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Contributions of E-Mentoring Program in Mentees Academic Performance: Bibilometric Study

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ABSTRACT

The effectiveness of novice mentoring or mentoring between a senior and a junior is compromised by the lack of trained mentors available. Therefore, this study considered the variables of support, communication, self- efficacy, psychosocial, and academic performance in determining students' academic performance through mentoring. Numerous academics are interested in this field because of the possibilities of E-mentoring. Readers may learn more about the subject from this study report. The study is a thorough analysis of 392 papers that were gathered between 1989 and 2025. This paper will concentrate on the results of influential authors, articles, countries/territory, and subject area. Utilizing the use of co-citation and co-occurrence networks, this paper also made an effort to identify different themes that developed and changed during the active years. The rising amount of research articles and the general acceptance of E-mentoring in several nations require the implementation of bibliometric analysis to provide a comprehensive set of information that is able to assist researchers in identifying the most pertinent work that has been conducted thus far. This can be accomplished by exploring various aspects of the E-mentoring research domain and identifying possible future study directions using the VOS Viewer and Biblioshiny tools.

1. Introduction

Success in academia in a higher education setting is often evaluated using the following metrics: grade point average, graduation rates, and determination percentages of students, "was also conducted by previous studies [19,36,45]". Many academics believe that academic achievement and support are two different but closely connected concepts in the context of a mentorship program. For instance, mentors' capacity to effectively foster comfortable communication and offer sufficient

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support have been crucial elements that may improve mentee outcomes, particularly academic achievement, “was also conducted by previous studies [9,49]”. Although this association is intriguing, little is known about how mentoring programs function as significant indicators of mentees' academic achievement in the study literature on higher education mentoring programs., “was also conducted by previous studies [4,9,23,24,31]”. Other than that, the factor of communication also plays a role in mentees academic performance such students can raise ' self-assurance, allowing them to take greater risks. This is corroborated by the findings, of “was also conducted by Ab Latif *et al.,* [1]”, which indicated that the mentoring program in question involves the sharing of information and skills between the mentor and mentees. Which communication approach allows mentor and mentee to improve their knowledge and skills. Consequently, this made it possible to practice dialogue between mentors and mentees, which can promote mentee competition and prepare them for difficulties in both internal and external organizational environments, “was also conducted by Ab Latif *et al.,* [1]”. Additionally, the mentees' academic success is influenced by their level of self-efficacy, which helps them feel confident and self-assured. Not only that, but the psychosocial element also affects the academic performance of the mentees, including their capacity to open up about their personal lives to others. Based on this, the idea that self-efficacy and performance both contribute to mentees' academic success was supported, “was also conducted by Ab Latif *et al.,* [1]”. Where the mentoring program may be able to highlight the mentee's developmental issues with academic performance.

Mentors can address their mentees' psychosocial issues through the mentoring program. Consequently, the ability of the mentor to put his or her qualities into reality is crucial, notably the mentee's potential for independence, “was also conducted by Ab Latif *et al.,* [1]”. E-mentoring is a valuable tool in higher education, particularly for improving student well-being and academic success. It involves using various digital platforms, such as online forums and messaging applications, to facilitate communication between mentors and mentees. This approach is effective in improving stress coping competency and creating a sense of community among students, especially during challenging times like lockdowns. The success of e-mentoring is closely tied to the mentor's communication style, with supportive and communicative mentors leading to better outcomes for mentees, including enhanced psychological well-being and a positive attitude toward the mentoring process. While the digital format offers flexibility and accessibility, it relies heavily on effective communication and the commitment of both parties to foster a productive and supportive relationship, “was also conducted by many other reseachers [6,15,33-35,37,39,48,51-52].”

More than that, mentoring programs on mentees' academic performance is very relevant to greater academic performance among students to understand the impact of student’s internal facts to their academic performance. Based on that, these two factors of self-efficacy and performance play a role in mentees academic performance, “was also conducted by Ab Latif *et al.,* [1]”. Where the mentoring program can point out the mentee’s development problems in academic performance. Through the mentoring program, mentors can address their mentees' psychosocial problems. Thus, a mentor's ability to put his or her traits into practice, especially the mentee's capacity for self-reliance, “was also conducted by Ab Latif *et al.,*[1]”. This “was also conducted by Iluoye *et al.,* [17]”, that explain an adaptable strategy for youth development is mentorship in which students who are quite often generally considered to be "at-risk" for poor outcomes, environments as impoverishment or single-parent households, were conjointly matched with related older responders in the expectation that a supportive and enabling relationship will build that continues to serve to help relieve this risk avoidance is the elimination. Not only that, but mentorship is provided adequate in a range of situations, including, for example, in communities and schools with young people, and it has also been proven to promote the development in psychological, behavioral, and academic

results, including one for higher-risk youngsters, “was also conducted by Iluoye *et al.,* [17]”. Other than that, in point of worldwide, mentoring programs on mentees' academic performance is very relevant to greater academic performance among students. Where in the United States, the foundations for mentoring may indeed be identified in the Friendly Visiting program, which began in the late 1800s. This also “was also conducted by Iluoye *et al.,* [17]”, opines that an initiative was created to offer disadvantaged youngsters and adolescents with role models by pairing up middle-class people with them. It was mentioned that existing mentorship organizations frequently handle university mentoring, recruiting and qualifying community volunteers before connecting them with millennials, “was also conducted by Iluoye *et al.,* [17]”.

University students throughout the globe are deeply concerned concerning unneeded stress as a outcome of the COVID-19 outbreak, “was also conducted by Abdullah *et al.,* [2]”. A person's psychological, emotional, and social welfare are all characterized through their mental health. This could also be referencing how they are thinking and performing. Many people have trouble keeping overall mental health in order. One facet that can have an effect on a person's day-to-day behavior, connections with those around, and academic success is their mental health. The pressure of academic work may play a factor in their mental health's degeneration, even as their mental health may be a factor in their productivity and bad academic achievement. Which mental health issues, including such depression, stress, and anxiety, potentially cause them to have issues in the study. The aforementioned issues will result in laziness, unproductivity, difficulty of focus, poor morale in class, misunderstandings about deadlines, and several other troubles which might potentially harm their academic performance. Likewise, individuals can exhibit poor optimism or a lack of motivation when they are suffering with poor mental health. Ailments like disordered eating may have an impact on their eating patterns, and youngsters may start to feel exhausted or unmotivated in the study. Thus, their academic performance and productivity may suffer if they are not completely aware of the material that would be studied. They may be less encouraged to continue interacting with their academic work if students do not feel optimistic or positive about it. A consistent academic performance is attainable if mental health is acknowledged and monitored as soon as symptoms are present. According to mentoring programs, mentors' capacity to effectively execute these traits may have a big influence on the achievement of mentees, particularly through terms of their academic achievement, “was also conducted [9,49]”.

Parents and instructors needed to provide more help because of the students' poor emotional state and academic problems. More than that, the factor of self-efficacy also plays a role in mentees academic performance such mentees to be confident and believe on their self. Not that only, the factor of psychosocial also plays a role in mentees academic performance such able to share their personal experiences with other individuals. Based to that, these two factors of self-efficacy and performance play a role in mentees academic performance, “was also conducted by Ab Latif *et al.,*[1]”. Where the mentoring program can point out the mentee’s development problems in academic performance. Which thru the mentoring program, mentor can address their mentees psychosocial problems. Thus, mentor’s having ability to put his or her traits into practice, especially the mentee's capacity for self-reliance, “was also conducted by Ab Latif *et al.,*[1]”. Parents play a vital role in guaranteeing that learning takes place in an especially true way since most online learning happens at home. Previous studies have focused on the function of social support, particularly the assistance of parents and teachers in responding with the emotional stress experienced by teenagers, “was also conducted by Abdullah *et al.,*[2]”. This also “was also conducted by Descals-Tomás *et al.,* [12]”, positive effects of assistance from teachers and families for pupils' engagement and motivation were discovered in a study of 267 university students studying in Spain, “was also conducted by Descals-Tomás *et al.,* [12]”. E-mentoring provide a short overview of key elements essential in having

mentoring. Determine factors of support, communication, self- efficacy, psychosocial, that affect academic performance in having E-mentoring. The majority of the preliminary research on staging indicated that the relation between support, communication, self- efficacy, psychosocial, in academic performance, have become variables that contribute towards students' academic performance, "was also conducted previous studies [1,16, 21-26]".

The definition of student performance is students or mentees' academic performance that include their performance in class, their graduation rates, their GPA, their placement placed in their classes, or the results of their standardized test scores. Student performance in a variety of educational areas is quantified via academic performance. Normative summative assessments, student performance, and academic achievement seem to be the main criteria used by academics to evaluate student achievements. Throughout the 1830s, evaluating performance in school has been a norm in the United States. Applying an established exam, education reformers Horace Mann and Samuel Gridley Howe evaluated the development of Boston children. The idea of standardized testing was first presented in 1914 by Frederick J. Kelly, a Kansas academic director, with the Kansas Silent Reading Test. Which the purpose of this multiple-choice test was to speed things up the grading process and uniformly evaluate all students. In order to grade exam papers, Reynold B. Johnson, an IBM employee, invented a grading gadget in 1934 that could detect the electrical signal produced by pencil markings (Washington Office of the Superintendent of Public Instruction, 2014). Harvard University professor Henry Chauncey developed the Scholastic Assessment Test (SAT) in 1934 to assess scholarship applicants, then University of Iowa professor E.F. Lindquist designed the first prototype of the American College Test (ACT) in 1959. (PBS, 2014 and ACT 2014). Standardized testing was supported by the Elementary and Secondary Education Act (ESEA) of 1965 in all states. As a consequence of this act, states were expected to assess student performance and create public school accountability metrics.

The accountability focus of the ESEA was extended by the No Child Left Behind Act of 2001, which demanded that confer resistance certain performance levels in order to receive federal dollars. More than that, mentoring is prevalent across a range of fields and supports a setting in which mentees may excel, "was also conducted by Boswell *et al.,*[10]". Programs for mentoring further demonstrate that the capacity of mentors to effectively use such features of mentoring may have a considerable impact on favorable mentee outcomes, particularly academic results, "was also conducted previous studies [9,49]". As a result, mentorship is a crucial non-formal learning strategy that educators and counselors use in colleges and universities to supplement official teaching-learning programs and student development initiatives, "was also conducted by previous studies [8,11].". The mentor as educator, leader, and instructor is one of the mentoring program's two main components. While the mentee needs advice and direction as a learner or/and a follower. Effective mentorship is appreciated more and more in the sciences. For mentees, mentoring has a variety of benefits, including improved research output and professional satisfaction. With enough training and education, anyone may become a qualified mentor. Academic performance is often assessed in the context of a higher education institution using the following metrics, such as students' persistence rates, graduation rates, and grade point average, "was also conducted previous studies [19,36,45]". Perhaps it would benefit the mentee's outcomes, specifically their academic achievement, "was also conducted previous studies [9,31,49]".

Findings on the relationship between support and students' performance. Support has a positive and significant effect on the student's performance. This claimed, "was also conducted by Ab Latif *et al.,* [1]", with the purpose of study to investigate how the mentorship program at ILKKM Kubang Kerian, Kelantan, is perceived by the nursing students. The sample that was involved in that research was 46 students. Which a total of 24 persons from semesters 3 and 4 of the ILKKM Kubang Kerian

(Nursing), which is made up of year 2 nursing students, participated in the research. The finding of that research is 65.21% of respondents overall agreed, and they said the mentorship program had boosted their support. Most of the respondents who responded to the question about support agreed that "my mentor inspires me to enhance my interpersonal communication abilities" and "my mentor constantly provides me favorable feedback." Because of the effective transmission of information, skills, and abilities to students via various ways, this style of learning has increased the amount of communication between lecturers and students (mentees), “was also conducted by Ismail *et al.,* [22]”. A closer look at the mentee mentoring system showed that the techniques used by the program may affect the success of mentees, especially those who are enrolled in higher education institutions, “was also conducted previous studies [43,47]”. This also “was also conducted by previous studies [32,42]”, the adoption of this program will motivate mentees to learn new things and develop new talents in order to enhance their emotional wellbeing and academic performance. In order to ensure the success of mentee mentoring programs, it was found that face-to-face contact and open communication are essential elements, “was also conducted by previous studies, [9,22,31]”.

Besides that, the findings on the relationship between support and students’ performance. Support has a positive and significant effect on the student’s performance. This claim can also be supported by similar research, “was also conducted by Gat *et al.,* [16]”, with the purpose of study is to evaluate the impact of online learning on students' academic performance in relation to collaborative learning. The sample that was involved in that research was 351. The samples chosen in the proportional stratified random sampling technique consisted of 351 selected respondents from 13 (thirteen) private higher education schools in Indonesia known as STMIK. The finding of that research has a favorable effect even if it has a little influence on pupils' academic performance. The extraordinary academic accomplishment of the pupils was also considerably and favorably impacted by the online learning that was mediated in the collaborative learning program. Universities nowadays must thus manage their teaching strategies to cultivate students' engagement in a collaborative learning setting. By incorporating students actively in the activities, the study's results could help colleges improve their online teaching methods. For instance, children may participate in mentorship programs so they can get mentor assistance for doing well in school. More than that, the findings on the relationship between support and students’ performance. Support has a positive and significant effect on the student’s performance. This claim can also be supported by similar research, “was also conducted by Ismail *et al.,* [29]”, with the purpose of study is to examine the relationship between the mentoring program and the psychological development of the mentees. The sample that was involved in that research was 196 undergraduate students in a research university in Sarawak, Malaysia. The finding of that research is supported positively and significantly correlated with psychosocial. This shows that mentoring programs not only focus on support but also improve students' psychosocial skills. Not that only, the findings on the relationship between support and students’ performance. Support has a positive and significant effect on the student’s performance. This claimed can also be supported by similar research, “was also conducted by Ismail *et al.,* [25]”, with the purpose of study is to investigates the connection between the mentoring program and the academic success of the mentees. The sample that was involved in that research was 196 undergraduate students in a research university in Sarawak, Malaysia. The finding of that research is support and academic achievement have a good and substantial relation. Lastly, this findings on the relationship between support and students’ performance. Support has a positive and significant effect on the student’s performance. This claimed can also be supported by similar research, “was also conducted by previous studies [27,28]”, with the purpose of study is to assess the mentees' self-efficacy, communication, and support levels. The second is to investigate the relationship between mentoring and self-efficacy. The last step is to look at the relationship between mentorship and

mentees' self-efficacy. The sample that was involved in that research was 136 undergraduate students in a research university in Malaysia. The finding of that research is first; there was a favorable and substantial relation between communication and mentees' self-efficacy. Second, there was a good and substantial relation between support and self-efficacy in the mentees. The outcome shows that, in the organizational sample, the mentoring program does have a significant role in determining mentees' self-efficacy.

Findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. This claimed, "was also conducted by Ab Latif *et al.,* [1]", with the purpose of study to investigate how the mentorship program at ILKKM Kubang Kerian, Kelantan, is perceived by the nursing students. The sample that was involved in that research was 46 students. Which a total of 24 persons from semesters 3 and 4 of the ILKKM Kubang Kerian (Nursing), which is made up of year 2 nursing students, participated in the research. The finding of that research is the mentorship program improved their communication, according to all of the respondents. According to the communication aspects findings, the majority of respondents felt that meaningful information may be shared face-to-face between a mentor and mentee and can be used to select the best course of action for addressing research difficulties. This also "was also conducted by Eller *et al.,* [14]", the mentor's communication techniques may boost the mentee's abilities and motivation to pursue their own personal growth. Additionally, "was also conducted by Ismail *et al.,* [22]", claimed that this type of instruction has improved the amount of communication between mentors and mentees, and that these interactions have been successful in transferring knowledge, skills, and abilities to the mentees. The results of mentees, particularly their academic success, may be significantly impacted by their capacity to establish good communication in the mentoring program, "was also conducted by previous studies [18,20,45]". Interpersonal communication skills are critical for higher education students, particularly those who come from diverse cultural backgrounds, "was also conducted by Sarwari *et al.,*[46]". The majority of survey participants said that self-confidence, support, and communication are all at high levels, "was also conducted by previous studies [27,28]".

Besides that, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. This claim can also be supported by similar research, "was also conducted by Ismail *et al.,*[21]", with the purpose of study is to analyze how mentorship communication techniques affect academic success. The sample that was involved in that research was 136 undergraduate students studying economics, management, and accounting at the undergraduate level at a public research institution in Malaysia. The finding of that research shows that although communication openness does in the organizational sample, interpersonal communication does not play a critical role in determining mentees' academic success. More than that, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. This claimed can also be supported by similar research, "was also conducted by Ismail *et al.,* [29]", with the purpose of study is to investigates the connection between the mentoring program and the academic success of the mentees. The sample that was involved in that research was 196 undergraduate students in a research university in Sarawak, Malaysia. The finding of that research is academic achievement and communication are considerably and favorably associated. Not that only, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. This claimed can also be supported by similar research, "was also conducted by previous studies [27,28]", with the purpose of study is to assess the mentees' self-efficacy, communication, and support levels. The second is to investigate the relationship between mentoring and self-efficacy. The last step is to look

at the relationship between mentorship and mentees' self-efficacy. The sample that was involved in that research was 136 undergraduate students in a research university in Malaysia. The finding of that research is first; there was a favorable and substantial relation between communication and mentees' self-efficacy. Second, there was a good and substantial relation between support and self-efficacy in the mentees. The outcome shows that, in the organizational sample, the mentoring program does have a significant role in determining mentees' self-efficacy. Lastly, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. This claim can also be supported by similar research, "was also conducted by Amadi *et al.,*[5]", with the purpose of study as a road to successful teaching and learning, determining the impact of student-teacher communication on students' academic progress. The sample that was involved in that research was 150 students. The finding of that research shows a very strong positive relationship between students' benefits on student-teacher communication and their academic achievement in the department, while students' attitudes had a much weaker positive relationship with students' academic success.

Findings on the relationship between self-efficacy and students' performance. Self-efficacy has a positive and significant effect on the student's performance. This claimed, "was also conducted by Ab Latif *et al.,*[1]", with the purpose of study to investigate how the mentorship program at ILKKM Kubang Kerian, Kelantan, is perceived by the nursing students. The sample that was involved in that research was 46 students. Which a total of 24 persons from semesters 3 and 4 of the ILKKM Kubang Kerian (Nursing), which is made up of year 2 nursing students, participated in the research. The finding of that research is 37 people (80.4%) agreed and 19% disagreed that the mentorship program improved their self-efficacy. According to the respondents, the questions "I feel that mentoring programs may assist me in adapting myself to learning" and "I am certain that mentoring program may help me in involvement actively in class discussions" received the highest scores. Self-reliance, "was also conducted by Ogilvie *et al.,* [41]", is the self-assurance and capacity of the person to carry out a task. High self-efficacy individuals often share their expertise, are capable of solving issues, and are always looking to grow. He adds, however, that those who lack enthusiasm for a task are more likely to give up and lack confidence in those with lower levels of self-efficacy. The responder has faith and trust that implementing mentee mentoring programs would improve academic performance. This also "was also conducted by previous studies [27,28]", said that in the company under study, mentoring programs are a significant predictor of mentees' self-confidence in carrying out a task. Besides that, the findings on the relationship between self-efficacy and students' performance. Self-efficacy has a positive and significant effect on the student's performance. This claimed can also be supported by similar research, "was also conducted by previous studies [27, 28]", with the purpose of study is to assess the mentees' self-efficacy, communication, and support levels. The second is to investigate the relationship between mentoring and self-efficacy. The last step is to look at the relationship between mentorship and mentees' self-efficacy. The sample that was involved in that research was 136 undergraduate students in a research university in Malaysia. The finding of that research is first; there was a favorable and substantial relation between communication and mentees' self-efficacy. Second, there was a good and substantial relation between support and self-efficacy in the mentees. The outcome shows that, in the organizational sample, the mentoring program does have a significant role in determining mentees' self-efficacy.

Findings on the relationship between psychosocial and students' performance. Psychosocial has a positive and significant effect on the student's performance. This claimed, "was also conducted by Ab Latif *et al.,*[1]", with the purpose of study to investigate how the mentorship program at ILKKM Kubang Kerian, Kelantan, is perceived by the nursing students. The sample that was involved in that research was 46 students. Which a total of 24 persons from semesters 3 and 4 of the ILKKM Kubang

Kerian (Nursing), which is made up of year 2 nursing students, participated in the research. The finding of that research is 91.30% of survey participants thought the mentorship programs had enhanced their psychological well-being. The question "I am able to meet new pupils" received the highest marks. When respondents and staff create positive relationships, academic attainment among the respondents may rise. The confidence in the ideas might be increased with a solid connection. This also “was also conducted by Abdullah *et al.,* [3]”, said that by receiving help from the mentorship program in place, psychological issues might be resolved. This also “was also conducted by Santos *et al.,* [44]”, who validated this finding, a mentor may help a student by providing emotional support while they adjust to college life on a personal and intellectual level. In the context of higher education, a student who is making an effort to fit in with their surroundings is sometimes described as a psychosocial mentee, “was also conducted by previous studies [13,45]”. Little is known about the mentee's psychological and self-care needs, despite the importance of the nature of this connection in mentoring models at the university level, “was also conducted previous studies [31,45]”. Mentoring may also help mentees' psychological growth at institutes of higher learning, “was also conducted by previous studies [4,9,13]”. This also “was also conducted by Ismail *et al*., [26]”, mentees' psychosocial development in the workplace may be improved by mentors' abilities to integrate communication and support in mentoring activities.

On the other hand, previous research has also used frameworks like the vector theory, theory of communication, theory of connectivism, self-efficacy theory, vroom theory, and more. Theory that support the relationship of support has a positive and significant effect on the student’s performance is vector theory, “was also conducted by Uno *et al.,* [50]”. Mentors who provide assistance often do so in two ways: emotionally by helping mentees develop new information, skills, and attitudes and guiding them in how to use them in everyday life; and practically by helping mentees adjust to different campus settings at different times. On the other hand, the concept of this vector theory is. Hence, this vector theory will apply in this research to investigate the impact of mentoring program online in support of mentees academic performance. Theory that support the relationship of communication has a positive and significant effect on the student’s performance is theory of communication by S. F. Scudder. This was supported by similar research, “was also conducted by Amad*i et al.,*[5]”, with the purpose of study as a road to successful teaching and learning, determine the impact of student-teacher communication on students' academic progress. The sample that was involved in that research was 150 students. While students' views showed a significantly lesser positive link with academic performance, the research's findings indicate a very high positive relationship between students' academic progress in the department and the advantages they receive from student-teacher interactions. On the other hand, the concept of this theory of communication is a constant in existence since it is necessary for all living things to speak with one another in order to thrive. According to Scudder, human communication may take one of the following forms: mechanical, psychological, social, systematic, or critical type of communication, all of which are intended to transfer information from one person to another. Barry asserts that, whether synchronous or asynchronous, there must be constant contact between the instructor and the students in the classroom for learning to be successful. Applying this theory to this study implies that a reciprocal type of communication between the students and the professors must exist throughout the learning process in order to raise the students' level of understanding of the subject being studied. Therefore, this communication theory will be used in this study to examine how mentorship programs affect academic achievement and communication.

Theory that support the relationship of communication has a positive and significant effect on the student’s performance is theory of connectivism by George Siemens and Stephen Downes This was supported by similar research, “was also conducted by Amadi *et al.,* [5]”, with the purpose of

study is to as a road to successful teaching and learning, determine the impact of student-teacher communication on students' academic progress. The sample that was involved in that research was 150 students. The results of that study demonstrate a highly significant positive correlation between students' academic success in the department and the advantages they receive from student-teacher interactions, while students' attitudes had a much weaker positive relationship with students' academic success. On the other hand, the concept of this theory of connectivism sees education as a process of building relationships, widening networks, and exchanging information via the use of cutting-edge digital tools. Hence, this theory of connectivism will apply in this research to investigate the impact of mentoring program in communication and academic performance.

Theory that support the relationship of communication has a positive and significant effect on the student's performance is self-efficacy theory by Bandura. This claimed can also be supported by similar research, "was also conducted previous studies [27,28]", with the purpose of study is to assess the mentees' self-efficacy, communication, and support levels. The second is to investigate the relationship between mentoring and self-efficacy. The last step is to look at the relationship between mentorship and mentees' self-efficacy. The sample that was involved in that research was 136 undergraduate students in a research university in Malaysia. The finding of that research is first; there was a favorable and substantial relation between communication and mentees' self-efficacy. Second, there was a good and substantial relation between support and self-efficacy in the mentees. The outcome shows that, in the organizational sample, the mentoring program does have a significant role in determining mentees' self-efficacy. Lastly, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. On the other hand, the concept of this self-efficacy theory by Bandura is that people who have self-confidence would behave and be motivated in ways that self-regulate, such as with effort, tenacity, and resilience while working on a job. Hence, this theory of connectivism will apply in this research to look in the impact of mentoring program in communication and academic performance.

Theory that supports the relationship of communication has a positive and significant effect on the student's performance is vroom theory by Victor Harold. This claimed can also be supported by similar research, "was also conducted previous studies [27,28]", with the aim of study is to assess the mentees' self-efficacy, communication, and support levels. The second is to investigate the relationship between mentoring and self-efficacy. The last step is to look at the relationship between mentorship and mentees' self-efficacy. The sample that was involved in that research was 136 undergraduates at a Malaysian research university. The finding of that research is first; there was a favorable and substantial relation between communication and mentees' self-efficacy. Second, there was a good and substantial relation between support and self-efficacy in the mentees. The outcome shows that, in the organizational sample, the mentoring program does have a significant role in determining mentees' self-efficacy. Lastly, the findings on the relationship between communication and students' performance. Communication has a positive and significant effect on the student's performance. On the other hand, the concept of this vroom theory by Victor Harold claims that people will behave in a specific way if they believe that doing so will lead to positive results. Hence, this theory of connectivism will apply in this research to investigate the impact of mentoring program in communication and academic performance.

Theory that support the relationship of communication has a positive and significant effect on the student's performance is theory by Erikson's. This claim can also be supported by similar research, "was also conducted by Ismail *et al.,* [21]", with the purpose of study is to analyze how mentorship communication techniques affect academic success. The sample that was involved in that research was 136 undergraduate students studying economics, management, and accounting at

the undergraduate level at a public research institution in Malaysia. The finding of that research shows that although communication openness does in the organizational sample, interpersonal communication does not play a critical role in determining mentees' academic success. On the other hand, the concept of this theory by Erikson's is that developing a sense of self and forming close relationships are critical for adolescents. To become a useful contributor to society, a young adult's sense of self and character must mature. Hence, this theory by Erikson's will apply in this research to look into the impact of mentoring program in communication and academic performance.

Theory that support the relationship of communication has a positive and significant effect on the student's performance is humanistic theory by Roger's (1951). This claim can also be supported by similar research, "was also conducted by Ismail *et al.,* [21]", with the aim of study is to analyze how mentorship communication techniques affect academic success. The sample that was involved in that research was 136 undergraduate students studying economics, management, and accounting at the undergraduate level at a public research institution in Malaysia. The finding of that research shows that although communication openness does in the organizational sample, interpersonal communication does not play a critical role in determining mentees' academic success. On the other hand, the concept of this humanistic theory by Roger's (1951), "was also conducted by Merenda *et al.,* [38]", is that a competent teacher should be more like a mentor, helping students reach their potential via a learner-centered strategy while staying out of their way. Hence, this humanistic theory by Roger's (1951) will apply in this research to look into the impact of mentoring program in communication and academic performance.

Theory that support the relationship of communication has a positive and significant effect on the student's performance is Mentoring Enactment Theory (MET) by Kalbfleish. This claim can also be supported by similar research, "was also conducted by Ismail *et al.,* [21]", with the aim of study is to analyze how mentorship communication techniques affect academic success. The sample that was involved in that research was 136 undergraduate students studying economics, management, and accounting at the undergraduate level at a public research institution in Malaysia. The finding of that research shows that although communication openness does in the organizational sample, interpersonal communication does not play a critical role in determining mentees' academic success. On the other hand, the concept of this Mentoring Enactment Theory (MET) by Kalbfleish is highlights the importance of open lines of communication in mentoring relationships. If students and mentors are to get the most out of their partnership, it is the students, not the mentors, who should take the lead in developing a communication strategy. Hence, this theory of Mentoring Enactment Theory (MET) by Kalbfleish will apply in this research to look into the impact of mentoring program in communication and academic achievement.

Although e-mentoring has gained attention in recent years, current research remains fragmented and limited in scope. Most studies emphasize bibliometric indicators such as publication trends, co-citations, and keyword analysis, but fail to capture the deeper qualitative aspects of mentor–mentee relationships. Cross-cultural perspectives are also underrepresented, leaving little understanding of how e-mentoring practices differ across educational contexts. Furthermore, the influence of emerging technologies such as AI-driven personalization and digital learning platforms has not been sufficiently addressed. Many studies remain retrospective, overlooking future-oriented implications for academic development. These gaps demonstrate the need for a more holistic and forward-looking exploration of e-mentoring in relation to students' academic performance. This study is significant because it offers one of the first comprehensive bibliometric mappings of e-mentoring, consolidating scattered literature into a structured overview. By analyzing 393 publications from the Scopus database, it identifies leading authors, influential journals, and key thematic evolutions in the field. The findings provide practical insights for educators and policymakers on how e-mentoring can be

designed to improve academic outcomes such as performance, self-efficacy, and communication skills. They also highlight the broader role of e-mentoring in addressing psychosocial needs and enhancing student retention in digital learning environments. Importantly, this study fosters interdisciplinary collaboration across education, psychology, and information systems. As such, it serves as a valuable foundation for future research and practice in the digital transformation of mentoring. The endeavor will use bibliometric analysis to address a number of topics. Search academic databases and research repositories to determine the total number of publications on the topic of E-mentoring. Analyze the publication trend over time, breaking down the number of research papers published year on year. Identify and list the names of influential academic journals that frequently publish papers on E-mentoring. Find reports or analyses on the geographical distribution of E-mentoring research to determine which countries are the most prolific in publishing on this topic. Identify the most relevant and most influential authors in the field of E-mentoring, based on their publication volume and citation count. Find the titles of highly cited research papers, differentiating between papers with high global citation counts and those with high local citation counts. Find the title of the research paper that has been cited or referred to the maximum number of times. Analyze existing literature reviews and meta-analyses to determine the current and evolving thematic structure of E-mentoring research. This study used bibliometric analysis of the Scopus database to describe the patterns of publications on e-mentoring in order to support the earlier findings. This study looked at a range of publications in terms of accessibility, language, topic matter, and source title in addition to the most often cited works, publishing patterns, and authors' keywords. The rest of the paper will be organized in the following steps. The methodology for bibliometric analysis will be presented in part (2) and result in part (4) and followed by results and conclusion in parts (4) and respectively.

2. Methodology

The bibliometric toolbox will be used to do the bibliometric analysis. The primary technique and the enrichment technique are the two methods included in the toolbox. Performance analysis (A) and science mapping (B) are the two key components of the approach. Although the primary approaches may be used for a wide range of investigations, this research study will concentrate on a few of them. Two pieces of software, R and VOSViewer, helped with the bibliometric. A quantitative study of a vast collection of data is called bibliometric analysis, and the results are presented as themes, networks, research elements, and descriptive analysis. The evolution and thematic organization of a certain field may be studied with the use of this bibliometric analysis, which "was also undertaken by Badenes-Rocha *et al.,* [7]". Additionally, this study is free of subjective prejudice. This paper's analysis of the bibliographic data "was also undertaken by Nasir *et al.,* [40]." Science mapping and performance analysis were used to derive the trends and research direction. A technique for analyzing the contributions of research participants, including authors, counties, publishers, publications, and institutions in the subject region, is performance analysis. The purpose of science mapping is to create connections among the components of research. As "also undertaken by earlier studies [7,40]," combining scientific mapping and enrichment approaches gives us the conceptual framework of a study area and the fundamental topics of the issue, establishing a connection between different research parts.

2.1. Bibliometric Search

A bibliometric analysis database is gathered from the Scopus database. The Scopus database, which "was also undertaken by Jakhar *et al.,* [30]," is regarded as the most scientific and methodical database for bibliometric analysis. Scopus has been recognized as the best database for bibliometric analysis in addition to the aforementioned claim, which "was also done prior research [7,40]". Therefore, it can be claimed that Scopus is the most extensive database that includes a wide range of information on articles and that papers must meet strict criteria in order to be included in this database.

Several keywords are recognized for the optimal search, including “virtual mentoring”, “E-mentoring”, and “electronic mentoring”. The optimal keyword was “E-mentoring”. This article will analyze E-mentoring. A search was performed on the Scopus database using the phrase " E-mentoring," resulting in the retrieval of 393 papers.

2.2 Filtration

The language publications were not chosen for to having other language publications. The selected papers were then those that were printed in journals. 393 publications were ultimately chosen for study. Since further filtration may lower the number of articles and may affect the bibliometric analysis, no sorting criteria other than these two were used.

3. Results

3.1 Total Publication and Number of Active Years of Publication

One performance analysis approach is the total publication. The overall number of publications on the study topic is taken into account. The 393 gathered findings from the articles released each year are included in the yearly scientific production. The papers were arranged in groups based on the year they were published in the journals. It is possible to conclude from Figure (1) that e-mentoring research is growing annually. There was just one publication in 1989; nevertheless, by 2012, there were 31 publications overall, and in 2023 and 2024, there were 25 and 15, respectively. Eight papers are counted until August 2025. The phrase "active years of publishing" refers to the number of years that research has been done in the field to examine the phenomena. Groundbreaking research is still being conducted, and the active year began in 1989. Given the pattern shown in Figures (1) and (2), there are still comparatively fewer studies conducted annually; as a result, there is need for further study on this subject.

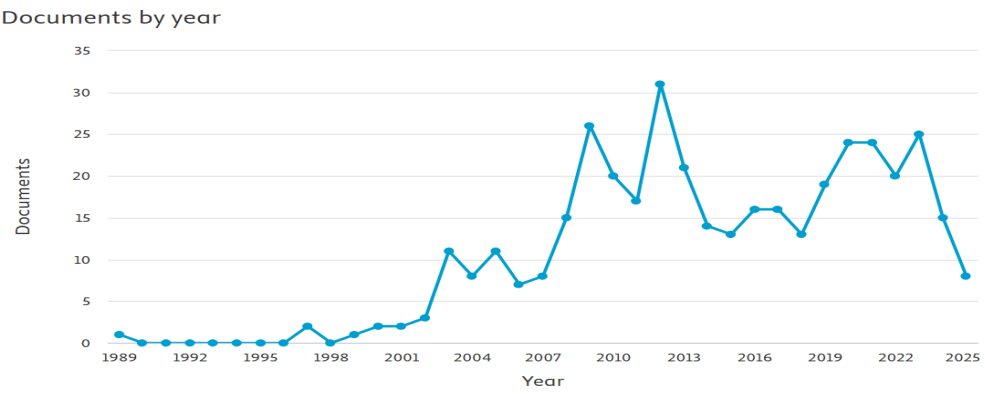

Fig. 1. Shows year-to-year publications from 1989 to 2025

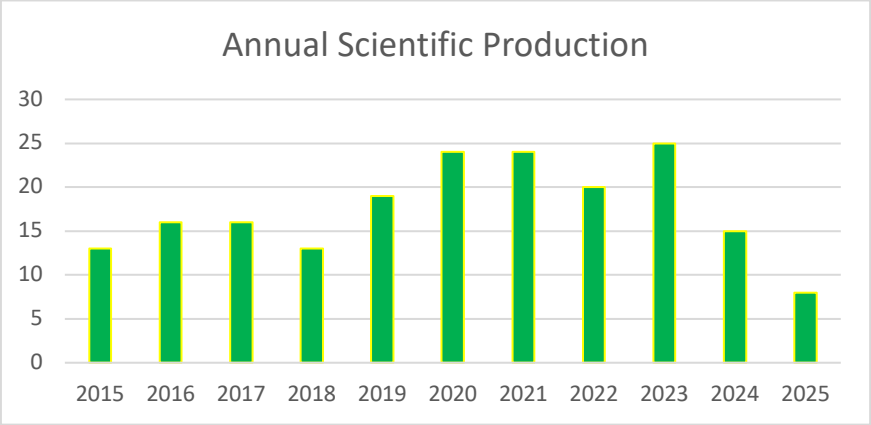

Fig. 2. Shows year-to-year publications from 2015 to 2025

3.2 Most Promising Journals

The journals that publish the most articles on a certain subject are considered promising. R software was used to identify promising journals based on Bradford's law. Table (1), which lists the top 10 promising journals in the subject of e-mentoring, shows the most promising journals. With a total of 18 articles in the topic of e-mentoring, the Mentoring and Tutoring Partnership in Learning journal has an advantage over other journals. With a total of 10 articles in the field of e-mentoring, the journal of lecture notes in computer science, comprising subseries of lecture notes in artificial intelligence and lecture notes in bioinformatics, has an advantage over other journals. With a total of five publications in the subject of e-mentoring, the Turkish online journal of distance education, the ASEE annual conference and exposition conference proceedings, and the ACM international conference proceeding series have an advantage over other journals. Bradford's law was chosen for examination in publications that showed promise. A graph displaying the source name and the quantity of papers published by a journal achieved the result. This can be seen in Table (1), the graph was later shaped into a table. By identifying the most pertinent journals that are leading the way in publishing content about e-mentoring, Bradford's law analysis will help researchers swiftly find and choose a few journals that will support their study of e-mentoring and future research. A journal's potential to impact future scholars in a certain topic increase with the number of papers it publishes in that field.

Table 1
The name of the journal along with the number of a paper published

No.	Name of journals	No. of published
1.	MENTORING AND TUTORING PARTNERSHIP IN LEARNING	18
2.	LECTURE NOTES IN COMPUTER SCIENCE INCLUDING SUBSERIES LECTURE NOTES IN ARTIFICIAL INTELLIGENCE AND LECTURE NOTES IN BIOINFORMATICS	10
3.	ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES	5
4.	ASEE ANNUAL CONFERENCE AND EXPOSITION CONFERENCE PROCEEDINGS	5
5.	TURKISH ONLINE JOURNAL OF DISTANCE EDUCATION	5
6.	JOURNAL OF VOCATIONAL BEHAVIOR	4
7.	SUSTAINABILITY SWITZERLAND	4
8.	INTERNATIONAL JOURNAL OF MENTORING AND COACHING IN EDUCATION	3
9.	JMIR PEDIATRICS AND PARENTING	3
10.	JOURNAL OF TELEMEDICINE AND TELECARE	3

3.3 Dominant Countries

In the field of research, the nations with the highest number of published papers and citations are regarded as dominating nations. The database is examined using R software for the analytical task. The results are interpreted using the scientific production and citations of the countries in order to identify the leading nations in the field of e-mentoring. Both the quantity of papers and the number of citations is used to determine which nations are dominant. The top ten nations are chosen to be examined from both angles. Finding the top nation by looking at figures (2) and (3) shows that, while Singapore has the greatest average article citations (20.5), the United States leads all other nations in terms of documents (153). With just 37 papers, the UK ranks second in terms of average document citations, which is a surprise element. Even though these nations had more published documents, Greece lagged behind several others in terms of citations, including Canada, Spain, Turkey, and others. Australia is in a similar situation. Compared to its Canadian equivalent, this country earned more citations with less papers. Information from figures (3) and (4) was transformed into a tabular format in Table (2) to facilitate the interpretation of the analysis. Thus, it can be said that Singapore and the United States are at the forefront of e-mentoring research. In terms of average article citations, the United States, the United Kingdom, Australia, and Greece are notable nations.

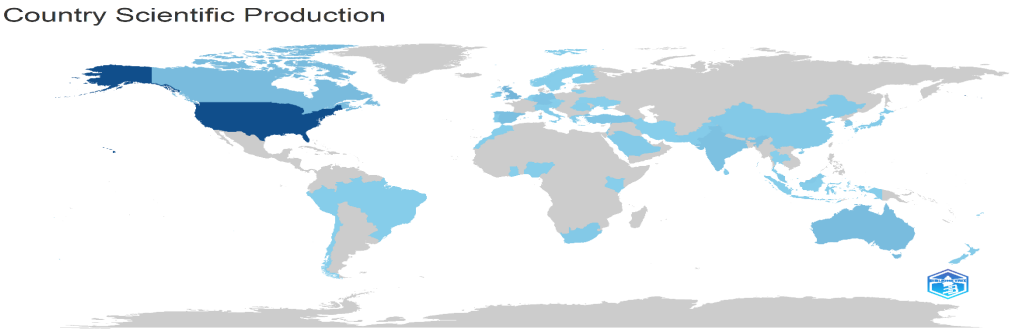

Fig. 3. A world map depicting the number of documents published by each country

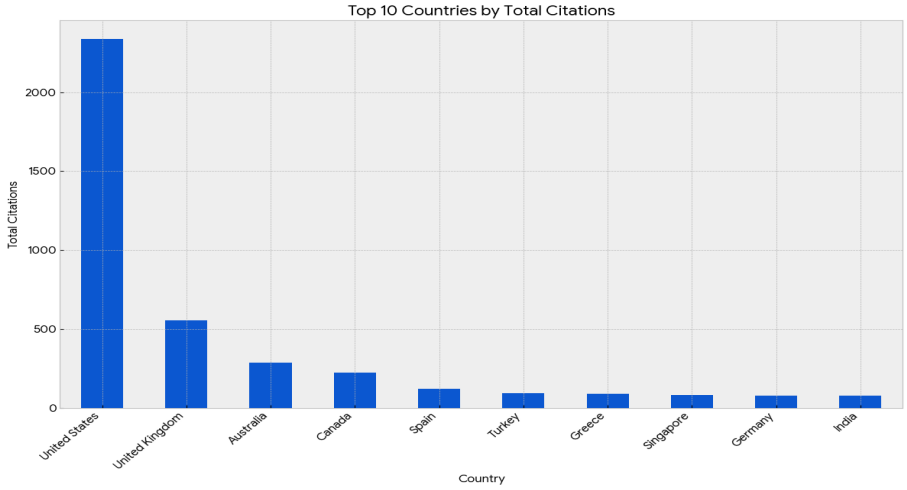

Fig. 4. The number of citations received by each country's documents

Table 2
The countries' names, the number of documents published and the number of citations received

Rank	Country	Documents	Rank	Country	Average Article Citations
1	United States	153	1	Singapore	20.50
2	United Kingdom	37	2	Greece	18.00
3	Australia	22	3	United States	15.28
4	Canada	18	4	United Kingdom	15.00
5	Spain	15	5	Australia	13.00
6	Turkey	12	6	Canada	12.44
7	Greece	5	7	Germany	8.78
8	Singapore	4	8	Spain	8.13
9	Germany	9	9	Turkey	7.92
10	India	13	10	India	5.92

3.4 Most Relevant Authors

The quantity of papers each author publishes determines which writers are the most pertinent. R software therefore calculated it by counting the number of e-mentoring-related publications they had written. According to the data, an author's significance increases with the number of papers they have written. The ten most pertinent writers are displayed in Figure (5). It is evident that Muller and Carol Blue both have twelve papers. The top ten writers cited can help readers understand their work and what more needs to be done. Joanne D. LECK and Sally Lindsay both contributed significantly with seven and six documents, respectively.

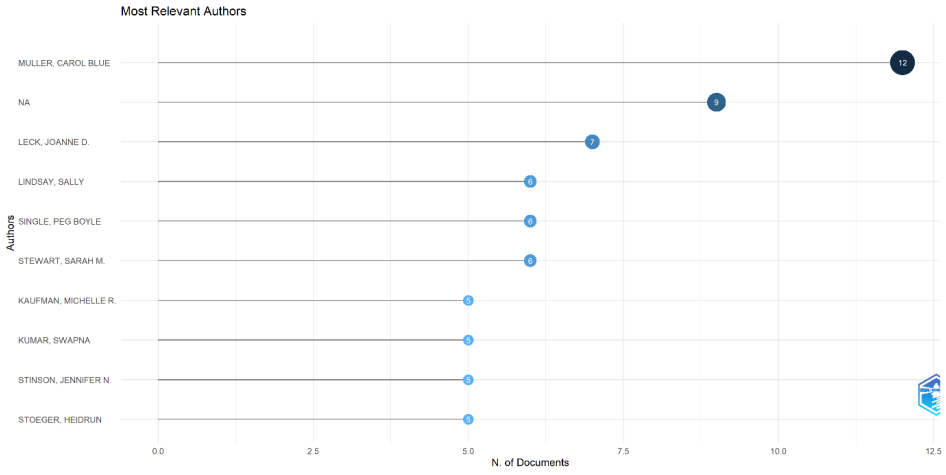

Fig. 5. The authors' names and the number of papers published by them

3.5 Influential Authors

The most influential authors are the ones who have received the highest number of documents in their field. It is solely based on the citations. Therefore, influential authors were determined by the total document count an author receives. Authors with the highest total document in their account will be the most influential, and authors with fewer citations will be less influential. Authors such as Bierema Laura Lee and Merriam Sharan B. with 274 document each, and Ensher Ellan Ann with 265 total documents are clearly leading the chart. But authors such as Single Peg Boyle and Single Richard M. are in 3rd and 4th position respectively. The rest of the authors are shown in figure (6).

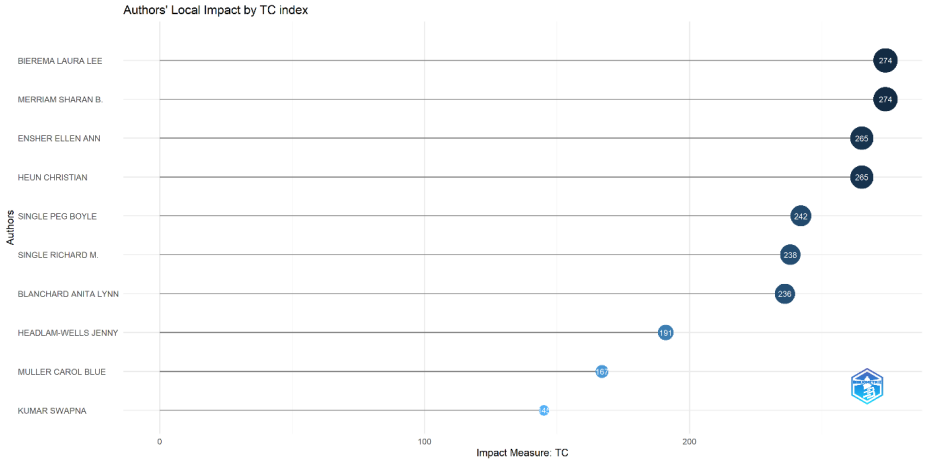

Fig. 6. Authors' names and numbers of total document

3.6 Citation Analysis

Citation analysis is a scientific mapping approach. When a publication is referenced by another publication, it links the publication. This "was also done by Jakhar *et al.,* [30]". Two criteria are used for citation analysis: (1) global citation and (2) local citation. The quantity of citations an article obtains from readers may be used to gauge its impact in citation analysis.

3.6.1 Most global cited documents

The publications with the most citations without any filtering, such as topic domain, are referred to as the most internationally cited texts. This research "was also done by Jakhar *et al.,* [30]". To put it another way, global citations are those that a publication receives regardless of whether it has been cited inside or outside of its topic domain. The ten most frequently cited papers worldwide might also be seen as having a significant impact on other writers' decision to include citations in their works. Both articles that discuss e-mentoring and those that do not discuss it make reference to these materials. Figure (7) displays the ten most influential papers, and table (3) analyzes them. The top ten most internationally cited publications that were examined from Figure (7) are included in Table (3) along with their article names, authors, and citation counts.

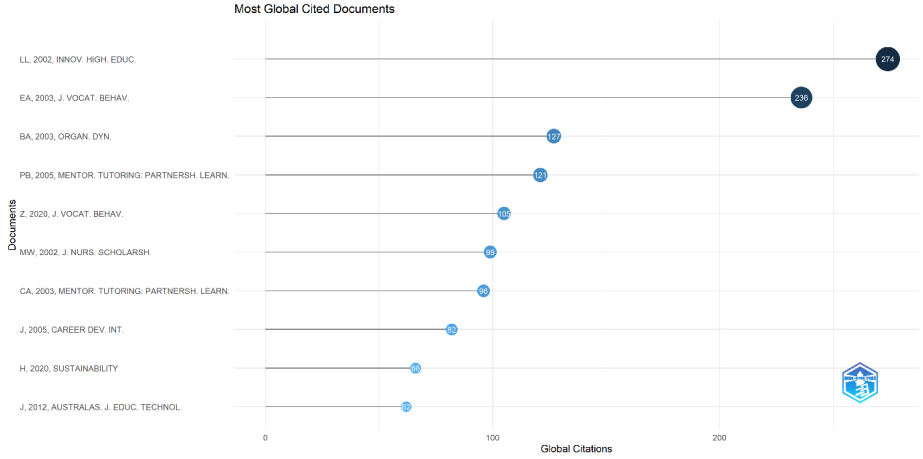

Fig. 7. Shows the most influential papers in terms of global citation

Table 3
Article name, authors' name, and citations of the top 10 globally cited documents

No.	Article Title	Authors	Global citation
1	E-mentoring: Using computer mediated communication to enhance the mentoring process	Bierema, L. L., & Merriam, S. B. (2002).	274
2	Online mentoring and computer-mediated communication: New directions in research	Ensher, E. A., Heun, C., & Blanchard, A. (2003).	236
3	E-Mentoring: Implications for organizational learning and development in a wired world	Hamilton, B. A., & Scandura, T. A. (2003).	127
4	E-mentoring for social equity: review of research to inform program development	Single, P. B., & Single, R. M. (2005).	121
5	Thriving at work: A mentoring-moderated process linking task identity and autonomy to job satisfaction	Jiang, Z., Di Milia, L., Jiang, Y., & Jiang, X. (2020).	105
6	Building research competence in nursing through mentoring	Byrne, M. W., & Keefe, M. R. (2002).	99
7	Building a better bridge: Testing e-training to improve e-mentoring programmes in higher education	Kasprisin, C. A., Single, P. B., Single, R. M., & Muller, C. B. (2003).	96
8	"There's magic in the web": e-mentoring for women's career development	Headlam-Wells, J., Gosland, J., & Craig, J. (2005).	82
9	E-Mentoring in higher education: A structured literature review and implications for future research	Tinoco-Giraldo, H., Torrecilla Sanchez, E. M., & García-Peñalvo, F. J. (2020).	66
10	International design collaboration and mentoring for tertiary students through Facebook	McCarthy, J. (2012).	62

3.6.2 Most local cited documents

Publications that are mentioned inside the topic domain are known as local cited documents; for example, an article that "was also undertaken by Jakhar *et al.,* [30]" obtains citations from another article in the same subject area. To put it another way, local citations are those that are specific to the field in which the materials are found. As an illustration, a paper about e-mentoring is referenced in another work about e-mentoring.

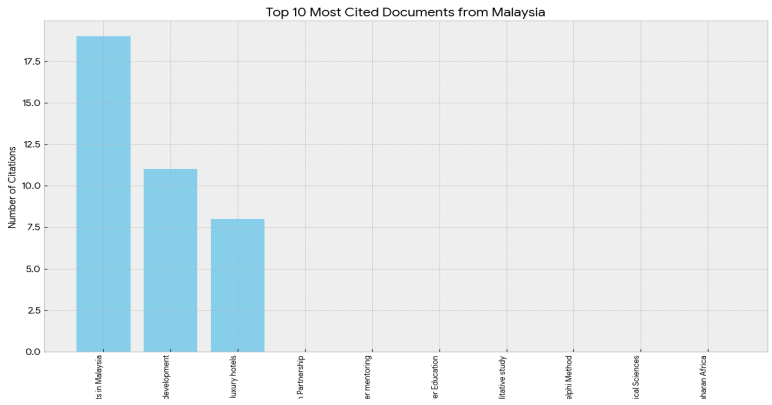

Fig. 8. Documents receiving a total number of local citations

As a result, the majority of locally cited papers examine works that are often referenced or mentioned in the field. One can rely on the papers displayed in figure (8) to gain understanding about

the topic matter. These materials are particularly pertinent to the subject of e-mentoring and can be considered trustworthy sources for obtaining first papers. It should be highlighted that, for the clear reasons stated in their definition, local citations are always lower than global citations. The analysis of Figure (8) is completed in Table (4).

Table 4
Article name, authors' name, and citations of the top 10 locally cited documents

No.	Article Title	Authors	Local citation
1	A framework for the development, implementation and evaluation of a clinical e-mentoring programme for physiotherapy students in Malaysia	M.Y. Manaf , A. Abdul Latif, M.H. Abdul Hamid, B.N. Baharom, T.J. Choo	19
2	Searching for e-mentoring practices for SME staff development	I. Leppisaari, M.L. Tenhunen	11
3	The matching process in e-mentoring: A case study in luxury hotels	D. Simmonds, A.M.Z. Lupi	8
4	Black Youth Access to Mental and Behavioral Health Care and Academic Support Through E-Mentoring and a Black Church Partnership	J.S. Parker, N.H. Haskins, R.A. Whitehead, B. Christian, T.N. Jackson, A. Ford	0
5	The Experience of Mentoring Students Online: An Evaluation of the Transition from Face-to-face to Online peer mentoring	C. Gkioka	0
6	Project-Based Mentoring and K-12 Collaboration for Sustainable Development in Pre-Service Teacher Education	B.Ç. Garipağaoğlu, B. Güloğlu, Y.D.D. Coşkun	0
7	Development of an e-mentoring intervention for support workers in aged care: A qualitative study	K.J. Czuba, A.C. Vandal, N.M. Kayes	0
8	Competency Development for E-Mentors of Undergraduate Nursing Students Using E-Delphi Method	D.M. Villarante, E. Schuler, T.A. Rincon, S.C. O'Donoghue	0
9	Transitioning from Teaching to Mentoring in Medical Sciences	A.K. Gupta	0
10	Evaluating the implementation of online research training and mentorship among early-career family physicians in sub-Saharan Africa	D.D. Schouw, R.J. Mash, P.O. Ameh, B.B. Fatusin, S.T. Engmann	0

3.7 Co-Citation Analysis

One method of scientific mapping is co-citation analysis. When two references are mentioned together in a third work, it is assumed that they are related in some way or share a similar content structure. Co-citation analysis, which "was also undertaken by Jakhar *et al.,* [30]," is used to expose the conceptual framework of a particular field of research. Based on the clusters created, this approach also assists us in identifying the most important publications. Each cluster has a theme and is based on a certain foundation. After grouping the documents into clusters, the co-citation analysis identifies the publications that are most related to each subject. Researchers can learn more about the article based on their interests thanks to this analysis. Additionally, future scholars might gather literature on a specific topic by consulting the related publications. The VOSViewer program employs a co-citation approach for the analysis. Only publications that have at least five citations in published articles are chosen. Just 40 out of 1085 reach the citation limit. Figure (9) was examined by assigning weight to the links.

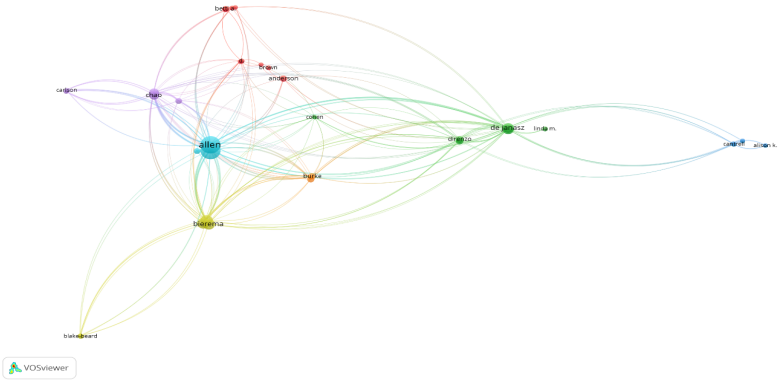

Fig. 9. A map of co-citation analysis based on the authors' name

Seven clusters are created in total. By giving the connections more weight, you may show how many additional papers are related to the papers in the reference list. A paper is better suitable for study if it has a greater number of connections.

Table 5
The interpretation of the co-citation map

Colour of cluster	Author name	Citation
Red	Anderson	10
Green	De Janasz	22
Bule	Cantrell	6
Gold	Bierema	26
Purple	Chao	17
Sky bule	Allen	71
Orange	Burke	10

This bar chart, titled "Document by author," in Figure (10) illustrates the number of documents published by a selection of authors. The y-axis represents the number of documents, while the x-axis lists the authors. Muller, C.B. is the most prolific author, with 9 documents. Three authors Lindsay, S.; Single, P.B.; and Stewart, S. are tied for second, each with 6 documents. The remaining six authors Kaufman, M.R., Kumar, S., Leck, J., Stinson, J., Stoeger, H., and Ziegler, A. have each published 5 documents. The chart clearly shows a decreasing trend in document count from the top author to the majority of the others. In summary, the chart highlights a clear leader in document production (Muller, C.B.), followed by a second tier of authors with a moderate number of publications, and a larger group of authors who have all contributed an equal and slightly lower number of documents.

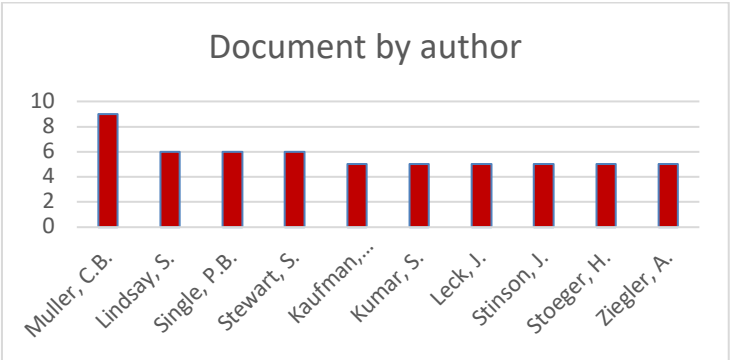

Fig. 10. Highest document from authors' name

This Table 6 shows the author pair of the collaborations," lists the top 10 author pairs based on the number of collaborations they've had. The table has three columns: No. (ranking), Author Pair, and Collaborations (the number of joint publications). The top three author pairs Stoeger Heidrun and Ziegler Albert, JN Stinson Jennifer N and Lindsay Sally, and CB Muller Carol Blue and PB Single Peg Boyle are tied for the highest number of collaborations, with 5 each. The next five pairs, including FJ García Peñalvo Francisco José and Tinoco Giraldo Harold, Cagliostro Elaine and Lindsay Sally, JD Leck Joanne D and JN Stinson Jennifer N, JD Leck Joanne D and Lindsay Sally, and PB Single Peg Boyle and RM Single Richard M, have all collaborated 4 times. Finally, the last two pairs on the list, DK Levine Deb K and MR Kaufman Michelle R and MR Kaufman Michelle R and Wright Kate, have each collaborated 3 times. This table effectively ranks the most frequent author pairs, with the highest frequency being 5 collaborations.

Table 6
The author pair of the collaborations

No.	Author Pair	Collaborations
1.	Stoeger Heidrun and Ziegler Albert	5
2.	JN Stinson Jennifer N and Lindsay Sally	5
3.	CB Muller Carol Blue and PB Single Peg Boyle	5
4.	FJ García Peñalvo FranciscoJosé and Tinoco Giraldo Harold	4
5.	Cagliostro Elaine and Lindsay Sally	4
6.	JD Leck Joanne D and JN Stinson Jennifer N	4
7.	JD Leck Joanne D and Lindsay Sally	4
8.	PB Single Peg Boyle and RM Single Richard M	4
9.	DK Levine Deb K and MR Kaufman Michelle R	3
10.	MR Kaufman Michelle R and Wright Kate	3

3.8 Co-Occurrence Analysis

An further science mapping method that uses "author keywords" is co-occurrence analysis. Considering the study aims to concentrate on the author's preferred method of conducting research, it contains terms that the author has utilized as keywords. Co-word analysis, which "was also undertaken by Jakhar *et al*., [30]," creates themes or groups based on words that occur together. Because just those keywords are desired, just the ones that appear in at least five articles are utilized for the purpose of analysis.

Keywords are frequently used by several writers to assess how a field of study is operating, and only powerful words may be examined. The point where the limit is reached by 111 characters. Five groups were formed by co-occurrence analysis using Figure (11) and Table (7). A keyword's effect increases with the size of the circle; e-mentoring and mentoring were mentioned 186 and 108 times, respectively. The keywords mentoring and students appeared 108 and 47 times, respectively, and the term e-mentoring appeared 108 times in a cluster (1) of red highlight words. The terms "human" (55) and "humans" (48) are included in cluster (2) of green. Keywords like "man" (27) in a blue cluster (3), "female" (31), and "mentor" (41), are highlighted. The gold-colored cluster (4) had terms like youth (10), leadership (11 times), and COVID. Purple is cluster (5), and the terms are interview (6), clinical article (6), and online education (8).

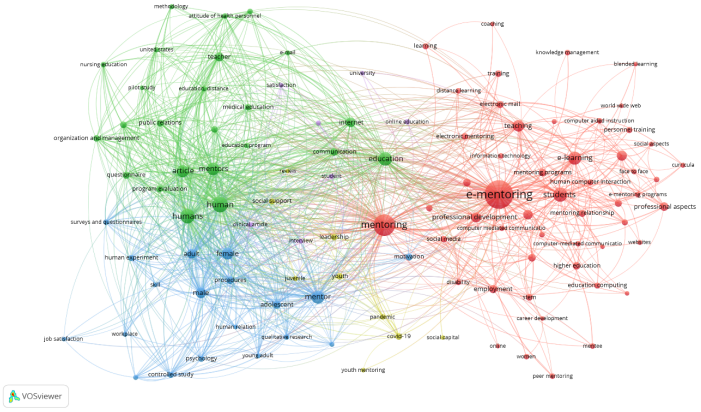

Fig. 11. A map of the co-occurrence of keywords

Table 7
Various keywords formulated through co-occurrence analysis

Colour of cluster	Keywords	Link	Total link strength	Times appeared
Red	e-mentoring	105	713	186
	mentoring	102	659	108
	students	80	276	47
Green	human	81	694	55
	humans	80	636	48
	education	89	383	43
Blue	mentor	82	423	41
	female	77	440	31
	male	73	389	27
Gold	covid	38	80	11
	leadership	42	83	11
	youth	33	73	10
Purple	online education	45	61	8
	clinical article	45	102	6
	interview	45	93	6

3.8.1 Thematic analysis

The co-occurrence analysis was used to create thematic clusters, as seen in Figure (12). This "was also studied by Jakhar *et al.,* [30]" Co-occurrence analysis is a science mapping approach concentrating around terms to develop clusters of different themes by categorizing keywords the fact that come together regularly. Every term was chosen in order to recognize the various themes that emerged. The reason is due to the simple reason that all keywords provide a more accurate image for theme creation, which considers the words used in the abstract, title, or keywords. Because the coverage of all keywords is greater than that of the author's keyword, phrases that featured in publications at least ten times were chosen for the thematic analysis. Phrases that appeared in documents more frequently were also considered. Although a keyword develops of greater significance in a specific area if it appears a minimum of 10 times in various papers, we need to assign it a weight of at least ten times before it appears in papers. Second, a hit-and-trial approach was used with varying weights; findings were easy to understand when the weight was ten times. A total of 47 words satisfied the minimum requirement, which assigned weight to keyword occurrences. Four clusters in all were created. Theme 1 talks about the role of E-mentoring as a fundamental building blocks of the field. The keywords here are centered on the foundational terms that define the subject

and the technological platforms that enable it. They explore the nature of e-mentoring itself, how it compares to traditional mentoring, and the technologies used to facilitate it. Theme 2 aims to the environments and sectors where e-mentoring is applied. The keywords reveal a strong emphasis on academic settings, from K-12 to higher education, as well as its use in professional and organizational development to improve workforce skills and training. Theme 3 is all about the subjects and participants involved in e-mentoring studies. It groups keywords related to the demographics of the individuals being studied, such as gender and age, and their specific roles within the mentoring relationship, such as mentor or mentee. Theme 4 is all the results and benefits that researchers are measuring. Keywords in this group relate to the positive effects of e-mentoring on individuals, such as career advancement, increased self-confidence, and job satisfaction. This theme highlights the "why" behind the research: what are the desired results of the mentoring process?. The same idea applies to analysis here as it does to cooccurrence; that is, a word is given more weight the larger the circle, which is visible.

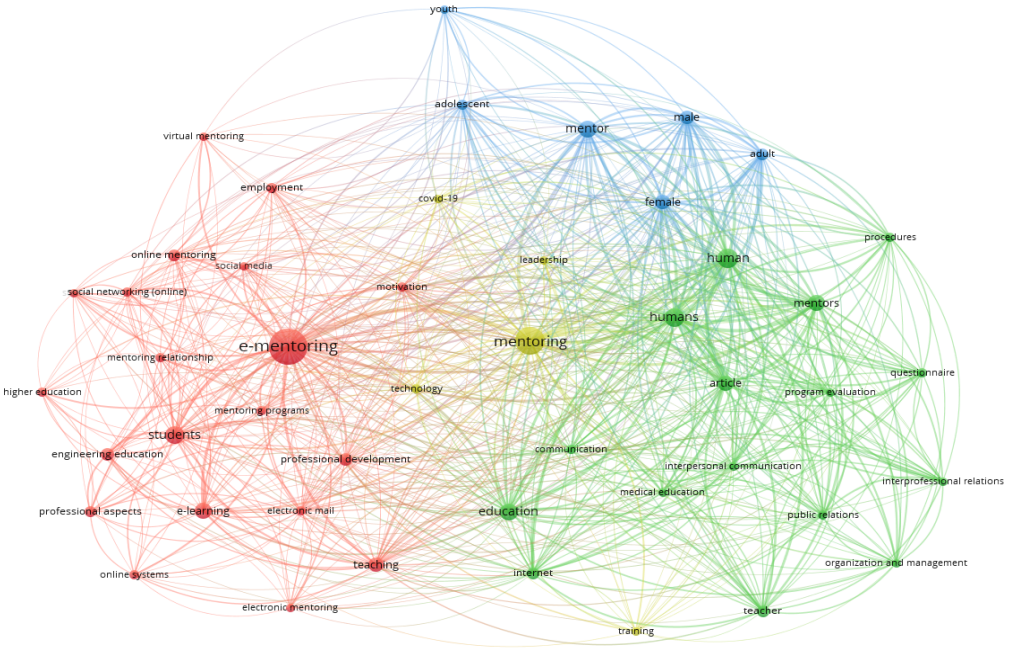

Fig. 12. A map of co-occurrence analysis to form themes through all keywords

3.9 Thematic Evolution

Thematic evolution is used to determine the direction of the trend, the diversification of the subject throughout time, and the paradigm change. Time is broken down into groups in theme progression in order to examine changes across time. Based on the Figure (13), analysis of publication trends and key research topics, the thematic evolution of e-mentoring has progressed through distinct phases. Early foundational work, primarily in the late 1990s and early 2000s, was characterized by seminal papers that focused on defining the core concept of e-mentoring and exploring its potential through early forms of computer-mediated communication. This was a period of theoretical exploration. As the field matured, particularly during the surge in publications from 2008 to 2012, the research shifted its focus from conceptualization to practical application. This era saw a greater concentration on implementing e-mentoring within specific contexts, especially in higher education and professional development. Finally, the most recent and significant spike in publications since 2020, likely catalyzed by the global shift to remote work and learning, marks a new

phase of widespread implementation. The current research is less about the "what" and more about the "how," with a heavy emphasis on analyzing the outcomes and effectiveness of e-mentoring on specific populations, such as students and the workforce, solidifying its place as a mainstream form of developmental support.

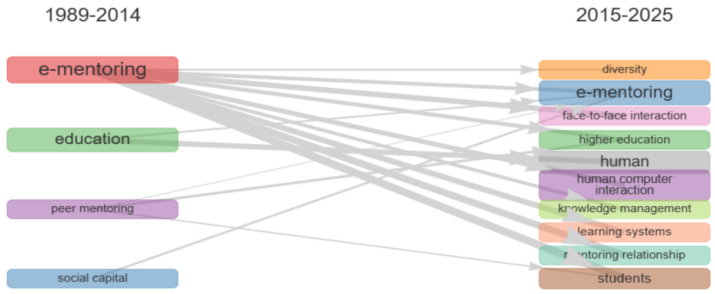

Fig. 13. Showcases thematic evolution

3.10 Discussion

Through offering a thorough bibliometric analysis of e-mentoring research, which methodically maps the field's intellectual structure, publishing patterns, and thematic evolution, the current study has significant advantages for both academia and practice. Finding reputable sources, identifying research gaps, and forming partnerships with seasoned professionals are all made easier for researchers and practitioners by the identification of powerful nations, significant writers, and high-impact publications. This study illustrates the growing importance of e-mentoring in higher education and professional development by examining 393 articles that were obtained from the Scopus database. It emphasizes the importance of e-mentoring in promoting mentees' academic success, self-efficacy, psychosocial development, and communication skills. Future researchers will also benefit from the study's clear overview of thematic clusters and co-occurrence patterns, which show how the field has developed from early investigations of computer-mediated mentoring to more intricate examinations of outcomes like career advancement, job satisfaction, and academic performance. With the use of these insights, researchers will be able to investigate new topics including how mentorship frameworks might include digital platforms, artificial intelligence, and post-pandemic online learning settings. Practically speaking, this study helps policymakers and educational institutions by showing that e-mentoring is a successful non-formal learning approach that may improve student engagement and retention, lessen academic stress, and augment traditional teaching. These results may be used by companies, training facilities, and universities to create evidence-based e-mentoring programs that put a focus on mentor training, support, and effective communication in order to optimize good outcomes for mentees. By using bibliometric tools like VOSviewer and Biblioshiny, this study also offers a methodological advantage by providing a reproducible framework for future researchers to conduct rigorous scientific analyses of other educational technology or social science fields. The use of the Scopus database guarantees the inclusion of high-caliber, peer-reviewed papers, which improves the findings' dependability and guarantees that practitioners, researchers, and policymakers may trust the results to inform strategic choices. Furthermore, by highlighting the shortcomings of the existing literature such as the underrepresentation of cross-cultural studies, the limited incorporation of disruptive technologies, and the lack of qualitative insights into mentor-mentee interactions—the study draws attention to future research prospects. The academic community will gain from filling these gaps by developing actionable information and broadening theoretical frameworks. Lastly, because e-mentoring crosses the boundaries of education, psychology, information systems, and organizational development, the

study contributes value by encouraging interdisciplinary collaboration. This allows researchers from various disciplines to relate their work to more general discussions about digital learning and professional development. Overall, by compiling and mapping previous research, the study not only enhances scholarly discourse but also offers practitioners, institutions, and policymaker's practical recommendations for utilizing e-mentoring as a scalable and sustainable approach to enhancing academic and professional results in a society that is becoming more and more digital.

4. Conclusions

To enable readers to better comprehend the field of e-mentoring, the paper's main objective was to perform a bibliometric study of the data gathered. The study's path, theme development and evolution, network analysis, and e-mentoring patterns were the main topics of the current study. Relevant data was gathered with the use of the bibliometric analysis about the E-mentoring and to uncover the topic's various virtual mentoring, mentoring, electronic mentoring and more. This bibliometric analysis on E-mentoring highlights the progressive development of research in this field, with a steady increase in publications from 1989 to 2025, indicating its growing academic and industry relevance. The findings reveal that research has primarily focused on variables such as support, communication, self-efficacy, and psychosocial development all play a crucial role in enhancing student outcomes. The study highlights that effective mentoring, regardless of the format (in-person or electronic), is a vital non-formal learning strategy that supplements traditional educational methods. By providing guidance and fostering a strong mentor-mentee relationship, these programs can improve students' academic results, self-assurance, and ability to handle personal challenges. The study also identifies promising journals such as the Mentoring and tutoring partnership in learning, Lecture notes in computer science including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics and the ACM international conference proceeding series, ASEE annual conference and exposition conference proceedings, and Turkish online journal of distance education as leading outlets for E-mentoring research, while Singapore, Greece, United States, and United Kingdom emerge as dominant contributors in terms of research productivity and citation impact. Furthermore, influential authors and highly cited works provide the intellectual foundation of this field, while thematic and co-occurrence analyses demonstrate that research has evolved from basic adoption factors to more complex considerations of student outcomes, academic results, and guidance. Overall, the study concludes that E-mentoring research has become an important academic domain, bridging technology adoption theories and consumer behavior in the digital education.

The findings of this study have significant implications for higher education and professional development. The positive relation between e-mentoring and academic performance suggests that educational institutions should actively integrate and promote e-mentoring programs to improve student success and retention rates. For instance, colleges can use these programs to help students cope with the stresses of academic work and life, especially in an increasingly digital world, by addressing factors such as anxiety and lack of motivation. Furthermore, the study's emphasis on support, communication, and self-efficacy implies that these programs should be designed with these specific elements in mind. This calls for the need for trained mentors who can effectively provide emotional support and facilitate open communication to help mentees develop their full potential and prepare for future challenges.

The present investigation has limitations. primarily because this study only examined publications in the Scopus database, its conclusions weren't applicable to various other contexts. Prospective investigations may thus gain intriguing insights by using more extensive datasets, such Web of

Science or Google Scholar. This limitation narrows the scope of insights and may overlook influential contributions in the E-mentoring domain published outside Scopus. Therefore, future research can expand the bibliometric mapping by incorporating multiple databases, which would allow for more holistic coverage, stronger cross-validation of findings, and broader generalizability across disciplines. This study primarily concentrated on quantitative bibliometric indicators such as publication trends, co-occurrence, co-citation, and thematic evolution. While these methods provide valuable insights into structural patterns, they do not capture deeper qualitative aspects of consumer experiences and managerial practices. Future research can adopt a mixed-method approach, combining bibliometric mapping with content analysis or systematic literature reviews to offer richer theoretical and practical insights. The study also has limitations in terms of temporal and thematic scope. Although it identifies evolving themes and trends from 2015 to 2025, the analysis remains largely retrospective and does not account for disruptive technologies or socio-economic changes that may redefine the E-mentoring landscape in the near future. For example, innovations such as AI personalization, virtual study, digital tools, and the learning management systems (LMS) could significantly reshape mentees' academic performance. Thus, future research should extend the bibliometric horizon by incorporating foresight analysis, trend forecasting, and scenario planning to anticipate emerging research avenues and practical challenges in the E-mentoring ecosystem.

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