STUDENT ENGAGEMENT IN ONLINE LEARNING: A BIBLIOMETRIC ANALYSIS OF A DECADE OF RESEARCH USING VOSVIEWER

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ABSTRAK
Penelitian ini mengkaji perkembangan penelitian *student engagement* dalam pembelajaran online melalui pendekatan bibliometrik dengan analisis pemetaan komputasi menggunakan VOSviewer. Judul dan abstrak artikel digunakan untuk memandu proses pencarian dengan mengacu pada kata kunci "*student engagement, engagement, e-learning* dan *online learning*". Ditemukan 997 artikel yang dianggap relevan. Periode studi yang digunakan sebagai bahan kajian adalah artikel yang terindeks Google Scholar selama 10 tahun terakhir (2012 hingga 2022). Hasil penelitian menunjukkan bahwa penelitian *student engagement* dalam pembelajaran online dapat dipisahkan menjadi 3 istilah: *learner engagement, online class*, dan covid. Istilah " *learner engagement* " diasosiasikan dengan 54 tautan dengan total kekuatan tautan 103. Istilah " *online class* " memiliki 52 tautan dengan total kekuatan tautan 137 dan istilah "covid" memiliki 75 tautan dengan total kekuatan tautan 351. Hasil analisis perkembangan publikasi 10 tahun terakhir mengenai *student engagement* dalam pembelajaran online menunjukkan fluktuasi yang cukup sering. Pada tahun 2012-2013 mengalami penurunan dari 71 pada tahun 2012 menjadi 53 pada tahun 2013. Fluktuasi penelitian terjadi dari tahun 2014-2019 (secara berurutan 73, 87, 81, 66, 71, 88 publikasi per tahun). Laju pertumbuhan publikasi tertinggi tentang *student engagement* dalam pembelajaran online terjadi pada tahun 2020 mencapai 190 artikel, namun menurun pada awal tahun 2021 menjadi 160 publikasi. Hasil penelitian ini dapat digunakan sebagai dasar untuk penelitian lebih lanjut atau penelitian di bidang serupa dengan menggunakan analisis bibliometrik.

Key words: Bibliometric; E-Learning; Pembelajaran Online; Student Engagement; VOSviewer

ABSTRACT
This study examines the development of student engagement research in online learning through a bibliometric approach with computational mapping analysis using VOSviewer. Article titles and abstracts were used to guide the search process with reference to the keywords "student engagement, engagement, e-learning and online learning". 997 articles were found to be relevant. The study period used for review was articles indexed by Google Scholar for the last 10 years (2012 to 2022). The results show that student engagement research in online learning can be separated into 3 terms: learner engagement, online class, and covid. The term "learner engagement" is associated with 54 links with a total link strength of 103. The term "online class" has 52 links with a total link strength of 137 and the term "covid" has 75 links with a total link strength of 351. The results of analyzing the development of publications in the last 10 years regarding student engagement in online learning show frequent fluctuations. In 2012-2013, it decreased from 71 in 2012 to 53 in 2013. Research fluctuations occurred from 2014-2019 (sequentially 73, 87, 81, 66, 71, 88 publications per year). The highest growth rate of publications on student engagement in online learning occurred in 2020 reaching 190 articles, but decreased in early 2021 to 160 publications. The results of this study can be used as a basis for further research or research in similar fields using bibliometric analysis.

Key words: Bibliometric; E-Learning; Online Learning; Student Engagement; VOSviewer

INTRODUCTION

The quality of education is one of the focuses of educational problems that is a major concern in improving the education system, especially with regard to the quality of learning. Along with the development of technology and its supporting infrastructure, efforts to improve the quality of learning can be carried out through the use of these technologies in a system known as online learning.

In general, the concept of online learning can be interpreted as e-learning or computer-based learning system which has the following definition as instructional content or learning experiences delivered or enabled by electronic technology (CJ Bonk, 2002). Online learning as a concept and as a keyword has consistently been a focus of education research for over two decades (Singh & Thurman, 2019). Online learning is one approach in distance learning by utilizing various technologies that utilize the internet network with the aim of facilitating learning between teachers and students when face-to-face learning cannot be done. One of the weaknesses of online learning is that students have difficulty adapting to these situations, causing students to be less actively involved or engaged in the online learning process.

Student engagement is a psychological process that shows the attention, interest, investment, effort and involvement of students who are devoted to learning work which includes (1) emotional involvement, which shows interests, values, and emotions for example: feelings in class, feelings towards campus and lecturers, feelings of treatment, discipline and motivation, feelings of belonging, positive feelings, and appreciating academic achievement, (2) cognitive involvement, namely perceptions of motivation, hard work and the use of strategies. This includes psychological investment in learning, hard work in learning, seriousness in studying, willingness to work beyond what is required, challenging choices, discipline, planning and learning strategies, flexibility in solving problems, choosing to work hard, and (3) behavioral involvement, namely doing tasks and following rules, including: (a) positive behavior, namely behaviors that illustrate effort, perseverance, concentration, attention, asking questions, contributing to class discussions, following rules, studying, completing assignments, participating in related activities. (b) Absence of disruptive behavior, such as being present and not making a mess in class (Dharmayana et al, 2012).

While 'student engagement' has enjoyed considerable attention in the literature since the mid-1990s, its beginnings can substantively be seen a decade previously, seminally in Alexander Astin's work on student involvement. Following on from 'the student experience' and 'research-led teaching' before it, 'student engagement' has become the latest focus of attention among those aiming to enhance learning and teaching in higher education, headlining meeting agendas and theming conferences in campuses around the world (Trowler, 2010).

One of the analytical techniques that can be used to determine the development of research in a particular field is by using bibliometric analysis. There have been many studies on bibliometric analysis, including bibliometric analysis in economics (Bonilla et al., 2015; Firmansyah & Faisal, 2019; Rusydiana, 2019; Castillo-Vergara et al., 2018; Nederhof and Van Raan, 1993), bibliometric analysis in research on online learning (Djeki et al., 2022) and technology adoption (Wang et al., 2021), psychology (Vogl et al., 2018), Educational Research (Al Husaeni & Nandiyanto, 2023).

Bibliometric analysis has gained immense popularity in business research in recent years and its popularity can be attributed to (1) the advancement, availability, and accessibility of bibliometric software such as Gephi, Leximancer, VOSviewer, and scientific databases such as Scopus and Web of Science, and (2) the cross-disciplinary pollination of the bibliometric methodology from information science to business research. More importantly, the popularity of bibliometric analysis in business research is not a fad but rather a reflection of its utility for (1) handling large volumes of scientific data, and (2) producing high research impact (Donthu et al., 2021).

However, research on computational mapping of bibliometric analysis of published data in the field of student engagement in online learning which has been carried out specifically to determine the development of the research has not been carried out. Especially because of the Covid 19 Pandemic that occurred throughout the world in 2020, this study intends to find out more about the development bibliometric analysis for research in the last 10 years in the period 2012 to 2022 through the VOSviewer application.

Therefore, this research was conducted to carry out computational research on mapping bibliometric analysis of articles indexed by Google Scholar using VOSviewer software. This research was conducted with the hope that it can be a reference for researchers to conduct and determine the research themes to be taken, especially those related to the field of student engagement in online learning.

METHOD

This study uses data from publications on student engagement and online learning from 2012-2022, sourced from the Google Scholar database. We selected Google Scholar in this study because the Google Scholar database is an open source that support information needs in research and education. Google Scholar is an educational service provider feature that helps users meet their information needs in the form of searching scientific journals and online publications from various disciplines connected around the world. usually used by students, researchers, lecturers, academics, and even students to find references to scientific works through journals from scientific publications. In addition to helping search for references, Google Scholar is also equipped with citation services or quotes from credible researchers around the world; this can help users in finding references for writing scientific papers and avoiding plagiarism. Currently, Google Scholar has provided quotes from various fields of Science such as general knowledge, natural Science, health, technology, philosophy, law, social, and many more presented in various sources such as books, theses, articles, abstracts, academic publishers, university journals, professional communities, and other academic organizations (Sutopo et al., 2022).

The data used in this study is journal publication data obtained using the reference manager application. The reference manager application used in this research is Publish or Perish. Publish or Perish is used to perform a literature review of the selected theme. So that we get a database of similar research themes. Publish or Perish is used to find out which author is most cited, the oldest and most recent year of an article and we will get a bibliometric record of each research to be used. Publish or Perish provides several choices of research data sources to be used such as from Crossref, Google Scholar, Google Scholar Profile, PubMed, Microsoft Academic, Scopus, and Web of Science. The data mapping in this study used a digital mapping application that is VOSviewer. The

data that has been obtained is processed in such a way that it matches the desired keywords. After that the data is inputted into the VOSviewer application which will then convert the data into an interconnected data map (Al Husaeni & Nandiyanto, 2022).

The research was carried out through several stages:

(i) Collection of publication data using the publish or perish application,
(ii) Processing of bibliometric data for articles that had been obtained using the Microsoft Excel application,
(iii) Computational mapping analysis of bibliometric publication data using the VOSviewer application, and
(iv) Analysis of the results of computational mapping analysis (Al Husaeni & Nandiyanto, 2022).

The article data search on Publish or Perish is used to filter publications using the keyword "Student Engagement", “Engagement”, “E-Learning”, and “Online Learning” based on the publication's title and abstract requirements. The papers used were published between the years of 2012 and 2022. All data was obtained in October 2022. The articles that have been collected and match the criteria for this study's analysis were then exported into two file types: research information systems (.ris) and comma separated value format (*.csv). VOSviewer was also be used to visualize and evaluate trends using bibliometric maps. The article data from the source database was then mapped.

VOSviewer was employed to create 3 variations of mapping publications, namely network visualization, overlay visualization, and density visualization based on the network (co-citation) between existing items. When creating a bibliometric map, the keyword frequency was set to be found at least 10 times. Therefore, obtained 144 terms and keywords that are less relevant were removed.

RESULTS AND DISCUSSION

Publication data search results

Based on the data search through application reference manager publish or perish from the Google Scholar database, 997 data articles were obtained that met the research criteria. The data was obtained in the form of article metadata consisting of the author's name, title, year, journal name, publisher, number of citations, article links, and related URLs. Table 1 shows some examples of published data used in the VOSviewer analysis of this study. The data samples taken were the 20 best articles that had the highest number of citations. The number of citations from all articles used in this study is 61130, the number of citations per year is 6113.00, the number of citations per article is 61.25, the average author in the articles used is 2.50, all articles have an average h-index is 113, and the g-index is 205.

Table 1. Student Engagement in Online Learning Publication Data

	Authors	Title	Year	Cites
1	S Dhawan	Online learning: A panacea in the time of COVID-19 crisis	2020	3774
2	V Arkorful, N Abaidoo	The role of e-learning, advantages and disadvantages of its adoption in higher education	2015	1736
3	V Singh, A Thurman	How many ways can we define online learning? A systematic literature review of definitions of online learning (1988-2018)	2019	958
4	AP Aguilera-Hermida	College students' use and acceptance of emergency online learning due to COVID-19	2020	867
5	CO Rodriguez	MOOCs and the AI-Stanford Like Courses: Two Successful and Distinct Course Formats for Massive Open Online Courses.	2012	859
6	JCY Sun, R Rueda	Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education	2012	664
7	K McCutcheon, M Lohan, M Traynor…	A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education	2015	587
8	AD Dumford, AL Miller	Online learning in higher education: exploring advantages and disadvantages for engagement	2018	557
9	C Irwin, L Ball, B Desbrow, M Leveritt	Students' perceptions of using Facebook as an interactive learning resource at university	2012	542
10	HN Mok	Teaching tip: The flipped classroom	2014	535
11	KF Hew	Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS	2016	529
12	RA Croxton	The role of interactivity in student satisfaction and persistence in online learning	2014	519
13	KR Clark	The effects of the flipped model of instruction on student engagement and	2015	482

	Authors	Title	Year	Cites
		performance in the secondary mathematics classroom.		
14	P Iyer, K Aziz, DM Ojcius	Impact of COVID-19 on dental education in the United States	2020	478
15	LP Macfadyen, S Dawson	Numbers are not enough. Why e-learning analytics failed to inform an institutional strategic plan	2012	450
16	H Baber	Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID-19	2020	444
17	SI De Freitas, J Morgan…	Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision	2015	437
18	AM Nortvig, AK Petersen…	A Literature Review of the Factors Influencing E-Learning and Blended Learning in Relation to Learning Outcome, Student Satisfaction and Engagement	2018	426
19	R Panigrahi, PR Srivastava, D Sharma	Online learning: Adoption, continuance, and learning outcome—A review of literature	2018	424
20	A Al-Adwan, A Al-Adwan, J Smedley	Exploring students acceptance of e-learning using Technology Acceptance Model in Jordanian universities	2013	418

(Source: Google Scholar)

Research development in the field of student engagement in online learning

Table 2 shows the development of research in the field of Student Engagement in Online Learning published in the Google Scholar indexed journal. Based on the data shown in Table 2, it can be seen that the number of researches in Student Engagement in Online Learning is 997 articles from 2012-2022. In 2012 there were 71 articles. In 2013 there were 53 articles. In 2014 there were 73 articles. In 2015 there were 87 articles, in 2016 there were 81 articles, in 2017 there were 66 articles, in 2018 there were 71 articles, in 2019 there were 88 articles, in 2020 there were 190 articles, and in 2021 there were 160 articles. Based on the number of publications, it can be seen that research in the field of student engagement in online learning has changed trends, especially in the last ten years (2012-2021). Its development is also quite volatile as can be seen clearly in Figure 1.

Table 2. Development of student engagement in online learning research

Year	Number of Publications
2012	71
2013	53
2014	73
2015	87
2016	81
2017	66
2018	71
2019	88
2020	190
2021	160
2022	57
Total	997

(Source: Google Scholar)

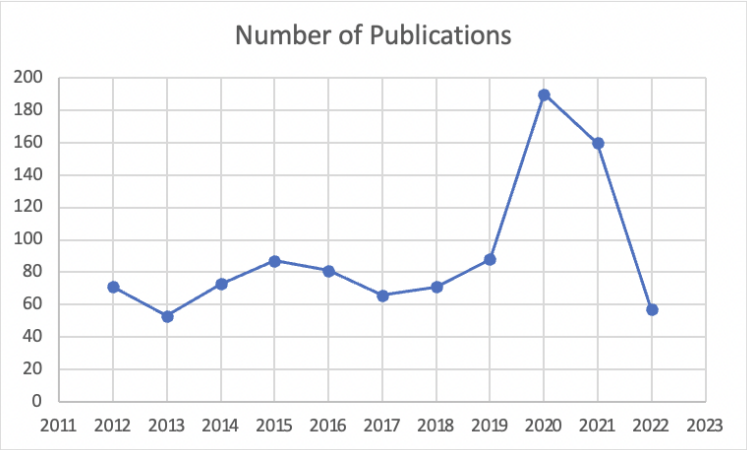

Figure 1. Level of development in student engagement in online learning research

Figure 1 shows the development of student engagement in online learning research for the last 10 years in the range of 2012 to 2021. Based on Figure 1, it is known that the development of research related to student engagement in online learning has decreased from 2012-2013. This decline can be seen from the number of publications in 2012 as many as 71 to 2013 only 53 publications. The development of student engagement in online learning research also fluctuated from 2014 to 2019, before experienced a significant increase in 2020. The highest growth rate of publications on student engagement in online learning occurred in 2020 reaching 190 articles, but declined in early 2021 to 160 articles. The data shows that the popularity of research on student engagement in online learning tends to be unstable and experienced a significant spike during the COVID-19 pandemic. However, after that research interest in student engagement in online learning has decreased again.

Visualization student engagement in online learning topic area using VOSviewer

Computational mapping was performed on the article data. VOSviewer is used in computational mapping. From the results of computational mapping found 86 items. Each item found related to student engagement in online learning in data mapping is divided into 5 clusters, namely:

(i) Cluster 1 has 22 items and marked in red, the 22 items are achievement, article, blended learning, evidence, form, gamification, importance, influence, learner engagement, massive open online course, mode, mooc, moocs, online learning environment, order, paper, readiness, relationship, retention, social presence, success, and type.

(ii) Cluster 2 has 21 items and marked in green, the 21 items are ability, academic performance, access, barrier, class, comparison, concept, e learning environment, e learning platform, empirical study, integration, knowledge, need, online class, online learning platform, online teaching, problem, project, quality, resource, and time.

(iii) Cluster 3 has 18 items and marked in blue, the 18 items are acceptance, addition, adoption, advantage, application, benefit, content, data, e learning tool, elearning, focus, institution, instructor, lms, management system, online education, student involvement, and student satisfaction.

(iv) Cluster 4 has 16 items and marked in yellow, the 16 items are case, challenge, covid, distance learning, faculty, implementation, Indonesia, opportunity, pandemic, students perception, teacher, term, traditional classroom, traditional learning, training, and university.

(v) Cluster 5 has 9 items and marked in purple, the 9 items are community, facebook, literature, online learner, part, review, social medium, student learning, and work.

The relationship between one term and another is shown in each existing cluster. Labels are given to each term with coloured circles. The size of the circle for each term varies depending on the frequency of occurrence of the term (Al Husaeni & Nandiyanto, 2021).

The size of the label circle shows a positive correlation with the occurrence of the term in the title and abstract (Al Husaeni & Nandiyanto, 2021).The more often the term is found, the larger the label size (Al Husaeni & Nandiyanto, 2022).The mapping visualization analysed in this study consists of 3 parts: network visualization (see Figure 2), overlay visualization (see Figure 3), and density visualization (see Figure 4) (Hamidah et al., 2020).

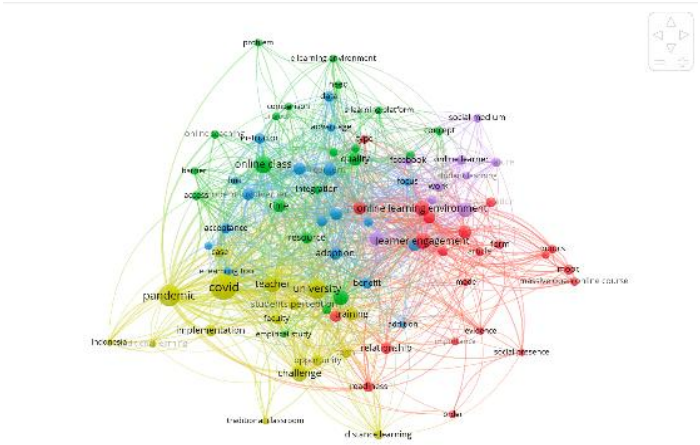

Figure 2. Network visualization of student engagement in online learning keyword

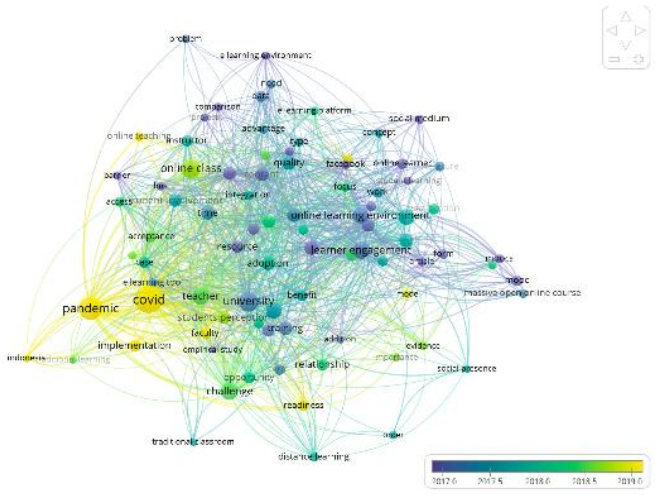

Figure 3. Overlay visualization of student engagement in online learning keyword

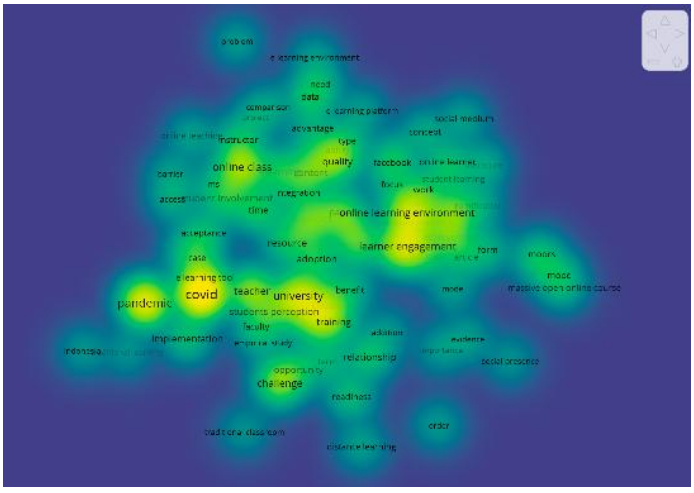

Figure 4. Density visualization of student engagement in online learning keyword

Figure 2 shows the relationship between terms. The relationship between terms is depicted in an interconnected network. Figure 2 shows the cluster of each term that is often researched and related to the research topic of student engagement in online learning. From the clusters contained in the network visualization, the research on student engagement in online learning can be separated into 3 fields, namely learner engagement, the second term is online class term and the covid term.

Figure 3 shows an overlay visualization of student engagement in online learning research. This visualization overlay demonstrates the novelty of research on related terms (Wang et al., 2021; Al Husaeni & Nandiyanto, 2021; Mok, 2014). Figure 3 which is clarified in Figure 8 shows that research on student engagement in online learning has actually been done a lot since 2017, and the topic is growing and more and more related to other topics, especially after the Covid 19 pandemic in 2020. Thus, this has become opportunities for further researchers to develop new research on student engagement in online learning.

Figure 4 shows the density visualization. Density visualization means that the brighter the yellow colour and the larger the diameter of the circle of term labels, the more often the term appears (Wang et al., 2021; Al Husaeni & Nandiyanto, 2021; Sutopo et al., 2022; Panigrahi et al., 2018). This means that a lot of research on related terms has been carried out. Vice versa, if the colour of the term fades closes to the background colour, then the number of studies on the term is small. Based on Figure 3, it can be seen that research related to the terms, covid, pandemic, online class, learner engagement, online learning environment, and university has a high number of studies.

From these data, it can be seen that student engagement in online learning is still slightly associated with other terms. From the mapping results, learner engagement and online classes only have 54 links and 52 links. In contrast to the field of covid and pandemics, which tend to have a high level of relevance and are often associated with various terms. It can be concluded that the field of student engagement is still very likely to be researched and associated with other terms, this will have a higher impact on the novelty of the research.

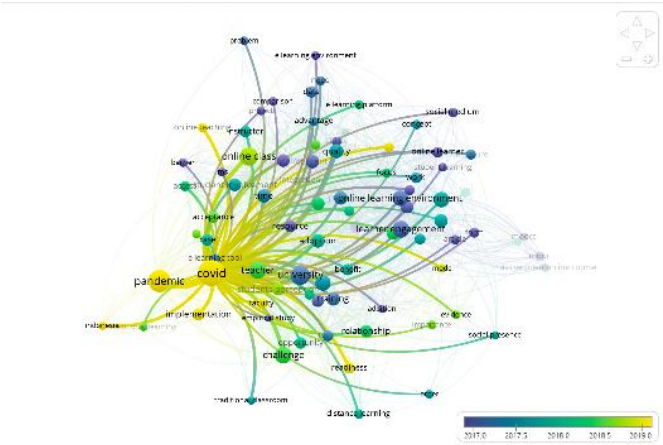

Figure 5. Overlay visualization of student engagement in online learning term in 2020.

Based on the results of mapping the collected article data, it can be seen that the keywords student engagement and online learning are still rarely used in research. From the results of this study, we can look for research on student engagement in online learning that is more recent and up to date.

CONCLUSION

The purpose of this study was to perform computational mapping analysis on the bibliometric data of research articles. The publication theme taken in this research is "Student Engagement in Online Learning". The articles used are taken from the Google Scholar database via Publish or Perish. The library data used in this study include titles and abstracts. From the search results, as many as 997 relevant articles were published in the range of 2012 to 2022. The results showed that student engagement in online learning research experienced a decline from 2012 to 2013, experiencing research fluctuations from 2014 to 2019, and experiencing a significant increase in 2020 to 2021. The results of the study indicate that the opportunity for research on student engagement in learning process still has a high enough chance and is linked to other terms.

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