The making of Android-based search engine applications with Elastic-search algorithm to improve programming competence

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Abstract. This research aims to create an Android-based search engine application using the Elastic-search algorithm which can later be used for students learning object-oriented programming. This media contains a search for material that makes it easy to learn and do assignments. The method used in developing this application is 4D from Thiagarajan and using Java language programming. The results of this study indicate that this application is valid for use in terms of Quality of visual and auditory perception, Ease of interaction and collaboration, Ease of learning to operate, Ease of use. It can be concluded that the Search engine application with Elastic Search algorithm is declared valid to be used as learning for students who want to learn about programming.

1. Introduction

Java programming language is a new thing to learn for students, the Java programming language with the concept of OOP is not enough to only understand programming techniques, but students are required to understand in terms of concepts as well. Student mistakes when studying OOP lead to changes in meaning and misinterpretation of syntax. When students convey the concept of OOP and apply it to the syntax, students find it difficult to learn it, so that when applying the concept to the java syntax students make mistakes in formulating it [1].

Search Engine is a place of all kinds of information that has no restrictions. The variety of information can be stored on the internet, very complete information and lots of benefits for users, so users can get any type of information needed. Search Engine has a variety of algorithms but with the same function and purpose as a data search engine. Search engines will take every page of the website and follow each link automatically, then categorize the data that has been obtained. This indexing is based on reading the text in the title, subtitles, meta tags, and others. Search engines can be very easy in providing quality and relevant information to keywords that are searched for by people who use the internet.

Elasticsearch is a search engine that is oriented to full-text or documents and can be accessed through the Restful API that can return indexed documents in JSON form when queried [2]. The most important point of elastic-search is that it can do full text search, handle synonyms and evaluate documents based on their relevance, generate analytics and aggregations from the same data and can do the search process in real-time without big batch processing jobs. Elasticsearch is a Search Server based on the Apache License Library that was developed using the JAVA Programming Language and is Open Source under
the terms of the apache 2 license. It was first introduced by its maker Shay Banon in February 2010. So this elastic search provides a distributed, multitenant, full-text search engine capable of an HTTP web interface and schema-free JSON documents. Elasticsearch has a concept that is quite unique. Where we can assume databases are called indexes, tables are called types and records or rows are called documents. While mapping can be called a table scheme. Elasticsearch has no transactions and can create index structures depending on needs. In addition, it can be arranged to become a distributed system for a number of servers [3].

2. Method
This development study using 4D procedures was carried out to obtain the expected results [4,5]. These procedures are: define, design, develop and disseminate or in other 4D compositions; define, design, develop, and deploy. However, the results of this study (revised media) were not disseminated due to time constraints. Each stage of development involved in this research is described in figure 1 as follows.

![Figure 1. Stages model 4D by Thiagarajan [4,5].](image)

2.1. Data analysis technique

2.1.1. Validation analysis. Analysis of application validation, and items are used to obtain data from the validator's assessment of the application, and items that are validated.

2.1.2. Application validation analysis. Analysis of the results of the validation is performed on each criterion related to each part of the application developed. To calculate the results used the Guttman scale on the validation questionnaire [6].

The results of the analysis of matter obtained through the validator assessment of instrument tests obtained with the calculation [4]:

\[
V_a = \frac{TS_e}{TS_h} \times 100\% V
\]  

Information:
\( V_a \) = value obtained validator
\( TS_e \) = total score obtained
\( TS_h \) = total maximum score
The validity of the results obtained by giving feedback based on criteria very valid, invalid, pretty, pretty valid, is less valid, invalid. These results were obtained from the calculation [4]:

\[ HR = \frac{\sum_{i} n_i \times i \times i_{\text{max}}}{n \times i_{\text{max}}} \times 100\% \] (2)

Information:
- \( n_i \) = number of validators that have value \( i \)
- \( i \) = weight value of quantitative assessment (1-5)
- \( N \) = number of validators
- \( i_{\text{max}} \) = maximum value

| Category         | Value | Percentage (%) |
|------------------|-------|----------------|
| Very valid       | 5     | 81 - 100       |
| Valid            | 4     | 61 – 80        |
| Valid enough     | 3     | 41 – 60        |
| Less than valid  | 2     | 21 – 40        |
| Invalid          | 1     | 10 – 20        |

3. Results and discussion
When a user uses a search engine-based application the first display is the login view. In this application has 2 access rights in the login that is user and admin. Users can enter a username and password that is already owned as in Figure 2 below.

Figure 2. Display login and register.

Register view is a new account registration display. In this view contains the account registration form such as username, firstname, lastname, email, password and confirm password, can be seen in the following picture 2 above. On the Side menu has a button about the application / about, the account menu functions for account information such as account logout, while the search button displays search functions for searching material.

Display the application homepage serves as looking for material, can be seen in the following picture 3.
Figure 3. (a). Display of the application homepage (b). Teacher data display.

Search function is to search for material, the user is asked to enter a search keyword so that the material appears. Searching on the application has a search suggestion so that the user is easy to find the material, if the user enters the wrong keywords then the material cannot be found. Like Figure 3b above. Display material has a search icon and under the material or after the material there is a comment column function to comment on the material. The material page also displays the info material sought by the user in Figure 4 below.

Figure 4. Results of searching.

Added the elastic-search function to the application. Elasticsearch functions as a search within the application, in using this function will be placed on the material search script. Elasticsearch will function when the user enters data material that is sought. The script used to connect to Elasticsearch can be seen in Figure 5 below.
Based on the above calculation, the average learning result without using the application in a student's limited trial of 77.50% was stated correct in answering the question. While the learning outcomes of students who use the application are 92.57%, students are declared to have graduated in carrying out the given tasks.

4. Conclusion

When compared to the research that states that the use of IT-based applications can boost student learning outcomes, it turns out in this study also states that IT-based applications can support student learning activities and outcomes [6,7].

Based on the validity test by the two expert validators on the Java search engine application obtained a percentage of 100% which means that this application is suitable for use in research. This is evidenced in the analysis of a limited trial of student learning with a percentage of truth level answering questions. The percentage of correct answers to questions that did not use the application was 77.50%, while students who used the application were 92.50%. It can be concluded that the data shows that students who use the application assistance get higher learning outcomes than by not using the Jasea application.

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