02 BIBLIOMETRICALLY STUDY AND ANALYSIS OF LOW COST-Setyo S_FT.pdf

by Ft` Unisma

Submission date: 06-Jul-2024 09:55PM (UTC+0700)
Submission ID: 2413110450
File name: 02_BIBLIOMETRICALLY_STUDY_AND_ANALYSIS_OF_LOW_COST-Setyo_S_FT.pdf (1.31M)
Word count: 5360
Character count: 29105

The Seybold Report

ISSN 1533-9211

DOI: 10.5281/zenodo.11613668

BIBLIOMETRICALLY STUDY AND ANALYSIS OF LOW COST LABORATORY

SETYO SUPRATNO [1]*, SUMARTO [2] and ENJANG A. JUANDA [3]

[1] Department of Electrical Engineering, Universitas Islam 45 Bekasi, Bekasi, Indonesia.
[2,3] Department of Electrical Engineering, Universitas Pendidikan Indonesia, Bandung, Indonesia.
Email: [1]setyo@unismabekasi.ac.id (*Corresponding Author), [2]profsumarto@gmail.com, [3]juanda@upi.edu

Abstract

This article examines various perspectives on low-cost laboratory seen from the scope of the laboratory model or form, laboratory embodiment method and technical implementation of activities in the laboratory. Through bibliometric analysis, the search begins with the keyword Low Cost Laboratory (LCL) in the Scopus database on June 19, 2022. Supporting tool, in the form of VOSviewer software are used to visualize networks between authors by analyzing the role of authors who contribute to the theme, networks between countries that contribute to the theme, keyword analysis of articles with that theme and citation analysis with that theme as well. Scopus data base excavation on that date found 219 documents from 1933 to 2022. LCL models will provide an overview of many alternatives that can be used as cheap laboratory role models to support learning activities.

Keywords: LCL. Bibliometrics, VOSviewer, Author Analysis, Keyword Analysis.

INTRODUCTION

The learning process is an activity that synergizes between teachers, students and the support of facilities and infrastructure (Hilman, 2017). Furthermore, to realize learning outcomes, it is necessary to set units in the form of SKS (Semester Credit System). The curriculum is a set of tools or systems that must be implemented within a certain period of time (Direktorat Pembelajaran, 2019). Knowledge and skills possessed by students can be improved in learning and science activities with the role or function of laboratory facilities (Selamet et al., 2020). To improve students' understanding and practice their skills in every scientific experiment, the laboratory is the most effective place and means to realize the learning process and learning outcomes (Hofstein & Lunetta, 1982). Special abilities in terms of science in accordance with scientific disciplines must be realized (Remington-Doucette & Musgrove, 2015). The role of the laboratory becomes an inseparable part to support these special abilities, whether they are conventional laboratories (Hofstein & Lunetta, 1982)where participants are directly involved in learning activities and are present in classrooms and virtual laboratories (Suhar, 2014)-(Agarina et al., 2018) simulation lab (Tiwari & Singh, 2011), telelab (Casini et al., 2003), remote laboratory (Limpraptono et al., 2020) who are not present in class (Gunasekaran & Potluri, 2012). Problems that often arise in realizing the two types of laboratories are related to the university's ability in terms of budget (Selamet et al., 2020). In laboratory operations, another problem arises when the resources, in this case the teachers, have not been upgraded to master the new technology used. The practicum module used has not yet supported the direction of an effective learning model with the involvement of students who focus on themselves*(student centered)* (Cech & Bures, 2004).Several educational institutions have been proven in terms of meeting the needs of laboratories to achieve learning outcomes. One of them

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

is to create a laboratory with low funding but still does not leave the main function of the laboratory (Reck, 2016)-(Mostefaoui et al., 2017). The term that is often used is low cost laboratory (Mostefaoui et al., 2017), affordable laboratories (Reck, 2016), online laboratory (Bochicchio & Longo, 2014), virtual laboratory (Agarina et al., 2018), telelab (Casini et al., 2003), simulation laboratories (Marcia K. Rothgeb, MSN, 2008)-(Ionescu et al., 2013), web laboratories and federation labs,(Angulo et al., 2013), which describes the realization of cheap, affordable financing, easy to use, easy to maintain and easy to upgrade in technology (Ma et al., 2010). This article discusses LCL from various perspectives, first, LCL is seen from the perspective of research opportunities from that theme. Second, the novelty of the research by analyzing the role of the authors who contributed to the theme. Third, keyword analysis of articles with that theme and citation analysis with that theme as well. Fourth, discuss the bibliometrics study of LCL. This article also discusses the names of the authors who contributed the most to the writing of LCL articles, the affiliates who contributed to the writing of LCL articles and the network of fellow authors.

METHOD

Meta-analysis has been used in this preparation of qualitative research articles (Wolf, 1986) where numbers and statistical data extracted from research articles will be used to organize and extract information from the data obtained. Finally, even the comprehensiveness of the results of the methods used can be obtained as much as possible. Furthermore, the meta-analysis method was narrowed down to the steps and procedures of bibliometrics analysis techniques (Glanzel, 2003). Bibliometrikks technique analysis aims to explore a lot of article information obtained from big data on the development of printed literature (print-based literature) using mathematical and statistical principles (bibliometrics) (Glanzel, 2003)-(Cobo & Herrera, 2011). To facilitate understanding of the process or stages can be explained with the method bibliometrics by Figure 1 as follows:

Figure 1: Bibliometrics-Based Research Process

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

Figure 1 describes the study and analysis based on bibliometrics, to simplify or unify the perception of the image. The following is an explanation of the 4 phases used:

1) Phase 1: **Data mining and collection**

a. *Decide on a theme,* the determination of the theme is carried out based on the needs of the research that will be carried out by the author, so that later in terms of the completion time of this article, it is in accordance with the target. Determination of this theme must also consider the ability or knowledge of the author to the scope of the theme itself. Finally, an article that reviews the development of literature using mathematical and statistical principles (bibliometrics) bring significant usefulness or novelty to the author's research plan. The theme raised in this article is about affordable laboratories. In a simple sense, an affordable laboratory has two syllables, namely, a laboratory which is defined as a learning tool that understands concepts and improves skills in conducting scientific experiments. While affordable in the languange big vocabulary has the meaning achieved, taken, so that an affordable laboratory is defined as a form of realization of learning facilities at low cost without leaving the actual function.

b. *Define keywords,* The use of appropriate keywords allows the articles we need to be met according to the criteria, especially in attracting significant traffic from search engines. The definition of keywords can be interpreted as the main concept in the form of words in the article and its discussion. Keywords can be obtained from existing branches of science. A simple technique that can be proposed is by choosing the most representative keywords in the discussion of an article. The most effective words can index an article and help attract as many articles as possible, involving an internet network connect of to a computer. Low Cost Laboratory is the keyword used in the search for articles in the database Google Scholar, Scopus, and Crossref from 1933-2022.

c. *Data acquisition,* the data obtained is a database of journals in Google Scholar, Scopus, and Crossref (Klapka & Slaby, 2018) -(Harzing & Alakangas, 2015). Scopus indexed articles are articles with reputable quality and content that can provide information for analysis using bibliometric approaches and studies (Donthu et al., 2021) -(Ellegaard & Wallin, 2015). Scopus is the largest database of abstracts and citations from peer-reviewed literature: Article, Conference Paper, Review, Book Chapter, Short Survey, Note, Book, Conference Review, Editorial and Report (Chadegani et al., 2017). The search feature on Scopus data allows it to be known by observing the following results: the year of publication that can be set by a range of years, the year of citation following the year of publication, the number of article/paper titles that can be downloaded in one keyword determination, how many citations are there, citations per year during the entry range of years, citations per paper or article, authors per article, H Index value, G Index value, normal h index, h index and others. The articles obtained are articles or journals which are the results of research from 1933-2022 with the keyword LCL. The source of an article or journal that is used as a literature review must have quality and reputation with several indicators, first, accredited which allows readers to assess the contents of a journal. Speaking of being accredited, at least have an International Standard Serial Number (ISSN). Second, articles or journals that are used

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

as literature reviews comply with publication ethics by publishing them regularly. Third, the nature and content of a journal has scientific principles from a scientific branch and fifth, journals that are published regularly must be indexed, both domestic and foreign indexing institutions.

2) Phase 2: **Data visualization**

a. *Define supporting tools*, "OpenRefine" (Ham, 2013)-(Verborgh, R., & De Wilde, 2013) This software provides convenience to select all data obtained from Scopus can be cleaned of all keywords that are less related to the theme. Furthermore, the downloaded file in csv format is analyzed using Vosviewer (van Eck & Waltman, 2010). Vbibliographical visualization on Vosviewer in the form of a data set containing bibliographic fields (author, article title, author ID, year of publication, publisher identification, publisher link, DOI no, affiliation, abstract and so on). In determining the type of data, Vosviewer can extract data types from the web of science indexer, Scopus, dimensions and pubmed. In the world of research, Vosviewer is used for bibliometric analysis, showing gaps or gaps for research, looking for the most dominant reference in its contribution to the theme of the article in question (Society & Society, 2022). Other supporting software in the form of Mendelay provides convenience in writing the bibliography in this article (Lambodara Parabhoi, Arabinda Kumar Seth, 2017).

b. *Export data***,** Data with the csv file type downloaded from the Scopus data base will be processed in the softwareOpenRefine. This software is useful for cleaning data, restoring data consistency and detecting duplication of data to eliminate one of them (Verborgh, R., & De Wilde, 2013). With this process for exporting and processing data in VOSviewer, it will be very accurate in visualizing bibliometrics in Co-authorsip, Co-occurrence and Citation analysis.

3) Phase 3: Data analysis

a. *Bibliometrics analysis***.** Analysis of data with VOSviewer on 219 documents that were successfully downloaded with the keyword LCL highlighting the type of analysis; a). Co-authorsip which provides information on the collaboration of one author with another with the unit of author and country, b). Co-occurrence provides information on the keywords of articles that are widely used and interrelated between authors and the unit of analysis Author keyword, c). Citation provides information on the citation relationship of one document to another when tested or searched for its relationship with other documents.

b. ***Discussion analysis.*** Discusses various types/laboratory models in the context of LCL in the downloaded Scopus database and their metadata.

4) Phase 4: **Recommendation**

The results of the discussion in the form of LCL models will provide an overview of many alternatives that can be used as cheap laboratory role models to support learning activities and its explanition.

ISSN 1533-9211

DOI: 10.5281/zenodo.11613668

RESULT AND DISCUSSION

A search process has been carried out on the Scopus database by searching in the title-abstract-keywords related to LCL. Keywords used: TITLE-ABS-KEY LCL in the range 1933-2022 on June 19, 2022:

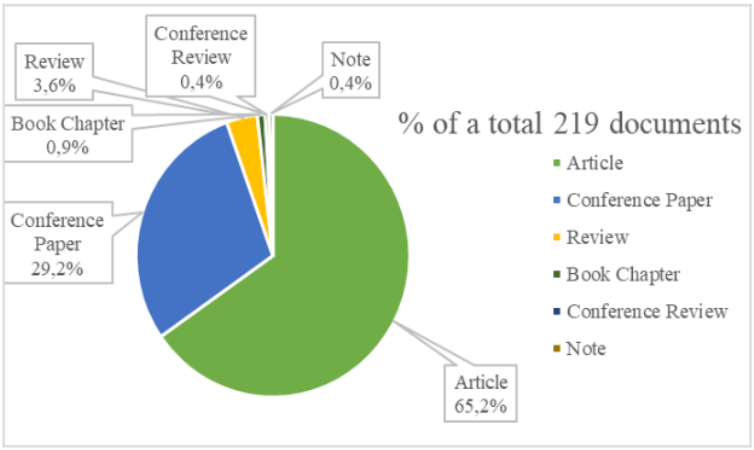

Figure 1: Percentage of publications by document type from 1933 to 2020

Figure 1 contains Article (143), Conference Paper (64), Review (8), Book Chapter (2), Conference Review (1), Note (1). All of them are forms of documents generated from searches with LCL keywords in the Scopus database.

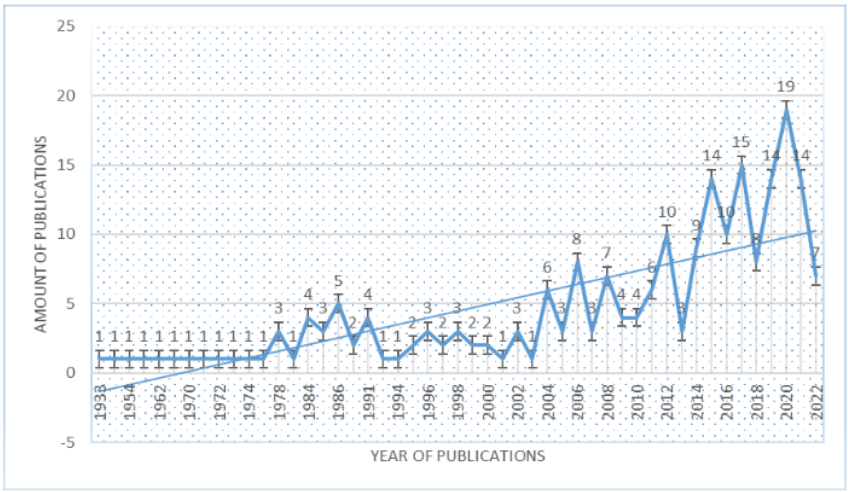

Figure 3: Percentage of Publications of Document Types about LCL from 1933 to 2022

ISSN 1533-9211

DOI: 10.5281/zenodo.11613668

In Figure 3. it can be seen that the results of research related to the LCL keyword show 1). Research on the LCL theme was first started in 1933-1975 with one document. 2). LCL theme research with a minimum of 10 documents was seen in 2012, 2015, 2016, 2017, 2019, 2020 and 2021. 3).

At the beginning of the study up to 2011 or 79 years, there were less than 10 documents produced each year. This condition shows that the writers in some countries are less productive and less interested in writing articles related to the LCL theme. This condition was also seen in 2022 where at the time of this research (19 June 2022) there were shows 7 documents related to the theme.

Author Analysis

The author's analysis of the Scopus indexed database with the LCL theme is done by extracting the csv file with the author's unit of analysis on the VOSviewer software menu. The results of the csv file extraction can explain how much an author contributes in publications, citations and total link strength.

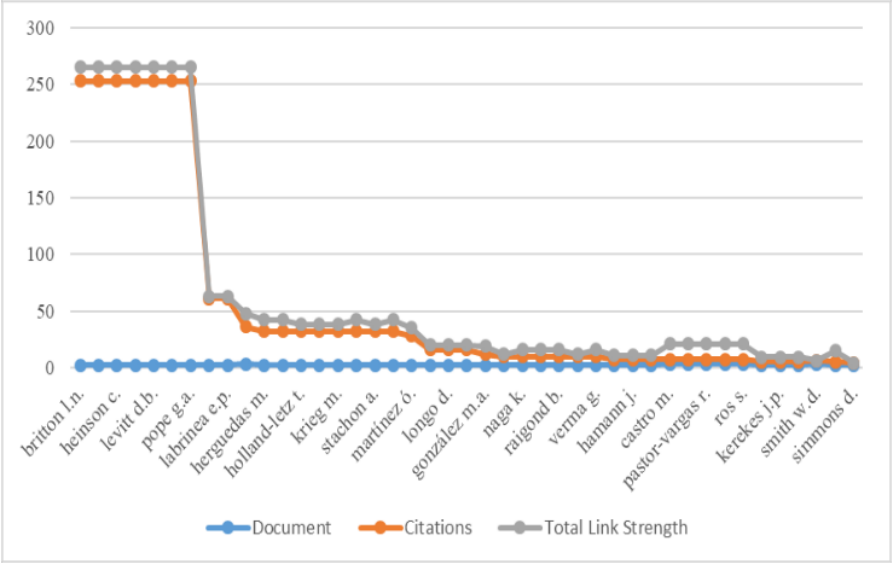

Figure 4: Author with Document and Citation Power

Figure 4 of the author's unit of analysis analysis on VOSviewer software explains that there are 43 authors who have at least 2 documents and at least 2 citations in their publications. Figure 4 also describes the 7 authors with the highest citations and total link strength with at least 2 documents, 251 citations and 12 total link strengths.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

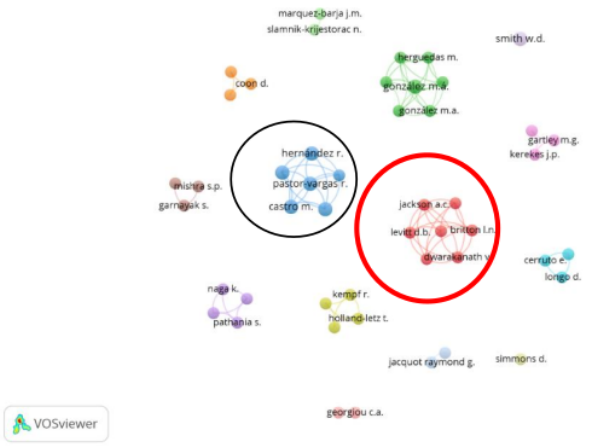

Figure 5: Visualization of VOSviewer Based on Authors Network

Figure 5, there are 14 clusters of authors, the highest number of citations are 7 authors in cluster 1 (circled in red) with a total of 2 documents and networked together. It should be noted that the highest number of citations lies not in the number of documents owned, but in the number of people who cite in the authors cluster. Cluster 1 (circular) whose authors are Briton I.n, Dawarakanath V. and their friends have networks in one cluster and do not network with other clusters. It can be seen that there is no link that connects the network with 13 other clusters. Cluster 1 consisting of Britton L.N., Warakanath V., Heinson C., Jackson A.C., Levitt D.B, Malik T. and Pope G.A has a shared network of 251 citations and 12 total link strengths. Cluster 2 (circled in black) with 6 authors Castro M., Hernández R., Pastor-Vargas R., Robles A., Ros S., Tobarra L. have a higher total link strength than cluster 1, this tendency is caused by the dominance of the number of documents per author and citing each other.

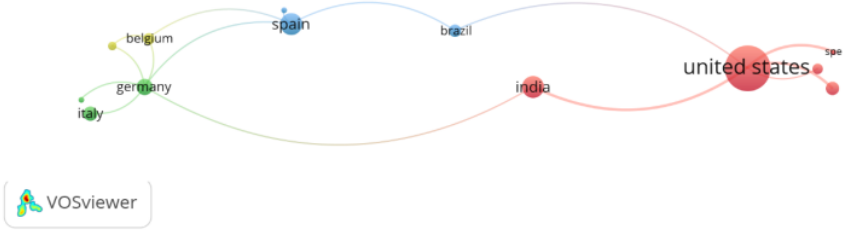

Figure 6: Author Visualization for Country Network

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

Figure 6, there are 68 countries contributing in publications in the Scopus database with the keyword LCL. United states has the highest number of documents (58 documents) with 945 citations and 8 total link strengths. To clarify the analysis of the involvement of countries in producing publications, see table 1:

Table 1: Countries Involved in Issuing Documents

No	Country	Documents	Citation	Total link strength
1	United States	58	945	8
2	India	18	140	3
3	Spain	18	111	4
4	United Kingdom	14	58	5
5	Germany	11	148	6
6	Australia	9	144	4
7	Italy	9	77	1
8	Canada	8	73	2
9	Brazil	7	127	2
10	Belgium	6	15	3
11	Turkey	5	34	1
12	Czech Republic	4	8	1
13	Greece	4	116	0
14	Poland	4	8	2
15	France	3	9	1
16	New Zealand	3	29	0
17	South Africa	3	10	0
18	Argentina	2	10	1
19	China	2	11	2
20	Ecuador	2	1	0
21	Georgia	2	11	1
22	Hungary	2	1	1
23	Mexico	2	5	1
24	Netherlands	2	62	0
25	Norway	2	8	0
26	Spe	2	251	2
27	Thailand	2	1	0
28	Uruguay	2	7	1
29	USA	2	2	0

Table 1 is generated based on the given filtering that each country provides at least 2 documents related to the research theme, so that in table 1 there are 29 countries that have at least 2 documents from the given filter. In terms of publishing Scopus detects articles from 134 publishers spread across 68 countries. Table 1 also shows the top 10 countries with at least 6 documents from 1933-2021.

Keyword Analysis

This analysis provides clarity on how many keywords are in the articles in the Scopus indexed database. Of the 219 articles that were successfully downloaded, there were 2573 keywords, 40 keywords that appeared at least 5 times in 219 articles and were related to the main search

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

keywords. Figure 7 is visualization of VOSviewer with keyword analysis in all keywords unit.

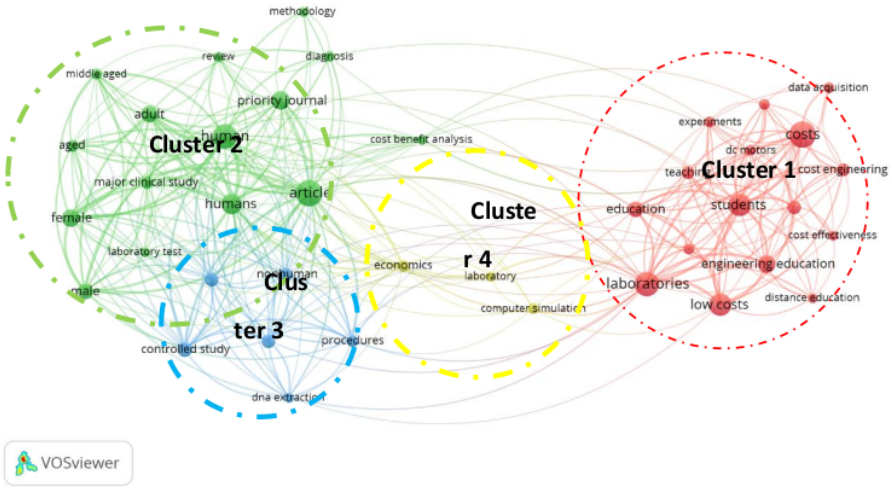

Figure 7: Keyword Visualization of LCL for Various Clusters

Figure 7 shows 4 clusters of 2573 keywords extracted from VOSviewer with 40 keywords that are often used together in 219 documents of Scopus indexed database. The LCL keywords for searching publications in the Scopus database are divided into 4 clusters, it is confirmed that in all clusters (1 to 4) contains major LCL themes from various perspectives, scientific disciplines, implementation techniques, strategies/methods of realization and management of the LCL framework itself.

Cluster 1 is marked in red, the trend of the existing keywords interpreting many LCL practices in the fields of engineering, education and finance. The most dominant financing theme in terms of publications is marked with the largest yellow ball color and has appeared in the last 5 years in this cluster.

Cluster 2 is marked in green, has a tendency to publish in medical, health, psychology and human sciences. Looking at the publications in this cluster, it is more indicated of low-cost medic techniques and cheap handling of various psychological cases.

Cluster 3 is dominated by blue, this publication tends to be in the fields of biology, agriculture and chemistry. Experimental practice in this science with a neat and sequential procedural method (SOP).

Cluster 4 is dominated by yellow color which shows the fields of economics science, computer simulation and laboratories. In this cluster, the number of publications is not too many and appeared in the period 2003 to 2012.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

From a technology point of view and LCL realization strategies can be categorized into 9 types, namely:

1. Integration of hardware assembly and software simulation, this category allows the assembly of affordable or inexpensive hardware, for example Arduino (Docekal et al., n.d.)-(Ausilio, 2012), Rasberry Pi, Atmega microcontroller (Ma et al., 2010). On a practical level, the assembly of the LCL module begins with a simulation to avoid errors in module realization. Utilization of available modules in the form of module packages, facilitates integration between modules for the same function. Integration between modules in one motherboard makes this module more practical, portable (Abdullah et al., 2018) so that it can be placed anywhere for practicum-based learning needs. Another convenience, this LCL model can be used as a final projectfor students who have completed their studies.
2. The simulation is in the form of MATLAB licensed software (Tŭŭõř, 2017). This LCL model does not come into direct contact with physical equipment. Simulation allows proof of theory into this software. Simulation also allows cost savings from the actual practicum (T ŭŭõř, 2017). A programming for numerical computing and visualization, this software is used to analyze data, develop algorithms, and create systems/models in an application.
3. Lab View, programming design simulation, this is computer software in the fields of data acquisition, control engineering, automation and instrumentation, this software is widely used for signal processing and data visualization (Mahata et al., 2010).
4. Hardware assembly of affordable modules based on the system designed, this type of LCL makes the system/model complete and for continuous function (Docekal et al., n.d.). Starting with looking, for related information, the material in the lecture, the learning objectives to be achieved and the practicum modules circulating in the market to be used as comparisons. Prioritizing the price of components that are cheap, affordable and easy to procure, allows the budget spent to be much more economical than the price of factory-made modules. The module material is in accordance with the needs of the curriculum.
5. Making prototypes with affordable modules, is a form of LCL that resembles the original (Urban, n.d.). At the practical level, this prototype is used to represent the characteristics and output data.
6. Creation of data acquisition tools with open-source hardware and software (Fisher & Gould, 2012) In this type the combination of hardware/hardware with open-source software/software to realize an affordable, LCL allows avoiding branded software and expensive hardware (Pearce, 2012).
7. Laboratory demonstration with standard procedures, and ISO standards (Bonachea, 2019). This LCL model has fixed and strict management requirements, as well as legal accountability.
8. A joint federation (shared function) and cross-institutional laboratory model with an agreed common framework (Loro et al., 2018), an online-based laboratory model (Sains et al., 2021), virtual (Suhar, 2014) -(Budai & Kuczmann, 2018) -(Agarina et al., 2018), and remote

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

lab (Limpraptono et al., 2020) shared with other institutions. This laboratory uses small, inexpensive and affordable devices. Lightweight Directory Access Protocol (LDAP) (Yeh et al., 2002) device that regulates panel administration, access to other servers that serve as the provider entity does all the work, namely: authenticating users, giving them authorization to use the laboratory, and providing laboratories on the laboratory provider side (Angulo et al., 2013). LDAP is one of the protocols used in this federation's laboratory. Avoiding expensive server procurement and maintenance costs is one way for institutions to avoid spending excessive laboratory budgets.

9. Web-based laboratory model for the provision of an open-source platform, online tutorials and courses (Aparicio & Sotelo-, n.d.), virtual lab, remote lab and remote lab, LCL model that provides free/open-source features to be shared in one community.The term remote laboratory (telelab) (Casini et al., 2003) which takes into account the lack of infrastructure, the condition of the existing internet network (low bandwidth), remote and remote locations, where accessibility of laboratory experience for students must be achieved well (Mostefaoui et al., 2017). Automatic Control Telelab (ACT) is an example of a control telelab with Matlab/Simulink design, experiment simulation, changing control parameters and evaluating and analyzing experimental results, all of which can be done by students anytime anywhere (Casini et al., 2003). Virtual LCL, a form of laboratory that resembles a real laboratory. With an interactive display, familiar to users and inexpensive, it allows students/users as if they were in a real laboratory. Users can be creative with various experiments without the risk of worrying about the destruction of this virtual laboratory.

CONCLUSION

Studies and bibliometric analysis with the keyword LCL provide an overview of the trend of publication growth in the last 6 years (2015-2021). This trend shows the efforts of an educational institution from various disciplines to realize LCL in order to support the achievement of learning, medical practice, engineering, laboratory demonstration of biology and chemistry. It can be seen that the United States, India, Spain, United Kingdom and Germany are the 5 countries that contributed the most publications and citations in recent years.

This LCL keyword analysis itself which is carried out in every learning practice is solely aimed at reducing excessive costs or budgets. Several forms of LCL revealed in this study are broadly in the form of, 1) Module assembly for a function at an affordable price, 2) Integration of module and software assembly at affordable prices, 3) Simulation with software, 4) Virtual laboratory, 5) Joint laboratory web (federation), and 6) Laboratory management with fixed standards.

In the future, LCL technology in the form and strategy of implementation will be a big demand for institutions because of the high cost of laboratory equipment. With the keywords efficient, affordable, cheap and easy to maintain, it takes serious efforts with research in various disciplines to realize LCL. As a closing discourse, efforts to realize LCL in every practice of deep learning in educational institutions must get support from management.

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

References

1) Abdullah, A. G., Hakim, D. L., Auliya, M. A., & Dani, A. B. (2018). *Low-cost and Portable Process Control Laboratory Kit*. *16*(1), 232–240. https://doi.org/10.12928/TELKOMNIKA.v16i1.6888

2) Agarina, M., Kristidjadi, E., & ... (2018). The Design of Virtual Laboratory-Based Learning Media For Practice Activities in the Management Departement in the Application Software Course. *Proceeding International …*, 307–315.

3) Angulo, I., García-zubia, J., Orduña, P., & Dziabenko, O. (2013). *Addressing low cost remote laboratories through federation protocols : fish tank remote laboratory*. 757–762.

4) Aparicio, G., & Sotelo-, J. R. (n.d.). *Article Cell Migration Analysis : A low-cost laboratory experiment for cell and developmental biology courses using keratocytes from fish scales w*. 1–8. https://doi.org/10.1002/bmb.21071

5) Ausilio, A. D. (2012). *Arduino : A low-cost multipurpose lab equipment*. *October 2011*, 305–313. https://doi.org/10.3758/s13428-011-0163-z

6) Bochicchio, M. A., & Longo, A. (2014). The importance of being curricular: An experience in integrating online laboratories in national curricula for high schools. *Proceedings of 2014 11th International Conference on Remote Engineering and Virtual Instrumentation, REV 2014*, *February*, 450–456. https://doi.org/10.1109/REV.2014.6784176

7) Bonachea, L. A. (2019). A low-cost laboratory demonstration of the effects of temperature on the metabolism of an aquatic poikilotherm temperature on the metabolism of an aquatic poikilotherm. *Journal of Biological Education*, *00*(00), 1–6. https://doi.org/10.1080/00219266.2019.1643763

8) Budai, T., & Kuczmann, M. (2018). *Towards a Modern , Integrated Virtual Laboratory System*. *15*(3), 191–204.

9) Casini, M., Prattichizzo, D., & Vicino, A. (2003). The automatic control telelab: A user-friendly interface for distance learning. *IEEE Transactions on Education*, *46*(2), 252–257. https://doi.org/10.1109/TE.2002.808224

10) Cech, P., & Bures, V. (2004). E-learning implementation at University. *3rd European Conference on E-Learning*, *Rosenberg 2003*, 25–34.

11) Chadegani, A. A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., & Farhadi, M. (2017). *A Comparison between Two Main Academic Literature Collections : Web of Science and Scopus Databases*. *9*(5), 18–26. https://doi.org/10.5539/ass.v9n5p18

12) Cobo, M. J., & Herrera, F. (2011). *Science Mapping Software Tools : Review , Analysis , and Cooperative Study Among Tools*. *62*(7), 1382–1402. https://doi.org/10.1002/asi

13) Direktorat Pembelajaran. (2019). Penyusunan Kurikulum Kemahasiswaan, Direktorat Jenderal Pembelajaran Dan Kementerian Riset, Teknologi Dan Pendidikan Tinggi\Pendidikan Tinggi di Era Industri 4.0. *Direktorat Jenderal Pembelajaran Dan Kemahasiswaan Kementerian Riset, Teknologi Dan Pendidikan Tinggi*, 1–20.

14) Docekal, T., Golembiovsky, M., & Docekal, T. (n.d.). ScienceDirect Low cost laboratory plant education Low cost cost laboratory laboratory Low cost laboratory plant. *IFAC-PapersOnLine*, *51*(6), 289–294. https://doi.org/10.1016/j.ifacol.2018.07.168

15) Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Marc, W. (2021). How to conduct a bibliometric analysis : An overview and guidelines. *Journal of Business Research*, *133*(March), 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

The Seybold Report
ISSN 1533-9211
DOI: 10.5281/zenodo.11613668

16) Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production : How great is the impact ? *Scientometrics*, *105*(3), 1809–1831. https://doi.org/10.1007/s11192-015-1645-z

17) Fisher, D. K., & Gould, P. J. (2012). *Open-Source Hardware Is a Low-Cost Alternative for Scientific Instrumentation and Research*. *2012*(April), 8–20.

18) Glanzel. (2003). *Bibliometrics as a research field*.

19) Gunasekaran, M., & Potluri, R. (2012). Low-cost undergraduate control systems experiments using microcontroller-based control of a dc motor. *IEEE Transactions on Education*, *55*(4), 508–516. https://doi.org/10.1109/te.2012.2192441

20) Ham, K. (2013). *OpenRefine*. https://doi.org/10.3163/1536-5050.101.3.020

21) Harzing, A., & Alakangas, S. (2015). Google Scholar , Scopus and the Web of Science : a longitudinal and cross-disciplinary comparison. *Scientometrics*. https://doi.org/10.1007/s11192-015-1798-9

22) Hilman, C. (2017). Manajemen Peningkatan Mutu Pendidikan. *Tadbir: Jurnal Studi Manajemen Pendidikan*, *1*(2), 216–239.

23) Hofstein, A., & Lunetta, V. N. (1982). The Role of the Laboratory in Science Teaching: Neglected Aspects of Research. *Review of Educational Research*, *52*(2), 201–217. https://doi.org/10.3102/00346543052002201

24) Ionescu, C. M., Fabregas, E., Cristescu, S. M., Dormido, S., & Keyser, R. De. (2013). *A Remote Laboratory as an Innovative Educational Tool for Practicing Control Engineering Concepts*. *56*(4), 436–442.

25) Klapka, O., & Slaby, A. (2018). *Visual Analysis of Search Results in Scopus Database*. Springer International Publishing. https://doi.org/10.1007/978-3-030-00066-0

26) Lambodara Parabhoi, Arabinda Kumar Seth, S. K. P. (2017). *A, Citation Management Software Tools: Mendeley, Comparison with Special Reference to Zotero and*. *6*(3), 288–293.

27) Limpraptono, F. Y., Nurcahyo, E., Faisol, A., Ajiza, M., & Sunaryo, D. K. (2020). Development Architecture of Remote Laboratory as Learning Solution in Industrial Revolution 4.0 Era. *Journal of Industrial and Intelligent Information*, *8*(2), 49–53. https://doi.org/10.18178/jiii.8.2.49-53

28) Loro, F. G., Cristobal, E. S., Diaz, G., Macho, A., Blazquez, M., Plaza, P., Orduña, P., Kulesza, W., Gustavsson, I., Alves, G., & Marques, A. (2018). *PILAR : a Federation of VISIR Remote Laboratory Systems for Educational Open A ctivities*. *December*, 134–141.

29) Ma, C., Li, Q., Liu, Z., & Jin, Y. (2010). *Low Cost AVR Microcontroller Development Kit for Undergraduate Laboratory and Take-home Pedagogies System power Microcontroller socket*. 35–38.

30) Mahata, S., Maiti, A., & Maiti, C. K. (2010). *Cost-EffectiveWeb-Based Electronics Laboratory Using NI MultiSim , LabVIEW and ELVIS II*. 242–243.

31) Marcia K. Rothgeb, MSN, R. (2008). *Creating a Nursing Simulation Laboratory: A Literature Review*. *47*, *No. 11*. https://doi.org/https://doi.org/10.3928/01484834-20081101-06

32) Mostefaoui, H., Benachenhou, A., & Benattia, A. A. (2017). Design of a low cost remote electronic laboratory suitable for low bandwidth connection. *Computer Applications in Engineering Education*, *25*(3), 480–488. https://doi.org/10.1002/cae.21815

33) Pearce, J. M. (2012). *Building Research Equipment with Free, Open-Source Hardware*. *1303*. https://doi.org/10.1126/science.1228183

34) Reck, R. M. (2016). *DSCC2014-6046*. 1–9.

The Seybold REPORT

ISSN 1533-9211

DOI: 10.5281/zenodo.11613668

35) Remington-Doucette, S., & Musgrove, S. (2015). Variation in sustainability competency development according to age, gender, and disciplinary affiliation: Implications for teaching practice and overall program structure. *International Journal of Sustainability in Higher Education*, *16*(4), 537–575. https://doi.org/10.1108/IJSHE-01-2013-0005

36) Sains, C., Fisika, J. P., Desain, T., & Pengembangan, T. (2021). *PENGEMBANGAN PANDUAN PRAKTIKUM ONLINE MENGGUNAKAN*. *2*, 35–42.

37) Selamet, Nahdiyaturrahmah, Pujani, N. M., & Kompyang. (2020). Pengelolaan Laboratorium Ilmu Pengetahuan Alam (Ipa) Smp Negeri 2 Singaraja. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, *3*(2), 118–129.

38) Society, J. E., & Society, J. E. (2022). *Social sustainability studies in the 21st century : A bibliometric mapping analysis using VOSviewer Software Social Sustainability Studies in the 21st Century : A Bibliometric Mapping Analysis Using VOSviewer Software*.

39) Suhar, J. (2014). Prosiding Seminar Nasional Aplikasi Sains & Teknologi (SNAST) 2014 Yogyakarta, 15 November 2014 ISSN: 1979-911X. *Snast*, *8*(1), 155–160.

40) Tiwari, R., & Singh, K. (2011). Virtualisation of engineering discipline experiments for an Internet-based remote laboratory. *Australasian Journal of Educational Technology*, *27*(4), 671–692. https://doi.org/10.14742/ajet.944

41) Tűŭőř, F. (2017). *³ʔ ˆÎđʔʊù Řŭʁ ŭT ː ŭùŘùŭʔő ŭŘŽʔʁŘùʔʁ˛ ʊùŘőη ˤʊŭőɒ ÀÄď³Ä * ʤăŭȧˤŭŭőŭ Řőη Äʁηˤŭőʔ*. *4*, 33–39. https://doi.org/10.14313/PAR

42) Urban, P. L. (n.d.). *Chemie*. https://doi.org/10.1002/anie.201803878

43) van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

44) Verborgh, R., & De Wilde, M. (2013). *Using OpenRefine*. Pack Publishing Ltd.

45) Wolf, F. M. (1986). *Meta-analysis: Quantitative methods for research synthesis*. SAGE Publications.

46) Yeh, Y., Lai, W., & Cheng, C. (2002). *Applying lightweight directory access protocol service on session certification authority*. *38*, 675–692.

02 BIBLIOMETRICALLY STUDY AND ANALYSIS OF LOW COST-Setyo S_FT.pdf

ORIGINALITY REPORT

4%	3%	2%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	hdl.handle.net Internet Source	<1%
2	Submitted to Universitas Pendidikan Indonesia Student Paper	<1%
3	issi2013.org Internet Source	<1%
4	Ni Made Suryati, I Ketut Jirnaya, I Nyoman Kardana, Made Sri Satyawati. "A Bibliometric Analysis of the Five-Decade Publications on Metaphor", Journal of Language Teaching and Research, 2023 Publication	<1%
5	Submitted to Nottingham Trent University Student Paper	<1%
6	www.mdpi.com Internet Source	<1%
7	ijai.iaescore.com Internet Source	<1%

8	Setyo Supratno, Aeri Sujatmiko, Sumarto, Enjang A. Juanda, Seta Samsiana. "SCADA-based low-cost single phase AC generator control laboratory kit", AIP Publishing, 2023 Publication	<1 %
9	amsdottorato.unibo.it Internet Source	<1 %
10	e-journal.unair.ac.id Internet Source	<1 %
11	proceedings.ums.ac.id Internet Source	<1 %
12	"Online Engineering & Internet of Things", Springer Science and Business Media LLC, 2018 Publication	<1 %
13	dl.lib.uom.lk Internet Source	<1 %
14	Marine Levidze. "Mapping the research landscape: A bibliometric analysis of e-learning during the COVID-19 pandemic", Heliyon, 2024 Publication	<1 %

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	On		

02 BIBLIOMETRICALLY STUDY AND ANALYSIS OF LOW COST-Setyo S_FT.pdf

GRADEMARK REPORT

FINAL GRADE

/100

GENERAL COMMENTS

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

RUBRIC: SOCIAL STUDIES SHORT ANSWER

FOCUS

State a clear claim/topic sentence and stay focused on supporting it.

MEETS EXPECTATIONS	A precise claim/topic sentence based on the historical topic and/or source(s) is present. The response maintains a strong focus on developing the claim/topic sentence, thoroughly addressing the demands of the task.
APPROACHES EXPECTATIONS	A claim/topic sentence based on the historical topic and/or source(s) is present, but it may not completely address the demands of the task, or the response does not maintain focus on developing it.
DOESN'T MEET EXPECTATIONS	The claim/topic sentence is vague, unclear, or missing, and the response does not address the demands of the task.

EVIDENCE

Represent relevant historical information accurately.

MEETS EXPECTATIONS	The most appropriate evidence is presented to support the topic sentence, and all information is historically accurate.
APPROACHES EXPECTATIONS	Appropriate evidence may be presented to support the topic sentence, but it may be inadequate or contain some historical inaccuracies.
DOESN'T MEET EXPECTATIONS	Evidence is general, inappropriate, or inadequate in support of the topic sentence, or is largely inaccurate.

DEVELOPMENT

Explain how evidence supports the topic sentence.

MEETS EXPECTATIONS	The response demonstrates reasoning and understanding of the historical topic and/or source(s), and sufficiently explains the relationship between claims and support.
APPROACHES EXPECTATIONS	Some reasoning and understanding of the historical topic and/or source(s) are demonstrated. The response attempts to explain the relationship between claims and support.
DOESN'T MEET EXPECTATIONS	The response does not demonstrate reasoning and understanding of the historical topic and/or source(s), and explanation of the relationship between claims and support is minimal.

ORGANIZATION

Present ideas in a logical structure that shows the relationships between ideas.

MEETS EXPECTATIONS	An effective organizational structure enhances the reader's understanding of the information. The relationships between ideas are made clear with effective transitional phrases.

APPROACHES EXPECTATIONS	An organizational structure is evident, but may not be fully developed or appropriate. Transitional phrases may be used but the relationships between ideas are somewhat unclear.
DOESN'T MEET EXPECTATIONS	An organizational structure is largely absent and the relationships between ideas are unclear.

LANGUAGE

Communicate ideas clearly using vocabulary specific to the historical topic.

MEETS EXPECTATIONS	Ideas are presented clearly, using vocabulary specific to the historical topic. If errors in conventions are present, they do not interfere with meaning.
APPROACHES EXPECTATIONS	Ideas are mostly clear, using some vocabulary specific to the historical topic. Some errors in conventions are present that may interfere with meaning.
DOESN'T MEET EXPECTATIONS	Ideas are not clear, using little to no vocabulary specific to the historical topic. Several errors in conventions interfere with meaning.