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Bibliometric and Network Analysis: Case Based Learning Model Based on Statistica Preneurship to Strengthen Data Analysis Ability and Resilience of Mathematics Students

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Abstract

Educators present complex cases as realistic problem scenarios relevant to the topic studied in case-based learning. Case-based learning provides an opportunity to analyze content by introducing core knowledge domains and encouraging students to search for other domains relevant to the problem given in the case. The learning theory underlying this research is constructivist. Learning Model Development can be interpreted as developing new learning models or modifying existing ones. The development of new learning models aims to increase the effectiveness and efficiency of the learning process. Statistica Preneurship, as one of the integration factors in this research, is used with the consideration that statistics is an essential and valuable science in various fields, such as economics, society, education, health, technology, or the environment. Statistics can help in making rational and data-based decisions. Statistics can also help in developing more advanced and innovative science and technology. Entrepreneurship education can be evaluated using various methods and indicators, such as knowledge or skills tests, attitude or behavior surveys, product or service portfolios, or case studies of success or failure. The evaluation results can be used to develop entrepreneurship education sustainably. Another integration factor in this research is student resilience. A key aspect of student resilience is the perception of academic stress and coping strategies. This study also found that problem-focused coping, emotion-focused coping, and social support were positively related to academic resilience while problem-solving dealing in the form of avoidance was negatively related to academic resilience.

Keywords: Case Based Learning, Data Analysis Ability, Student Creativity, Student Resilience,

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INTRODUCTION

The development of case-based learning is an exciting topic to study and research, as can be seen from the bibliometric results for research with the theme of case-based learning model development, as presented in Figure 1. Some relevant research includes The Effect of Applying Case Based Learning Methods on Motivation Learning and Student Learning Results (Wospakrik, 2020). This research aims to analyze the effect of applying the CBL learning method on student learning motivation and learning outcomes. The research results show that the CBL method effectively develops students' knowledge and motivation in learning and obtaining better learning outcomes. Furthermore, Wahyuni et al. (2020) examined the effectiveness of developing case-based learning-oriented modules to improve high school students' critical thinking skills. This research aims to develop and validate a CBL-oriented Physics learning module to improve high school students' critical

thinking skills. The research results show that the CBL module improves students' critical thinking skills.

Another relevant research is the development of case-based learning e-modules using analogies to improve scientific literacy skills. This research aims to analyze the characteristics of a CBL-based physics module using analogies to improve students' scientific literacy skills. The research results show that the CBL module improves students' scientific literacy skills (Chanifah, 2021). In line with the results of this research, other research explains that CBL is a constructivist learning approach where the problems are presented in case-based learning. In CBL, educators present complex cases in realistic problem scenarios relevant to the material being studied. During mathematics learning that applies CBL, students must actively integrate many sources of information in the context and try to solve cases based on previous experience and knowledge. Case-based learning provides an opportunity to analyze content by first introducing core knowledge domains and encouraging students to look for other domains relevant to the problem given in this case.

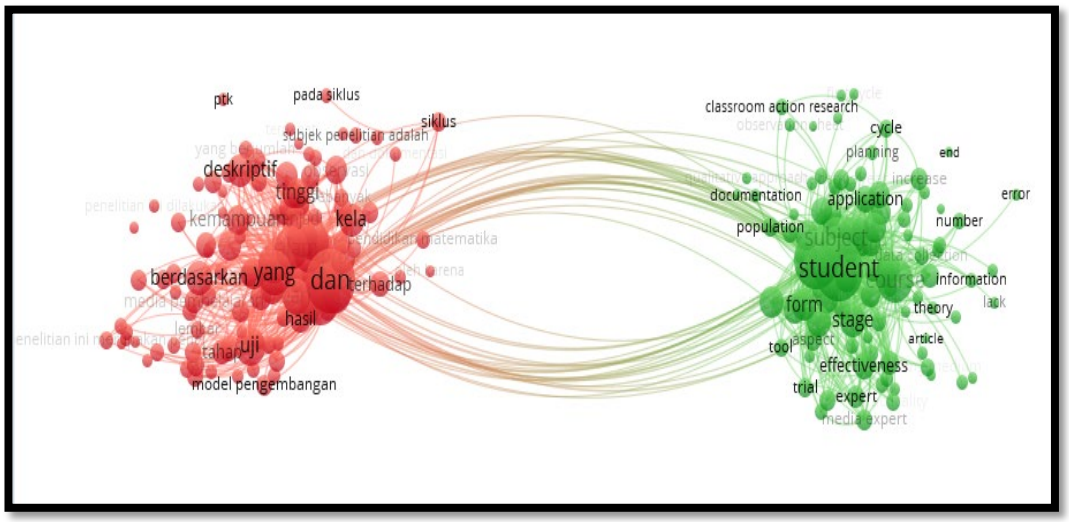

Figure 1. Vosviewer Visualization Research Development of Case Based Learning Models

Based on Figure 1, there are two large clusters in case-based learning development research. Cluster 1 is descriptive research, model development research, student abilities, and mathematics education research, which also uses case-based learning. Cluster 2 is inferential research involving populations and samples, for example, classroom action research, lesson plans, learning documentation, applied research, student-centered learning research, learning effectiveness research, and several other research focuses.

METHODS

Research using bibliometric methods can also reveal that very few research results are not cited after a decade of publication in popular radiology journals in the United States; considering that citations reflect research impact, research results show that these journals have worked well at selecting meaningful research results. Therefore, researchers hope to consider these characteristics (Rosenkrantz et al., 2019). Katharina Fellnhofer (2019) examined 1,773 articles published from 1975 - 2014, and found a taxonomy scheme for

entrepreneurship education research using bibliometric methods with eight clusters: (1) Education social and policy-based entrepreneurship, (2) "Human capital studies related to entrepreneurship, (3) Organizational entrepreneurial education, (4) Triple helix, (5) Redesign and evaluation entrepreneurship education initiatives, (6) e*ntrepreneurship learning, (7) impact studies entrepreneurship education and (8) environment-related opportunities for entrepreneurship education in organizational level. This research uses the bibliographic coupling analysis method and Network Analysis using Isingsampler.

Bibliographic coupling analysis is different from direct citation analysis and produces a taxonomy. It will reveal what scientists are working on as the field of research changes from year to year due to researchers making discoveries and diverting their attention to various research problems. Bibliographic coupling analysis is a method for grouping technical and scientific documents, facilitating the provision of scientific information, and retrieving documents (Sidiq, 2019).

RESULTS & DISCUSSION

Results

Some learning theories that educators popularly use are contextual, behavioristic, constructivist, and cognitivist learning theories. (1) Contextual Learning Theory, this theory emphasizes the importance of context in the learning process. According to this theory, learning occurs when students can relate new knowledge to everyday experiences. Research shows that a contextual learning approach can improve students' understanding and motivate them to learn. (Yanti, 2022). (2) Behavioristic Learning Theory emphasizes the environment's role in shaping human behavior. According to this theory, human behavior is influenced by learning experiences obtained from the surrounding environment. Research shows a behavioristic learning approach can improve students' problem-solving skills and strengthen desired behavior (Abidin, 2022). (3) Constructivist Learning Theory emphasizes students' active role in the learning process. According to this theory, students must construct knowledge through direct experience and reflection. Research shows that a constructivist learning approach can improve students' understanding and motivate them to learn. (Suryana, 2022; Ngadino dkk., 2021). (4) Cognitivistic Learning Theory, this theory emphasizes the role of information processing in the learning process. According to this theory, students must process new information in a way that is meaningful to them in order to remember it well. Research shows that a cognitive learning approach can improve students' understanding and motivate them to learn (Ni'amah, 2021).

A learning model is a framework that provides a systematic description for implementing learning to help students learn with specific goals to be achieved. The learning model is a general description but focuses on specific objectives (Kusumawati, 2023). The learning model has a unique characteristic, namely the existence of a systematic pattern or plan. Learning models have four unique characteristics that differentiate them from strategies, methods, or procedures. These characteristics include the following: The learning model is a logical theoretical rationale prepared by its creators or developers. A learning model is a plan or pattern used as a guide in carrying out learning in class or tutorials. A learning model is a conceptual framework that describes systematic procedures for organizing a learning system to achieve specific learning goals and functions as a guide for learning designers and teachers in planning and implementing learning activities. Nowadays, 21st-century learning models have been widely studied because of their perceived usefulness in improving the quality of students' learning. Learning models can be divided into several types: cooperative learning models, inquiry learning models,

problem/case-based learning models, project-based learning models, and so on (Albina, 2022; Handayani, 2023).

Learning models have been widely researched in the last ten years; per the Mendeley Database, 2014, there were 3232 studies related to Learning Models; likewise, in 2015 and 2016, there were 4338 and 5869 related studies, respectively. Learning Models were also the theme of 8113 studies in 2017, 9871 in 2018, 12334 studies in 2019, and 13643 studies with the theme of Learning Models in 2020. Meanwhile, in 2021, 2022, and 2023, respectively, there were 14098, 14053, and 3870 studies on Learning Models. Visualization of research related to the Learning Model can be seen in the following Vosviewer output.

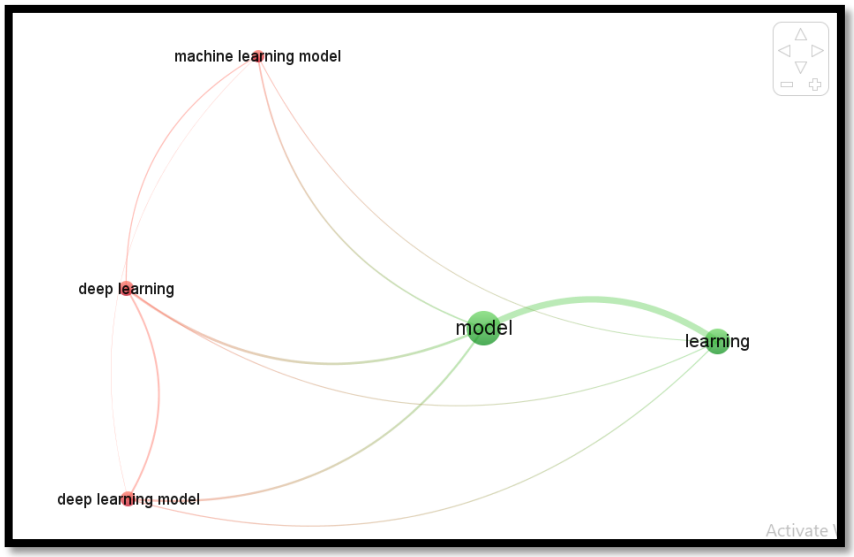

Figure 2. Bibliometric Visualization Research Theme Learning Model

Based on Figure 2, two large learning research groups can be grouped. Cluster 1 is learning research in general, and Cluster 2 is research related to machine learning, deep learning, and deep learning models. Learning Model Development can be interpreted as developing new learning models or modifying existing ones. The development of new learning models aims to increase the effectiveness and efficiency of the learning process. Case-based learning is a model emphasizing case-solving as the center of learning activities. Students are allowed to identify cases and find solutions to these problems. Research with the theme Case Based Learning (CBL) has been widely carried out from year to year; according to information on www.mendeley.com, in 2016, there were 8991 studies related to CBL; in 2017, 2018, and 2019, there were 12083, 17605, respectively. , and 18609 studies on CBL themes. Moreover, in 2020, 2021, 2022, and 2023, respectively, there were 19,174, 22,860, 23,985, and 12,105 studies related to CBL, which can be visualized in the results of the bibliometric analysis using VosViewer.

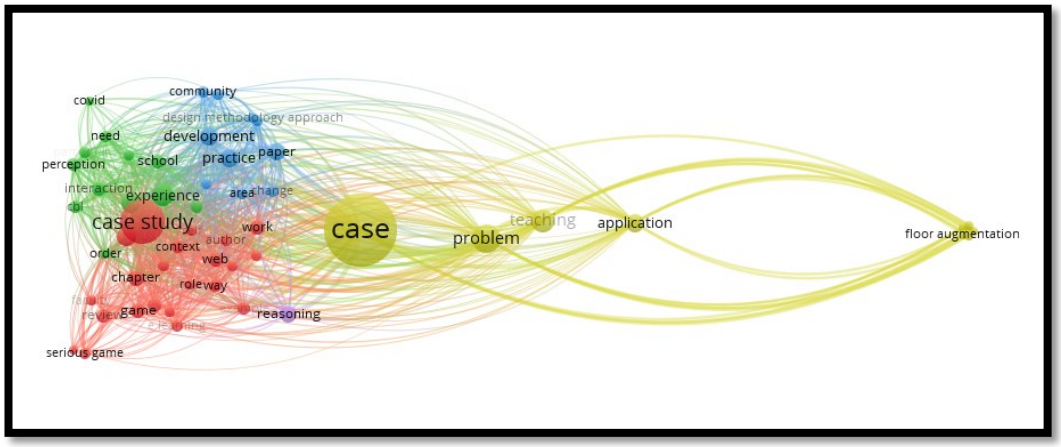

Figure 3. Vosviewer visualization of the relationship between research themes and case-based learning

Based on Figure 3, there are five large clusters in research related to case-based learning. Cluster 1 is research on floor augmentation, applied research, teaching research, problems in learning, etc. Cluster 2 is research on communities, practical research, development research, etc. Cluster 3 is research related to Covid 19, analysis of student needs, perception research, experience-based learning research, research in schools, interactions in research, etc. Cluster 4 is research related to case studies, contextual learning, learning with game techniques/methods, use of the web for learning, rollaway learning, etc. Cluster 5 is reasoning in case-based learning.

The learning method that can be used in mathematics education in statistics lectures is the case method. The case method is a learning method that uses real or fictional cases as material for discussion and analysis. The case method can help students develop critical, creative, and communicative thinking skills in solving statistical problems. The case method is a learning method that uses real or fictional cases as material for discussion and analysis. A case is a story or description of a situation or problem in a particular context. Cases can come from various fields of science, such as business, law, medicine, education, etc. Cases can be simple or complex, structured or unstructured, open or closed.

In the case method, students act as active learners who must study cases independently or in groups, identify the problems, look for additional information relevant to the case, analyze data related to the case, and formulate alternative solutions to the problems. The problem is to choose the best solution based on specific criteria and present the results of their analysis and solution orally or in writing. Lecturers act as facilitators who provide cases to students, guiding questions to help students understand the cases, providing feedback and suggestions, and evaluating the learning process and outcomes.

The case method has several characteristics that differentiate it from other learning methods. Some of these characteristics are: (1) Focusing on real or fictional cases relevant to the learning material. (2) Using an inductive approach requires students to discover statistical principles or concepts from the given case. (3) Using a collaborative approach that requires students to work together in groups to analyze cases and find solutions. (4) Using a reflective approach that requires students to reflect on the process and results of their learning. (5) Using an interactive approach that requires students to discuss the cases given with lecturers and fellow students. (6) Using an integrative approach that requires students to integrate statistical knowledge and skills with other fields of science related to the case.

The case method has several advantages that can improve the quality of mathematics education in statistics courses. These advantages include: (1) Increasing students' motivation and interest in statistics because the cases given are engaging, meaningful, and relevant to real life. (2) Improve understanding and mastery of statistical concepts because students must apply these concepts in solving the given cases. (3) Improve students' critical, creative, and communicative thinking skills in solving statistical problems because students must identify, analyze, and present these problems systematically and logically. (4) Improve students' teamwork abilities and social skills because students must work together in groups to analyze cases and find solutions. (5) Students' independent and lifelong learning abilities must be increased because students must seek additional information relevant to the case and develop a reflective attitude towards their learning process and results.

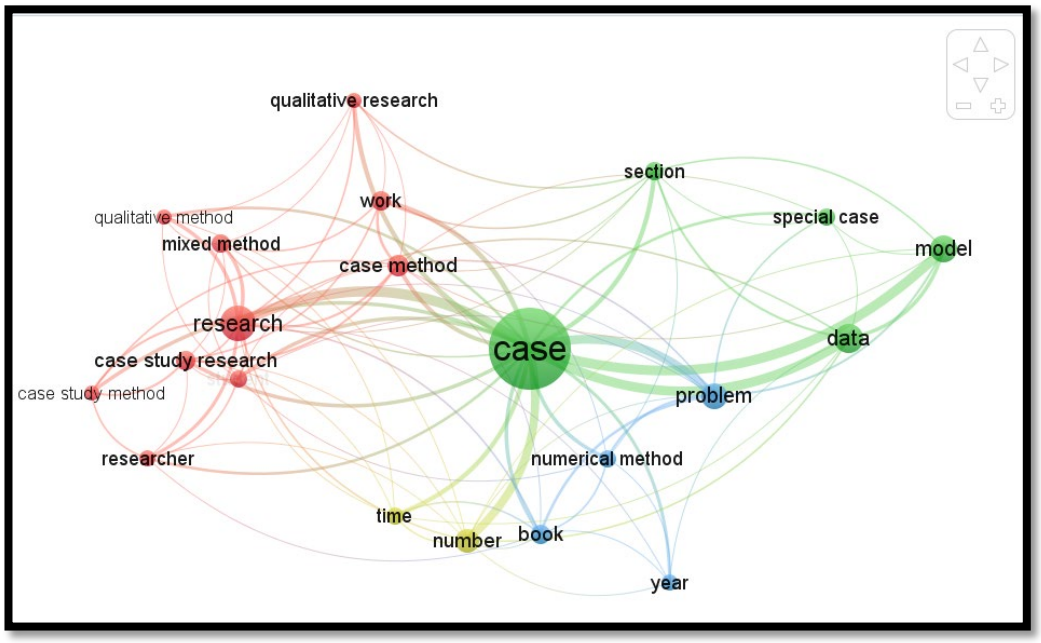

Figure 4. Vosviewer Visualization for Case Method Research Themes

Based on Figure 4, there are four research clusters related to case method research. Cluster 1 is section method, particular case method, modeling research, data-based research, etc. Cluster 2 consists of problem-based methods, annual case research, numerical case methods, and case books. Cluster 3 is in the form of time series cases, case number research, etc. Cluster 4 consists of qualitative research, casework, case method, mixed method, case study research, etc. Case-based learning (CBL) is a learning method that uses real or fictional cases for discussion and analysis. CBL is a form of problem-based learning (PBL), which requires students to solve problems using relevant knowledge and skills. CBL has several advantages, such as increasing student motivation, understanding, critical thinking skills, teamwork, and independent learning. However, CBL also has several disadvantages, requiring more time, preparation, skills, and support than conventional learning methods. To overcome these shortcomings, several modifications can be made to the CBL. CBL modification is developing or adjusting CBL according to conditions, needs, and learning objectives. CBL modifications can be made to various aspects, such as source, type, structure, or case process. CBL modifications aim to increase the effectiveness and efficiency of CBL in achieving the expected learning outcomes.

Some examples of CBL modifications in mathematics education are (1) Modification of case sources. The case source is the origin or background of the case used in CBL. The source of cases can be internal or external. Internal case sources are cases created by lecturers or students themselves. External case sources are cases taken from other sources, such as books, journals, the internet, or mass media. Case sources can be modified by combining internal and external case sources so that cases become more varied, engaging, and relevant to the learning context. (2) Modification of case types. Case type is the form or case format used in CBL. Case types can be written or multimedia. The type of written case is a case that is presented in the form of text, images, tables, graphs, or formulas. Multimedia case types are cases presented in the form of audio, video, animation, or simulation. Modifying case types can be done by replacing or adding written cases with multimedia cases, making the cases more stimulating to students' senses of sight and hearing. (3) Modification of case structure. Case structure is the arrangement or components of cases used in CBL. Case structure can be structured or unstructured. A structured case structure is a case that has clear and complete components, such as background, problem, data, solution, and evaluation. An unstructured case structure is a case with less clear and complete components, so it requires explanation or additional information from the lecturer or other sources. Modifications to the case structure can be made by changing the level of the case structure so that the case becomes more appropriate to the student's level of ability and independence. (4) Modification of the case process. The case process is the stages or activities carried out in CBL. The case process can include several stages, such as case presentation, group discussion, class discussion, presentation of results, and evaluation. Case process modifications can be made by changing each stage's sequence, duration, or method to make the process more flexible, efficient, or effective.

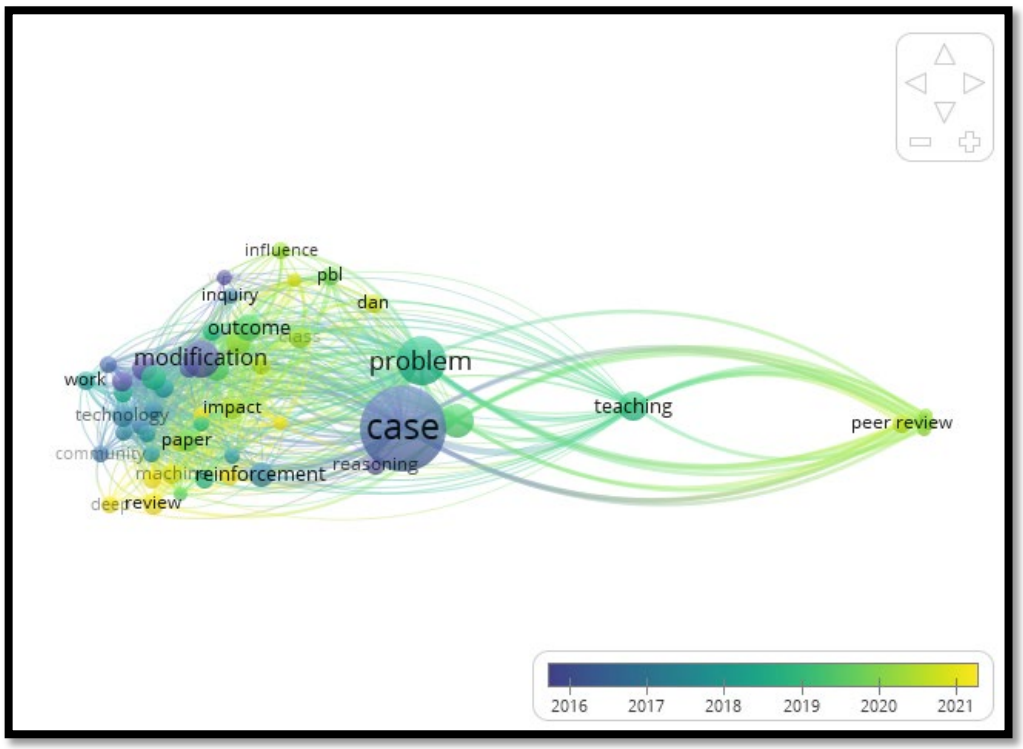

Figure 5. Vosviewer Visualization for Case-Based Learning Modification Research Themes

Based on Figure 5, in 2016 - 2021, CBL and CBL modification are closely related to research on teaching techniques, peer review and peer assessment, problem-based learning, inquiry method, learning outcomes, learning impact, reinforcement, etc. Conversely, Statistics is a science that studies how to collect, analyze, and present data systematically and objectively. Statistics can be used to test hypotheses, make estimates, or provide recommendations based on data. Statistics consists of two main branches, namely descriptive statistics and inferential statistics. Descriptive statistics is a branch of statistics that aims to present and summarize data in the form of tables, graphs, or measures of concentration and distribution. Descriptive statistics can describe data characteristics, such as mean, median, mode, standard deviation, quartiles, percentiles, or correlation coefficients.

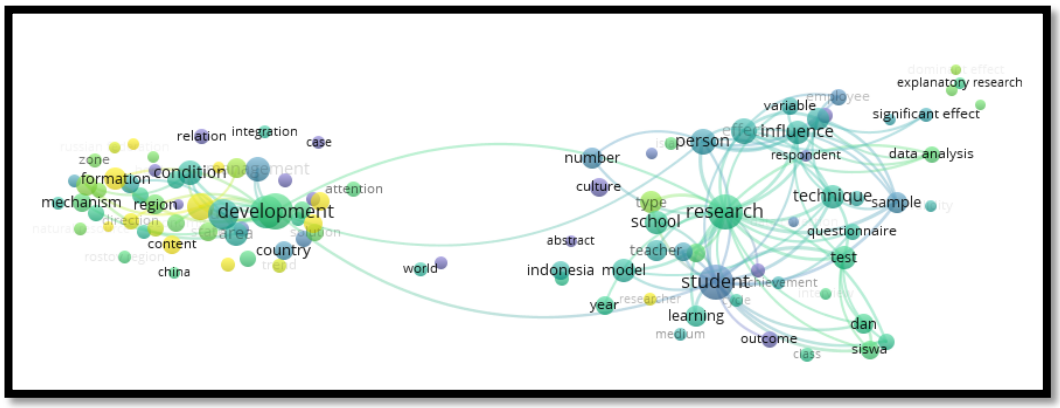

Figure 6. Vosviewer Visualization of Research with the Statistics in Education Theme

Figure 6 shows the relationship between statistics in education and various other research, such as influence analysis, significant effect (effect size), data analysis, sampling techniques, development research, relations, integration, conditions, formation, mechanisms, etc.6Inferential statistics is a branch of statistics that aims to make conclusions or generalizations about populations based on sample data. Inferential statistics can provide information about the level of confidence or significance of the conclusion or generalization, such as confidence intervals, p values, t-tests, F tests, chi-square tests, or analysis of variance. Statistics is an important and useful science in various fields, such as economics, society, education, health, technology, and the environment. Statistics can help in making rational and data-based decisions. Statistics can also help in developing more advanced and innovative science and technology.

Entrepreneurship is creating, developing, and managing a business by exploiting opportunities, facing challenges, and overcoming risks (Dharma, 2019). Entrepreneurship is essential to improve community welfare, reduce unemployment, and encourage economic growth. Therefore, entrepreneurship needs to be instilled early, including among university students. One study program that has excellent potential for developing entrepreneurship is mathematics. Mathematics is a science that studies abstract concepts, logic, and order, and it can be applied in various fields. Mathematics students have advantages in terms of analytical, creative, innovative, and problem-solving skills, which can be utilized for entrepreneurship. However, not all mathematics students are interested in and motivated to become entrepreneurs. Many factors influence entrepreneurial attitudes and behavior among mathematics students, such as curriculum, environment, culture, and entrepreneurship education. Entrepreneurship education is a learning process that aims to form and develop entrepreneurial competence in individuals. Entrepreneurship education

in higher education can be carried out through various activities, such as entrepreneurship courses, entrepreneurship internships, business work courses, business consulting, new entrepreneur incubators, student creativity programs, and student entrepreneurship programs.

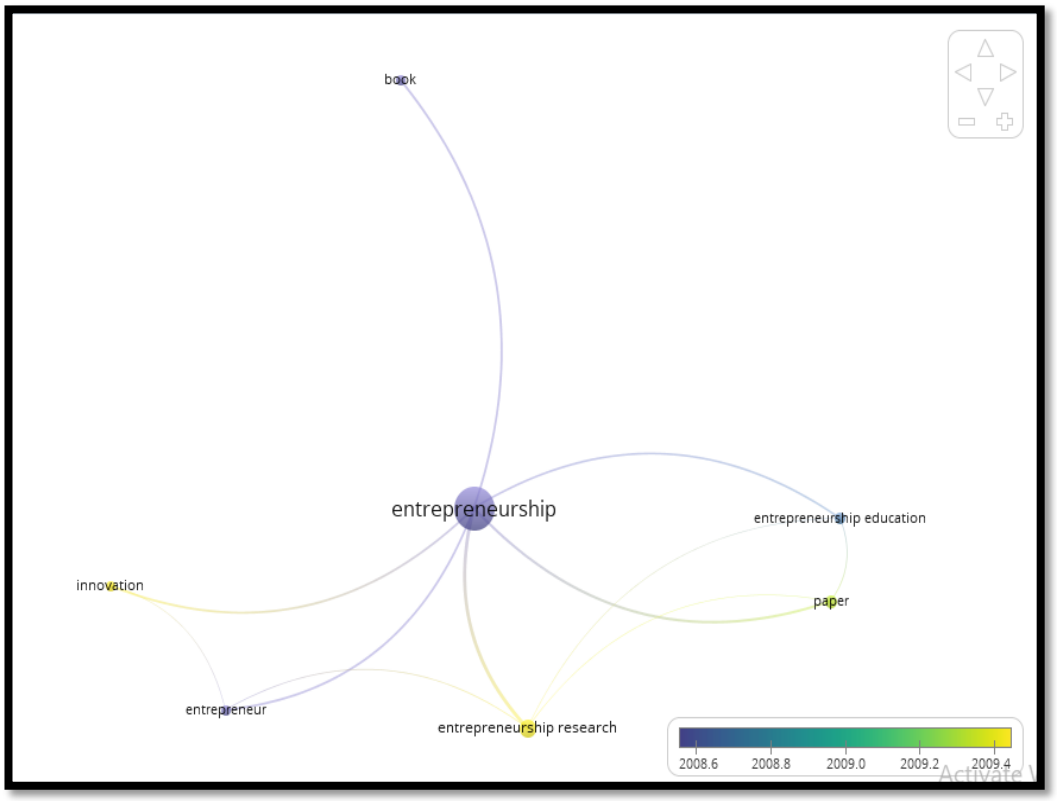

Figure 7. Vosviewer Visualization Results for Entrepreneurship Research Themes

Figure 7 shows the relationship between entrepreneurship and entrepreneurship education, research, innovation, and entrepreneurship. Entrepreneurship education among university mathematics students faces several challenges, including (1) Lack of curriculum suitability to entrepreneurial needs. Mathematics curricula in universities tend to be theoretical and academic, so they do not provide enough space for entrepreneurial development. Existing entrepreneurship courses are still general and optional, so they do not attract the interest of mathematics students. The mathematics curriculum also pays little attention to cross-disciplinary aspects relevant to business, such as economics, management, law, and psychology. (2) Lack of environmental support and entrepreneurial culture. Universities' entrepreneurial environment and culture are still not conducive to fostering interest and motivation in mathematics students to become entrepreneurs. Factors that influence the entrepreneurial environment and culture include the vision and mission of higher education, academic policies and regulations, supporting resources and facilities, internal and external networks, collaboration, and social values and norms. (3) Lack of quality and quantity of entrepreneurship educators. Entrepreneurship educators are people involved in the entrepreneurial learning process, such as lecturers, instructors, mentors, guest speakers, or role models. Entrepreneurship educators must have pedagogical, professional, social, and personal competencies based on entrepreneurial learning characteristics. However, the quality and quantity of entrepreneurship educators in universities are still inadequate. Many entrepreneurship educators do not have an

educational background or entrepreneurial experience relevant to mathematics. (4) Lack of evaluation and development of entrepreneurship education. Evaluation of entrepreneurship education is the process of measuring and assessing the effectiveness and impact of entrepreneurship education on the entrepreneurial competence of mathematics students. Entrepreneurship education can be evaluated using various methods and indicators, such as knowledge or skills tests, attitude or behavior surveys, product or service portfolios, or case studies of success or failure. The evaluation results can be used to develop entrepreneurship education sustainably.

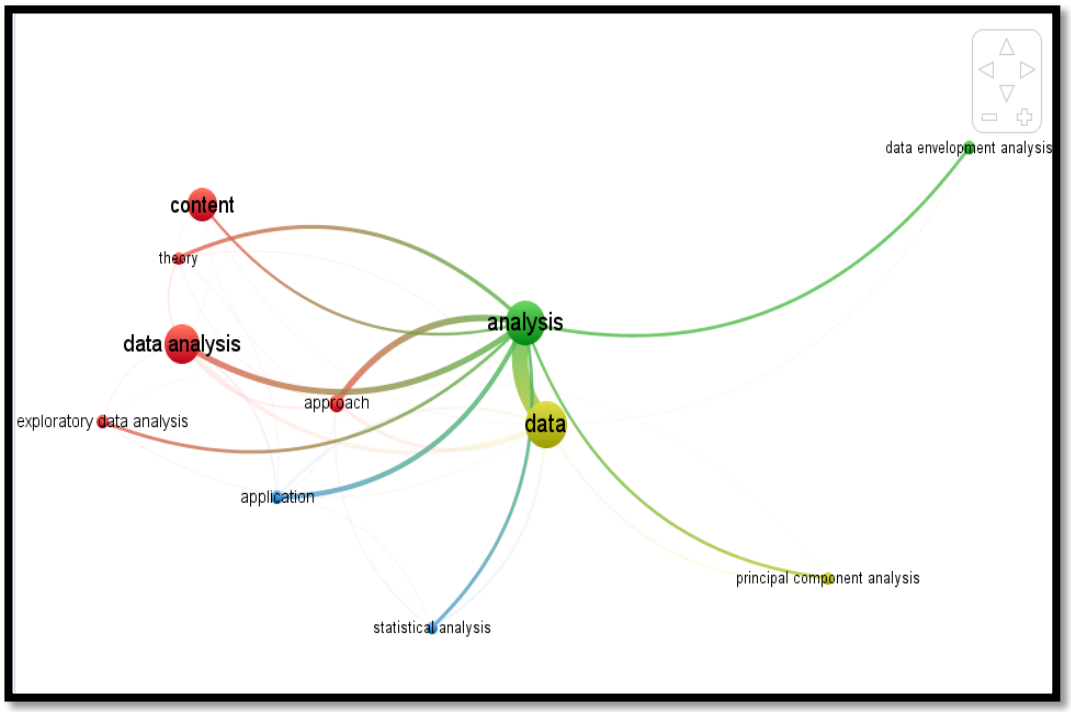

Figure 8. Vosviewer Visualization Research Data Analysis Theme

Figure 8 shows several clusters in the research analysis. Cluster 1 is content analysis, theoretical research, data analysis, research approach, and exploratory analysis. Cluster 2 is statistical analysis and application. In cluster 3, several related research themes are data analysis, principal component analysis, and data envelopment analysis. Data analysis skills are one aspect of critical thinking skills, the primary goal of mathematics education. Data analysis skills include collecting, processing, interpreting, and presenting data systematically and logically. Data analysis capabilities can be improved by applying appropriate learning models, such as case-based learning, which is expected to improve students' learning competencies, including data analysis abilities, because this model can stimulate students' cognitive, affective, and psychomotor activities. Other factors that can influence students' data analysis abilities are learning independence and the use of information and communication technology (ICT).

Student resilience is the ability to overcome and adapt to complex events or problems that occur in life. It is the result of the strength that exists within an individual so that he is able to adapt to unpleasant conditions. According to Fitriani (2022), resilience is the human ability or capacity possessed by a person, group, or society that enables them to face, prevent, minimize, and even eliminate the detrimental impacts of unpleasant

conditions or even change miserable living conditions. It becomes a natural thing to overcome.

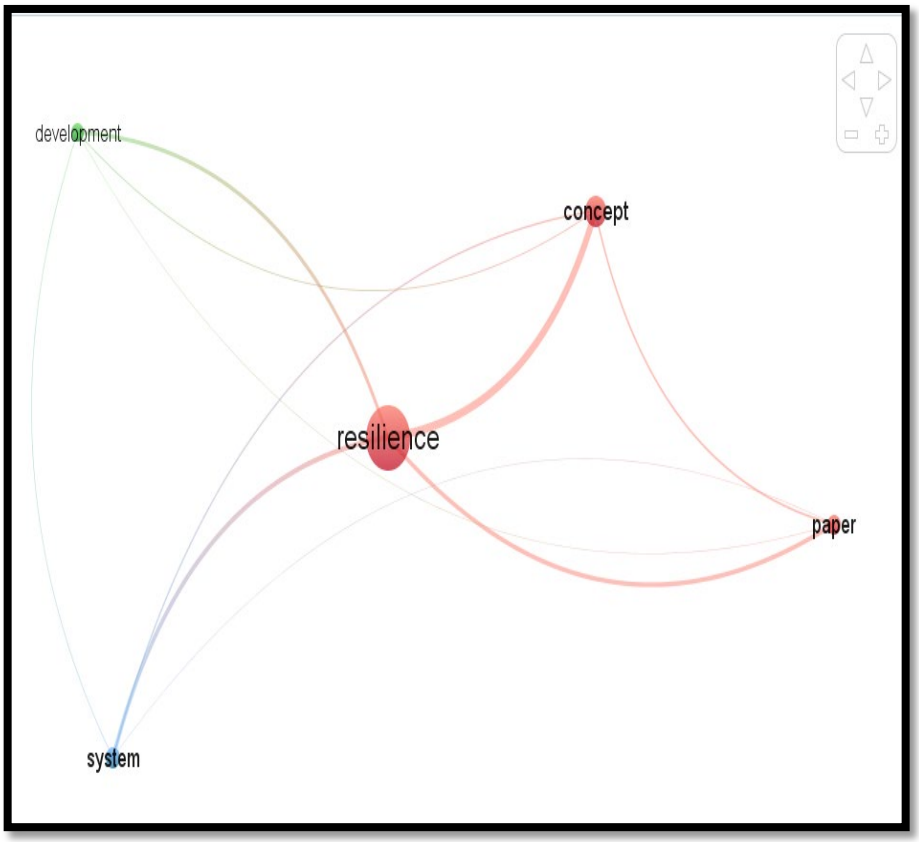

Figure 9. Vosviewer Visualization of Research with the Theme of Resilience (Resilience)

Figure 9 shows the relationship between the resilience research theme and concepts, systems and development, and research papers related to resilience. Resilience has several underlying aspects: meaningful life, perseverance, equanimity, self-reliance, and existential aloneness (Cajada, 2023). Meaningful life (purpose) is the awareness that life has a goal to be achieved, which requires effort to achieve this goal. Perseverance is an attitude of surviving in the face of challenging conditions or situations that are being faced. Equanimity is the perception held by individuals related to life experiences. Individuals can see the perspective of events they have experienced so that they focus more on the positive rather than the negative things about the difficult situations they experience. Self-reliance is a person's ability to be independent in making decisions and acting in challenging situations. Existential aloneness is a person's ability to feel comfortable with themselves and not depend on other people.

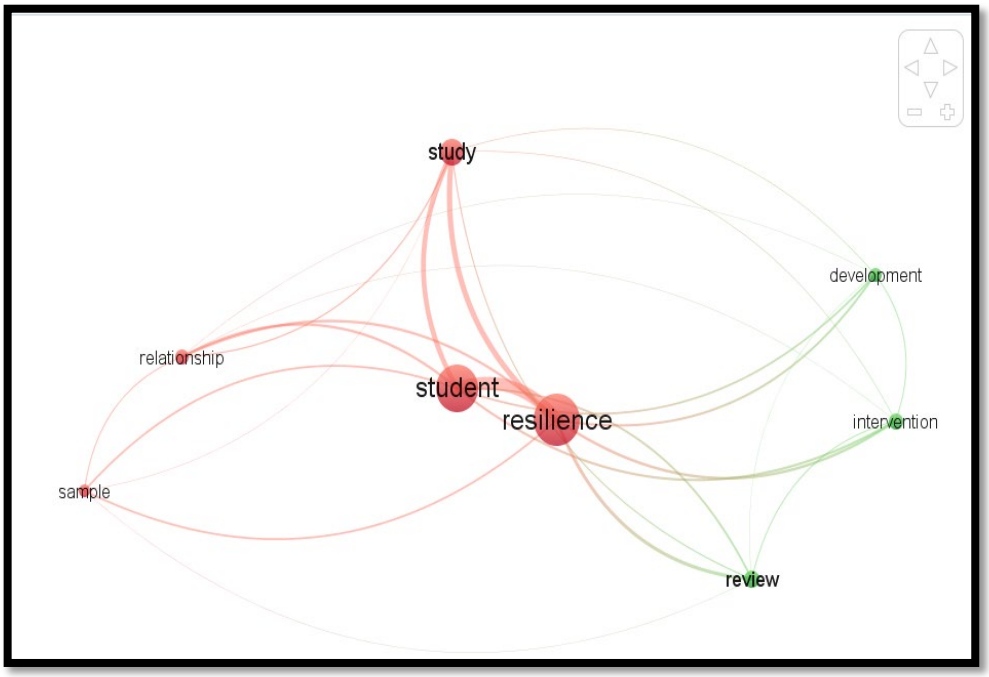

Figure 10. Vosviewer Visualization of Research with the Theme of Student Resilience

Figure 10 shows the relationship between student resilience and relationships, study, development, intervention, etc. One way to increase student resilience is through intervention programs that target specific aspects of resilience, such as self-regulation, optimism, social support, and problem-solving skills. A literature review by Radhamani and Kalaivani (2021) examined 30 studies on academic resilience interventions among students at national and international levels. The review found that most interventions effectively improved students' academic resilience and achievement. The review also identified several common characteristics of successful interventions, such as using multiple components, involving multiple stakeholders, applying interactive methods, and providing adequate services.

Discussion

Research that links case-based learning and resilience over the last ten years has included 154 studies in 2023, 218 studies in 2022, 2365 studies in 2021, 1002 studies in 2020, 1203 studies in 2019, and 754 studies—109, 111, and 112 studies in 2018, 2017, 2016, and 2015, respectively. Bibliometric analysis using VosViewer has shortcomings in the form of descriptive or qualitative analysis. To overcome this deficiency, it needs to be equipped with other network analyses, one of which is Isingsampler. The following are network analysis assisted by JASP software.

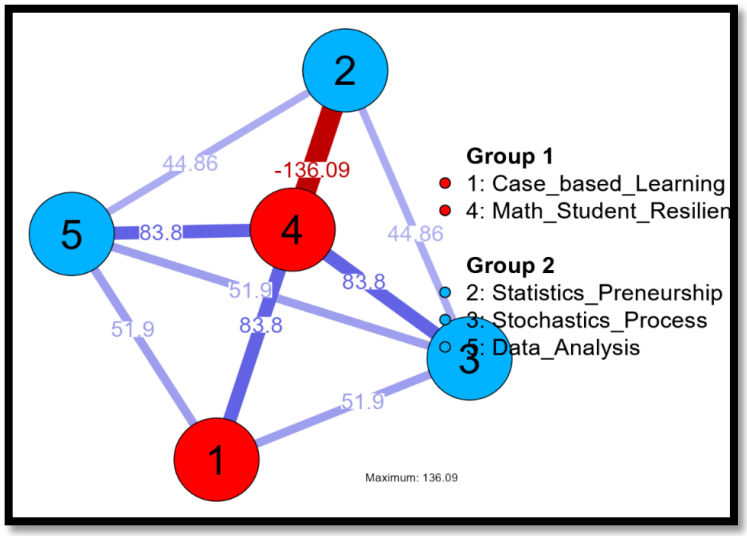

Figure 11. The Relationship between CBL and Mathematics Student Resilience with Statistics (Preneurship et al.)

Figure 11 above shows that bibliometrically, according to network analysis, aspects related to learning, such as case-based learning and resilience of mathematics students, are closely related to statistical aspects, such as partnership statistics, stochastic processes, and data analysis.

Table 1. Centrality measures per variable

Variable	Network			
	Betweenness	Closeness	Strength	Expected influence
Case_based_Learning	-0.447	-0.431	-0.576	0.671
Statistics_Preneurship	-0.447	-0.495	-0.007	-1.565
Stochastics_Process	-0.447	-0.431	-0.576	0.671
Math_Student_Resilience	1.789	1.788	1.734	-0.448
Data_Analysis	-0.447	-0.431	-0.576	0.671

Table 1 above explains each variable's central size (research theme) as the size between objects in the variable, closest size, strength, and expected influence.

Table 2. Clustering measures per variable

Variable	Network	
	Onnela	Zhang
Case_based_Learning	-0.525	0.519
Statistics_Preneurship	-0.194	0.215
Stochastics_Process	-0.525	0.519
Math_Student_Resilience	1.770	-1.773
Data_Analysis	-0.525	0.519

Table 2 shows the clustering size of each variable based on the Onnela and Zhang network (Generalizations of the clustering coefficient to weighted complex networks).

Table 3. Weights matrix

Variable	Network				
	Case_based Learning	Statistics Preneurship	Stochastics Process	Math Student Resilience	Data Analysis
Case-based Learning	0.000	44.861	51.899	83.799	51.899
Statistics Preneurship	44.861	0.000	44.861	-136.086	44.861
Stochastics Process	51.899	44.861	0.000	83.799	51.899
Math Student Resilience	83.799	-136.086	83.799	0.000	83.799
Data Analysis	51.899	44.861	51.899	83.799	0.000

Table 3 above shows the weight of the relationship between variables (research themes) in network analysis. The relationship between CBL research themes and Preneurship Statistics is worth 44,861, between CBL and Stochastic Processes is worth 51,899, between CBL and Mathematics Student Resilience is worth 83,799, and between CBL and Data Analysis is worth 51,899. The weight between Preneurship Statistics and Mathematics Student Resilience is very high. It has a negative value, worth -136,086, and a positive and high weight, according to network analysis, between the research theme of data analysis and mathematics student resilience, which is worth 83,799.

CONCLUSION

Learning Model Development can be interpreted as developing new learning models or modifying existing ones. The development of new learning models aims to increase the effectiveness and efficiency of the learning process. Case-based learning is a model emphasizing case-solving as the center of learning activities. Students are allowed to identify cases and find solutions to these cases. Data analysis skills are one aspect of critical thinking skills, the primary goal of mathematics education. Data analysis skills include collecting, processing, interpreting, and presenting data systematically and logically. Data analysis capabilities can be improved by applying appropriate learning models, such as case-based learning, which is expected to improve students' learning competencies, including data analysis abilities, because this model can stimulate students' cognitive, affective, and psychomotor activities. According to network analysis, aspects related to case-based learning and the resilience of mathematics students are closely related to statistical aspects in partnership statistics, stochastic processes, and data analysis. The relationship between CBL research themes and Preneurship Statistics is worth 44,861, between CBL and Stochastic Processes is worth 51,899, between CBL and Mathematics Student Resilience is worth 83,799, and between CBL and Data Analysis is worth 51,899. The weight between Preneurship Statistics and Mathematics Student Resilience is very high. It has a negative value, worth -136,086, and a positive and high weight, according to network analysis, between the research theme of data analysis and mathematics student resilience, which is worth 83,799.

REFERENCES

Abidin, A. M. (2022). Penerapan teori belajar behaviorisme dalam pembelajaran (studi pada anak). *An Nisa', 15*(1), 1–8.

Albina, dkk. (2022). *Model Pembelajaran di Abad ke 21*. Universitas Islam Negeri Sumatera Utara, Indonesia.

Bahri, A., Palennari, M., Hardianto, Muharni, A., & Arifuddin, M. (2021). Problem-based learning to develop students' character in the biology classroom. *Asia Pacific Forum on Science Learning and Teaching, 20*(2), 1 – 15.

Cajada, L., Stephenson, Z., Bishopp, D. (2023). Exploring the psychometric properties of the resilience scale. *Adversity and Resilience Science, 4*: pp. 245 – 257.

Chanifah, N., Hanafi, Y., Mahfud, C., & Samsudin, A. (2021). Designing a spirituality-based Islamic education framework for young Muslim generations: A case study from two Indonesian universities. *Higher Education Pedagogies, 6*(1), 195-211.

Dharma, Surya. (2019). *Bahan Ajar Fleksibel: Kewirausahaan*. Jakarta: Direktorat Tenaga Kependidikan Dirjen PMPTK

Dharmayanti, N. P. I. (2023). Penerapan model case based learning (CBL) untuk mengembangkan critical thinking skill siswa dalam pembelajaran geografi di SMA Negeri 1 Kuta Utara. *Jurnal Pendidikan Geografi Undiksha, 10*(3), 291 – 301.

Fendrik, M., Marsigit, dan Wangid, M., N. (2020). Analysis of Riau Traditional game-based ethnomathematics in developing mathematical connection skills of elementary school students. *elementary education online, 19*(3), 1605 – 1618.

Fitri, S. F. N. (2021). Problematika kualitas pendidikan di Indonesia. *Jurnal Pendidikan Tembusai, 5*(1), 1617 – 1620.

Hamid, M. A., Ramadhani, R., Juliana, M., Safitri, M., Munsarif, M., Jamaludin & Simamara, J. (2020). *Media Pembelajaran*. Medan: Yayasan Kita Menulis.

Handayani, P. H., Marbun, S., & Novitri, D. M. (2023). 21st century learning: 4C skills in case method and team-based project learning. *Elementary School Journal, 13*(2), 181 – 193.

Kusumawati, A., & Prapanca, A. (2023). Pengembangan media pembelajaran berbasis website dengan model pembelajaran project based learning pada mata pelajaran dasar - dasar teknik jaringan komputer dan telekomunikasi di SMKN 7 Surabaya. *IT-Edu: Jurnal Information Technology and Education, 8*(1), 137-146.

Kuswoyo, R., Dur, S., Cipta, H. (2023). Penerapan proses stokastik markov chain dalam pengendalian persediaan produksi kelapa sawit di perkebunan Nusantara IV Sumatera Utara. *G-Tech: Jurnal Teknologi Terapan, 7*(2), 429 – 438.

Ngadino, S., Kamid, & Syaiful. (2021). Pengembangan modul program linear berbasis konstruktivisme untuk siswa prakerin. *Edu-Sains 10*(2), 21 – 26.

Ni'amah, K., & Hafidzulloh, S. M. (2021). Teori pembelajaran kognitivistik dan aplikasinya dalam pendidikan islam. *Jurnal Ilmiah Mahasiswa Raushan Fikr, 10*(2), 204 – 217.

Radhamani, K., & Kalaivani, D. (2021). Academic resilience among students: A review of the literature. *International Journal of Research and Review, 8*(6), 360 – 369.

Rahmi, M., Usman, & Subianto, M. (2020). First-grade junior high school students' mathematical connection ability. *Journal of Physics: Conference Series, 1460*(1).

Rosenkrantz, A. B., Chung, R. and Duszak, R. (2019). Uncited research articles in popular United States general radiology journals. *Academic Radiology, 26*(2), 282-285.

Sari, P. A. (2021). Kemampuan argumentasi siswa yang belajar menggunakan argumentation based learning, problem based learning, dan argumentative problem based learning pada materi hidrolisis garam.

Skute, I. (2019). *Opening The Black Box of Academic Entrepreneurship: A Bibliometric Analysis*. Springer: Scientometrics.

Suryana, E., Lestari, A., Harto, K. (2022). Teori pemrosesan informasi dan implikasi dalam pembelajaran. *Jurnal Ilmiah Mandala Education (JIME), 8*(3), 1853 – 1862.

Wahyuni, V. E. (2020). Metode demonstrasi problem based learning untuk peningkatan keterampilan menulis teks prosedur. *Jurnal Ilmiah WUNY, 2*(1), 101 – 115.

Wibawa, G. Y. S. (2020). Jaminan hak konstitusional peserta didik untuk mendapatkan pendidikan yang layak dalam menjalani pembelajaran dalam jaringan di masa pandemi Covid 19. *PINTU (Pusat Penjaminan Mutu), 1*(1), 36 – 45.

Widyastuti, A., Panggabean, S., Kristianto, S.S., Rahmat, T., Purba, S., Khalik, M. F., Sari, M., Ritonga, M., Simarmata, J., Haruna, N. H., Recard, M., Meirista, E., & Chamidah, D. (2022). *Media dan Multimedia Pembelajaran*. Medan: Yayasan Kita Menulis.

Wospakrik, F., Sundari, S., & Musharyanti, L. (2020). Pengaruh penerapan metode pembelajaran case based learning terhadap motivasi dan hasil belajar mahasiswa. *Journal Health of Studies 4*(1), 30 – 37.

Yanti, W., Taufik, M., & Yandari, I, A, V. (2022). Pengembangan media pembelajaran majalah pintar edukatif IPS pada peserta didik kelas IV. *Primary: Jurnal Pendidikan Guru Sekolah Dasar, 11*(4), 1055-1062.