Visualization of performance assessment research to support education computing in the laboratory

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Abstract. Practical learning in the laboratory is very important learning as a bridge between theory and reality in the field. Students must be able to understand the theory by proving the process of practical learning in the laboratory. The success of students in learning theory in class can be measured through affective, cognitive, and psychomotor assessments. Evaluation of three aspects can be done with performance assessment. Performance assessment has the meaning of assessing assignments and real performance that can be done by students, which is the goal of learning. In this study, trying to visualize previous research that examined the performance assessment and laboratory practicum related to the use of computer technology. So that it can be used as a foundation to develop further research. Visualization is done with bibliometric analysis, using a dataset from Scopus. The results showed that the performance assessment research had a close relationship with educational computing. In the visualization of overlays, it can also be seen that research that discusses performance assessment and computational education is research that has novelty.

1. Introduction

Practicum learning in the laboratory is very important learning as a bridge between theory and reality in the field. Students must be able to understand the theory by proving the process of practicum learning in the laboratory. Student success in learning theory in class can be measured through affective, cognitive, and psychomotor assessments. But sometimes the class assessment is only oriented to cognitive assessment, which is reflected in the formative and summative tests only. The process of evaluating learning outcomes, including practical learning, should include three aspects of affective, cognitive, and psychomotor assessment [1,2].

Assessment is one of the activities of a process to determine how much the goal can be achieved. An assessment of three aspects can be done with a performance assessment. Performance assessment has the meaning of assessing the real tasks and performance that can be done by students, which is the learning objective [3]. This approach reflects a paradigm shift from a psychometric model and measurement towards a model that emphasizes assessment as an integral part of the learning process (assessment for learning) and not just an assessment of learning [4].

The advantages of performance assessment are as follows: 1) Can measure learning outcomes that cannot be measured by other types of assessment; 2) The use of performance assessment is consistent
with modern learning theory; 3) Makes it possible to produce better learning; 4) Making learning more meaningful and motivating students; 5) Allows assessing processes as well as evaluating results; 6) Extending the approach to other types of assessment [5,6].

The practical learning process is now beginning to be integrated with technological advances, one of which is the use of practical web-based application modules [7,8]. In this study, trying to visualize previous studies that examined the performance assessment and laboratory practicum related to the use of computer technology. So that it can be used as a foundation to develop further research.

2. Methods and data
Data collection supporting the writing of this article uses the bibliographic analysis method with four stages carried out, namely data collection, data filtering, analysis, and report [7]. This method is a method of reviewing articles from the results of previous studies related and how often the article as a research outcome is quoted by another article [8]. The information provided by this software is articles, authors, and the country of origin of the study.

Data collection was carried out by searching literature at the end of May 2020 with the keyword “performance assessment” AND “practicum” in the Scopus database, obtained as many as 74 articles. Scopus was chosen because it is currently considered a top rank database for academic and scientific information from various studies [9]. In addition to providing detailed bibliographic information from a large number of prestigious peer-reviewed journals from around the world, the Scopus database has a citation index that functions to develop various bibliometric indicators.

The results of the search are checked to avoid data duplication. The search is also done by limiting the Title, Abstract, Keyword. Found 74 articles in all years, then used as a dataset, which consists of important data such as the title of the paper, the name of the author and affiliation, abstracts, keywords, references, and citation. Then saved using the *.ris format.

Bibliometric analysis in this study uses VOSviewer software. Vosviewer functions to visualize and analyze trends in the form of bibliometric maps [10-12]. The results of the analysis are based on keyword analysis. This method allows us to analyze specific data, which is derived from 74 articles consisting of 42 journals, 194 authors, and 1438 cited references. Citation analysis determines the relationship of items to the number of times the items cite each other, which offers insights about people, ideas, journals, and organizations which are given fields [13,14].

3. Results and discussion
In using keyword analysis, the author must determine the keywords to be searched. Keywords in bibliometric should be common ones [15]. The next analysis is keyword co-occurrence. This analysis is used to read the scope of knowledge from the research and the main theme of each research. This analysis is done by measuring the co-occurrence of keyword pairs of all articles [16]. This analysis is done by visual analysis. The visual analysis helps researchers identify the direction of research to advance the scientific field by highlighting terms that are not connected as fields for future research. This is done by identifying terms that are missing or represent a small gap from the network map but have potential.

The results of a keyword co-occurrence analysis of 74 articles were visualized using VosViewer. Co-occurrence of all keywords (author keywords and index keywords), full calculation with a minimum number of co-occurrences of keywords = 1, out of 99 keywords, 99 meet the threshold. In visualization, node size indicates the number of items. The thickness of the line between nodes indicates the level of the direct relationship between keywords. The results of the co-occurrence measurements obtained can be seen in Figure 1. 14 clusters were obtained, with prominent keywords as follows; “Performance assessment,” “education computing,” “teacher education,” “human,” “student” and learning. “Each of these keywords is interconnected, so it can be indicated that the development of research on this subject is related.
Figure 1. Co-occurrence from all keyword (author keyword and Index keyword), Full counting with a minimum number of co-occurrences of a keyword = 1, of the 99 keywords, 99 meet the threshold.
Figure 2. Overlay visualization of co-occurrence from all keyword.

Other visualizations that can be analyzed are overlay visualization and density visualization. Overlay visualization shows the time difference between each keyword. In comparison, density shows the density of the use of each keyword. The results of the overlay visualization can be seen in Figure 2, made based on the year of the article, to see the novelty of the study topic, in the range of dark blue to yellow with a figure that the more yellow, the newer.

Based on keywords analysis and visualization, it can be seen that research on performance assessment has a close relationship with education computing. In overlay visualization, it can also be seen that research that discusses performance assessment and education computing is research that has novelty.

4. Conclusion

This study aims to visualize previous research that examines laboratory performance assessments and practicum related to the use of computer technology. So that it can be used as a foundation to develop further research. The results show that research on performance assessment has a close relationship with education computing. In overlay visualization, it can also be seen that research that discusses performance assessment and education computing is research that has novelty.

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