***Development of a Mobile Application for Monitoring Academic Performance and Student Discipline at* SMPN 1 Lengkong**

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ABSTRACT

Academic and disciplinary records of students at SMPN 1 Lengkong are still managed manually using paper-based logbooks, causing data recapitulation to occur only on a monthly basis and resulting in delays for parents in monitoring their children's progress. This issue was further compounded by the discontinuation of a previous Radio Frequency Identification (RFID) system due to subscription costs that burdened parents financially. This research aims to develop a mobile application called Pemsis, integrated with Cloud Firestore database and Firebase Cloud Messaging (FCM) service, to deliver real-time academic and disciplinary information at no additional cost, while also implementing clustering analysis to group students based on academic and non-academic data. Academic features were constructed from the average scores of 11 subjects grouped into 6 categories based on their academic domains, combined with one non-academic feature, namely a Violation Score derived from unexcused absences (Alpha). The K-Means and Agglomerative Hierarchical Clustering (AHC) algorithms were compared using the Silhouette Score metric to determine the best clustering method. System development was conducted using the Agile method with the Flutter framework. Testing results showed that the AHC method with the Average Linkage approach achieved the highest Silhouette Score of 0.6519 at K=2, outperforming K-Means, which only reached 0.2759, leading to the selection and integration of Average Linkage into the application to classify students into "Exemplary Student" and "At-Risk Student" categories. Usability testing using the System Usability Scale (SUS) involving 92 parent respondents obtained an average score of 88.48, which falls into the excellent usability category.

***Keywords**: clustering, Agglomerative Hierarchical Clustering, K-Means, Silhouette Score, mobile application, student monitoring.*