lecturers' Switch to Online Teaching during the First COVID-19 Lockdown: The Role of Educational Technology, Self-Efficacy, and Institutional Support.	This study aimed to explain disparities in the use of educational technology for teaching, institutional support, and individual variables among lecturers from institutions in (four) nations. The first COVID-19 lockdown's implementation of emergency remote teaching (ERT) necessitated a lot of university lecturers, however, not all of them had the same difficulties.	[96]
Picciano, A.G., Dziuban, C.D. and Graham, C.R.	2013	*Blended Learning: Research Perspectives. Vol. 2*	Blended Learning: Research Perspectives, Volume 2 addresses institutional issues, design and adoption issues, learning issues, and offers a thoughtful reflection on potential future trends and research in the field with plans and investments for significant increases in blended learning environments.	[97]

Table 3. Some studies related to the teachers' training, professional development, and teachers' satisfaction.

Author	Year	Title	Summary	Ref.
Lopes, C., Bernardes Ó., Gonçalves, M.J.A., Terra, A.L., da Silva, M.M., Tavares, C. and Valente, I.	2022	E-Learning Enhancement through Multidisciplinary Teams in Higher Education: Students, Teachers, and Librarians.	The COVID-19 challenge is extensive, complex, and rapidly evolving; it poses a threat to everyone's health as well as to the environment, the global economy, all cultural and societal norms, and our daily activities. It is crucial that the needs of students are ultimately and consistently met, and that they are supported effectively, both during the Coronavirus outbreak and any upcoming lockdowns.	[98]
Milić, M., Radić Hozo, E., Maulini, C., De Giorgio, A. and Kuvačić, G.	2022	What Is the Place of Physical Education among the Teaching Priorities of Primary School Teachers? An Empirical Study on Importance, Qualification and Perceived Teachers' Competence.	The paper aims to investigate teachers' attitudes about subjects in primary school, with a particular focus on physical education. Teachers typically have a focus and have a significant impact on how a subject is taught and how students perceive it.	[99]
Conradty, C. and Bogner, F.X.	2022	Education for Sustainable Development: How Seminar Design and Time Structure of Teacher Professional Development Affect Students' Motivation and Creativity.	The study used changes in students' motivation and inventiveness as markers to measure the effectiveness of Professional Development (PD) indirectly. A typical lecture with one feedback session and recurrent supervision sessions were the two PD approaches that were investigated.	[100]
Abel, V.R.; Tondeur, J. and Sang, G.	2022	Teacher Perceptions about ICT Integration into Classroom Instruction.	This study examined studies that examined teachers' perceptions of the ways in which technology is employed in the classroom. In order to better comprehend the variety of teacher attitudes regarding ICT integration in the classroom, it used the meta-ethnography method to trace, evaluate, and synthesise the data.	[101]

Table 3. *Cont.*

Author	Year	Title	Summary	Ref.
Kohout, J., Buršíková, D., Frank, J., Lukavský, J. and Masopust, P., et al.	2022	Predictors of the Effectiveness of Different Approaches to Pandemic Distance Learning.	The objective of this paper is discussing the development of an online screening tool to assist teachers in identifying students who may perform less well during distance learning and in choosing the best teaching strategy for the particular class.	[102]
Cooper, R., Fitzgerald, A., Loughran, J., Phillips, M. and Smith, K.	2020	Understanding teachers' professional learning needs: what does it mean to teachers and how can it be supported?	This paper explores the participants' perspectives on and expectations for their professional growth based on an in-depth PD research of some teachers in a school.	[103]
Akiba, M., Murata, A., Howard, C., Wilkinson, B. and Fabrega, J.	2019	Race to the Top and Lesson Study Implementation in Florida: District Policy and Leadership for Teacher Professional Development	The paper investigated teachers' PD and discovered that the district's requirements of lesson study, funding provision, and future sustainability plans were significantly and favourably associated with a wider implementation of lesson study within the district using mixed methods.	[104]
Desimone, L.M.	2009	Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures	In order to improve our conceptualization, measurements, and technique for researching the effects of teachers' PD on teachers and students, the author advises that we use contemporary research findings. She argues that there is empirical evidence for the use of a set of basic features and a shared conceptual framework in impact studies on professional growth.	[105]
Wayne, A.J., Yoon, K.S., Zhu, P., Cronen, S. and Garet, M.S.	2008	Experimenting With Teacher Professional Development: Motives and Methods	This article evaluates the state of PD research and suggests a specific course of action for future investigation. The possibility of PD having a beneficial effect on achievement when a programme is provided across a variety of conventional venues and when its delivery is dependent on trainers is not well understood.	[106]
Supovitz, J.A. andTurner, H.M.	2000	The effects of professional development on science teaching practices and classroom culture.	The paper is on PD that is centred on subject-matter knowledge, tied to specified performance requirements for students, and anchored in a systemic context has been established by reformers. It is built on intensive and prolonged training around actual tasks.	[107]
Yoon, K.S., Duncan, T., Lee, S.W.-Y., Scarloss, B. and Shapley, K.L.	2022	Reviewing the Evidence on How Teacher Professional Development Affects Student Achievement. Issues & Answers	The study gives findings on quick-response projects from important current issues in education that were carried out by the regional educational laboratories to improve students' achievement.	[108]

Table 4. Some studies related to student assessment and school curriculum.

Author	Year	Title	Summary	Ref.
Belova, N., Krause, M. and Siemens, C.	2022	*Students' Strategies When Dealing with Science-Based Information in Social Media—A Group Discussion Study.*	The paper is on scientific disinformation which is common because it is so simple to disseminate information via platforms such as social media. It is anticipated that teaching students to analyse information critically will improve their capacity to evaluate media and scientific content.	[109]
Nicol, D.J. and Macfarlane-Dick, D	2006	*Formative assessment and self-regulated learning: a model and seven principles of good feedback practice.*	The study shows how these procedures might help students become self-regulated learners and take control of their education, whereby the results from formative assessment and feedback studies are reinterpreted.	[110]
Watson, D. and Knight, G.L.	2012	*Continuous Formative Assessment and Feedback in an Enquiry-Based Laboratory Course.*	The study addresses continual formative assessment and feedback in an inquiry-based laboratory course. The authors of this research detail the successful implementation of an online experimental summary sheet, which allowed for ongoing student monitoring of a huge cohort of students working on a six-week inquiry-based laboratory project.	[111]
Gibbs, G. and Simpson, C.	2010	*Chapter 2: How assessment influences student learning.* In: Using assessment to support student learning.	This article explores the importance of providing constructive criticism and praise while assessing academic work. It emphasises the significance of evaluation and encouraging comments when marking coursework. Although some of the sampled students showed greater interest in their feedback than in their grades, illustrating the huge impact of feedback on learning, the utility of feedback was studied in this study.	[112]
Bloxham, S. and Boyd, P.	2007	*Chapter 6: Marking. In: Developing Effective Assessment in Higher Education: A Practical Guide.*	This chapter emphasises marking as a significant component of evaluation in higher education (HE). In any university or higher education institution (HEI), this is largely a crucial time. Assessments are used to evaluate students' aptitude for their assignments and aid in their progression to the subsequent class or level of study.	[113]
Morss, K. and Murray, R.	2005	*Chapter 6: Assessment of and Feedback to Students. In: Teaching at University: A Guide for Postgraduates and Researchers*	It provides a succinct reference to important pedagogical ideas, providing new teaching instructors, postgraduate researchers and associate lecturers in higher education with a solid foundation. It emphasises on the significance of evaluation and encouraging comments when marking coursework.	[114]
Ramsden, P.	2004	*Chapter 6: The nature of good teaching in higher education. In: Learning to Teach in Higher Education.*	This chapter is on the lessons for teaching and learning principles, which make it to be quite fascinating. The book's thorough examination of teaching and learning from the students' point of view at the outset allowed for the development of reasonable guidelines for doing so in higher education.	[115]
MacLellan, E.	2001	*Assessment for Learning: The differing perceptions of tutors and students*	This paper challenges the reader to consider how students and academic staff view assessment and evaluation in the context of higher education. They attempted to analyse many elements about the goal of assessment, the nature and difficulty of the tasks that were assessed, the scheduling of assessment, and the marking and reporting process.	[116]

Table 5. Some studies related to digital literacy and social media for education.

Author	Year	Title	Summary	Ref.
Steehler, A.J.; Pettitt-Schieber, B.; Studer, M.B.; Mahendran, G.; Pettitt, B.J.; and Henriquez, O.A.	2021	Implementation and Evaluation of a Virtual Elective in Otolaryngology in the Time of COVID-19.	The paper focuses on implementation and evaluation of virtual electives in a medical otolaryngology curriculum during the COVID-19 pandemic.	[117]
Li, M. and Yu, Z.	2022	Teachers' Satisfaction, Role, and Digital Literacy during the COVID-19 Pandemic	The COVID-19 pandemic has surprisingly affected the educational process worldwide, pressuring teachers and students to transmit via online teaching and learning format. The COVID-19 health crisis has posed challenges to teachers' professional roles, levels of career satisfaction, and digital literacy when compared to traditional face-to-face teaching methods.	[118]
Picciano, A.G.	2018	*Online Education: Foundations, Planning, and Pedagogy*	This book covers a thorough investigation of blended and fully online teaching platforms. Also, Online Education covers history, theory, research, planning, and practise. Critical insights into the implications for administration and teaching are required as colleges, universities, and schools around the world adopt large-scale technologies and traditional class models transition into seamless, digitally interactive environments.	[119]
Turner, K.H., Hicks, T., and Zucker, L.	2020	Connected reading: A framework for understanding how adolescents encounter, evaluate, and engage with texts in the digital age.	The study presents theories of reader response, online reading comprehension, and digital reading. In order to understand readers' interactions with digital texts through coming across, assessing, and engaging with them, the study suggests a framework of connected reading.	[120]
Loh, C.E. and Sun, B.	2019	"I'd still prefer to read the hard copy": Adolescents' print and digital reading habits.	The study examines adolescents' print and digital reading habits. It found that young people prefer print, but as they become older, they read more online. It argues that adolescent reading preferences and behaviour with physical books are reflected in their online reading patterns. It indicates that taking into account the print or technological medium matters for teen readers' motivation.	[121]
Kesson, H.	2020	Reading digital texts: Obstacles to using digital resources.	The paper investigates how 12th grade ELA students used Chromebooks to access a digital textbook and read it. It investigates the elements that influence or restrict how students engage with and respond to digital web-based texts, with the goal of dispelling longstanding myths about young people's affinity for digital tools. The study concludes that classroom routines, reading instruction and learning tools, and student views about school-based reading can all limit students' access to digital components of texts.	[122]
Kanniainen, L., Kiili, C., Tolvanen, A., Aro, M. and Leppänen, P.H.	2019	Literacy skills and online research and comprehension: Struggling readers face difficulties online.	The paper analyses the relationship between students' performance on online research and comprehension (ORC) tasks and their literacy abilities (reading fluency, written spelling, and reading comprehension), as well as nonverbal reasoning, prior knowledge, and gender.	[123]
Greenhow, C. and Chapman, A.	2020	Social distancing meet social media: Digital tools for connecting students, teachers, and citizens in an emergency.	The article argues that the unprecedented COVID-19 health crisis has put K–12 public education on the front lines of producing informed and engaged citizens and examines how social media integration into remote learning strategies can be beneficial.	[124]

Table 5. *Cont.*

Author	Year	Title	Summary	Ref.
Daley, S.G., Xu, Y., Proctor, C.P., Rappolt-Schlichtmann, G. and Goldowsky, B.	2020	Behavioral engagement among adolescents with reading difficulties: The role of active involvement in a universally designed digital literacy platform.	The paper investigates how adolescents use a digital literacy platform created with the Universal Design for Learning concept to engage in activities and understand what they are reading. This study examines their behavioural engagement with text-based activities to assist students with poor reading comprehension.	[125]
Elder, R.H.	2012	Developing tools for teaching chemical engineering unit operation design.	The paper presents tools for a synoptic course and improved student learning, for a chemical engineering unit operation design must be taught in a project-week setting to increase student knowledge of the resources available as IChemE design.	[126]
Comiskey, D., McCartan, K. and Nicholl, P.	2013	IBuilding for Success? IBooks as open educational resources in built environment education.	Open, online course technologies that may be utilised by professors and students to enhance e-learning have become more popular in recent years in the teaching and learning environment. In order to help students study the principles of the subject outside of the classroom, the Apple iPad iBooks project set out to create a reusable, media-rich Open Educational Resource (OER).	[127]
Craig, A.	2012	Chapter 7-The academy goes mobile: an overview of mobile applications in higher education. In: *Social Media for Academics: A Practical Guide.*	The chapter provides an overview of mobile applications in higher education. Together, social media platforms such as Twitter and Facebook and smartphone technology provide a setting that is not just conducive to dialogue but also conversation that is no longer bound by physical space since we connect to one another.	[128]

Table 6. Some studies related to student engagement and student motivation.

Author	Year	Title	Summary	Ref.
Mendini, M. and Peter, P.C.	2019	Research note: The role of smart versus traditional classrooms on students' engagement.	In this study, the use of smart technology in the classroom was contrasted with face-to-face instruction. The findings point to greater participation from students in groups and with the teacher in a classroom without technology.	[129]
Morley, C. and Ablett, P.	2017	Designing assessment to promote engagement among first year social work students.	In this study, first-year student participation is taken into account. It results in enhanced cooperation and teamwork among students when they are assessed on a group project (presentation). It considers group work evaluation as a means of encouraging engagement through collaborative effort.	[130]
Mandernach, B.J.	2015	Assessment of student engagement in higher education: A synthesis of literature and assessment tools.	This study considers student engagement for higher education students. It does evaluate students using teamwork and cooperation. Engagement is examined as a dynamic notion with cognitive, affective, and behavioural elements.	[131]
Martin, F. and Bollinger, D.U.	2018	Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment.	In this study, student engagement in online learning environments is taken into account. They discover that realistic assignments promote learner engagement with the subject, and that collaboration and conversations improve learner to learner engagement, whether viewed from the perspective of a community or inquiry (learner to instructor, learner to learner, and learner to content).	[132]

Table 6. *Cont.*

Author	Year	Title	Summary	Ref.
Muir, T., Dyment, J., Hopwood, B., Milthorpe, N., Stone, C. and Freeman, E.	2019	Chronicling engagement: students' experience of online learning over time.	Students are surveyed every week to find out what influences student involvement and what causes it to fluctuate, tracking students' participation over the length of the lesson rather than at one specific time.	[133]
Nagel, L., Blignaut, A.S. and Cronje, J.C.	2009	Read-only participants: A case for student communication in online classes.	The study makes the case that online discussion boards are crucial channels of communication for distance learning. This article also emphasises the drawbacks of online debates, namely the presence of readers solely.	[134]
Newton, D.W., LePine, J.A., Kim, J.K., Wellman, N. and Bush, J.T.	2020	Taking engagement to task: The nature and functioning of task engagement across transitions.	This paper looks at student engagement based on tasks. Instead of being a classroom-based study, this one is work-based. The level of involvement may vary from task to task, and there may be a spill-over effect where the level of participation in one activity may affect engagement in a subsequent task.	[135]
Ouyang, F. and Chang, Y.H.	2019	The relationships between social participatory roles and cognitive engagement levels in online discussions.	The study examines the connections between online conversation participation in social contexts and degrees of cognitive engagement. This multi-method investigation looked at students' involvement in asynchronous online debates. Interaction can become more meaningful when it is more socially engaged, and vice versa.	[136]
Pérez-López, R., Gurrea-Sarasa, R., Herrando, C., Martín-De Hoyos, M.J., Bordonaba-Juste, V. and Acerete, A.U.	2020	The generation of student engagement as a cognition-affect-behaviour process in a Twitter learning experience.	This study assesses the usage of Twitter as an online conversation medium in order to improve student engagement. Utilizing interactive and cooperative activities is advised in order to boost performance and engagement.	[137]
Salter, N and Conneely, M.	2015	Structured and unstructured discussion forums as tools for student engagement.	This study assesses the effectiveness of using discussion forums to boost student engagement. Students used the input more frequently in structured forums than in unstructured forums, which were perceived as being less engaging. It encourages more peer interaction in forums with less structure.	[138]
Skinner, E.	2009	Using community development theory to improve student engagement in online discussion: a case study.	The study discusses how community formation requires student participation. To improve engagement, students must express their own emotional and personal interests (i.e., they need to be personally invested to get something out of the class). Inquisitive students can help instructors choose subjects and questions.	[139]
Sweat, J., Jones, G., Han, S. and Wolfgram, S.M.	2013	How does high impact practice predict student engagement? A comparison of white and minority students.	By contrasting white and minority students, the study discusses how student participation is a requirement for creating community. It discusses how racial categories, such as service learning, undergraduate research, group projects, learning communities, sequence courses, and, in particular, having a close faculty mentor, affect student participation.	[140]
Taneja, A.	2014	Teaching tip: Enhancing student engagement: A group case study approach.	The paper discusses student participation as a teaching strategy. Group work is seen as a distinct learning objective. Case studies are used in the group to apply theoretical understanding to practical application.	[141]
Rodriguez, R.J. and Koubek, E.	2019	Unpacking high-impact instructional practices and student engagement in a preservice teacher preparation program.	The focus of the paper is student engagement for a preservice programme to enable teachers to prepare better. High-impact strategies for engagement and learning include collaborative assignments, applied learning, understanding different points of view, and constructive feedback on tasks.	[142]

5. Conclusions

In this paper, a scientific review and an annotated bibliography on teaching in Higher Education Academies (HEA) are presented with their frontiers towards sustainable education. Literature on teaching styles, student assessments, online learning, adaptation to the COVID-19 pandemic, and e-learning was presented. To also create a better understanding on the methodology, some related annotated bibliographies and scientific reviews were also presented. However, some aspects of teaching such as inclusive learning, reflective comments, reflective thinking, and reflective behaviours of teaching were not included in this paper. The scope of this paper is diverse as seen in the section titles for the main topics covered in this paper, however, it has been streamlined to enable readers to find the references easily. These collected literature examples with the summaries and some reflections help professors, educators, teachers, students, postgraduate researchers, laboratory demonstrators, teaching assistants, and workshop tutors to have a quick view of related literature in the subject area to improve their teaching skills and reflect better on their teaching methods. The literature used for the annotated bibliography shows that teachers' actions might influence students' learning activities. The limitations of the research include the database used, due to the use of only Scopus database and the choice of keywords, some relevant recent literature could be missed out from the batch. It should be noted that the Scopus database was selected because it has a broader range of coverage, it is faster in the index process, and it has more recent publications from the literature search [143–145].

The scientific review and scientometric analysis conducted were used to understand the research pattern in this area. It is evident that there are key indicators that affect the research pattern on teaching in HEAs. Based on the publication records from 2003 to mid-2022, it was observed that different global occurrences could have affected the research trends noticed in this subject area, such as the 2008 global economic recession, the 2016 drop in oil price, and the COVID19 pandemic that hit the global world in 2020.With the increase in online learning, publications with the highest publications were produced in the U.S.A. Also, it was evident that the U.S.A. and the U.K., are the top two developedcountries that make significant investments in educational research as shown in the study. Also, the study shows that the most publications on this subject area were available as articles or journal papers. Using the most frequent words, a trend was identified showing that learning is the keyword with the highest relative frequency. Therefore, future research can include an annotated biography on teaching in HEAs with themes such as student assessment, diversity, teaching pedagogy, and group learning included. Also, detailed scientific literature reviews can be conducted on teaching in HEAs using other search database.

Supplementary Materials: The supplementary data used in the study is uploaded herewith. The following supporting information can be downloaded at: Amaechi, Chiemela Victor (2022), "Data on Scientometrics of Teaching in HEA and adapting to COVID-19 (online learning)- Paper 1", *Mendeley Data*, V1, https://doi.org/10.17632/7mmwpvxtwr.1.

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