



MyBuddy for Early Detection of School Disengagement: User Assessment of Interaction Elements

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Abstract

School dropout is a critical issue globally, impacting educational justice and leading to adverse effects on employment, lifetime wages, and physical health. Efforts to combat student disengagement include the development of an intelligent tutoring system (ITS), aimed at identifying and addressing instances where students lose interest in tasks, ultimately addressing the complex challenge of school dropout through technology-driven interventions. It is difficult to predict disengagement on a trial-by-trial basis, especially in complicated cognitive areas. In order to identify the risk of school disengagement among vulnerable secondary school pupils, the *MyBuddymobile* application was created as a smart classifier. The functioning engine of *MyBuddy* is translated from a computational model made up of fourteen predictors for the four primary entities of student, family, school, and environment. The application employs advanced mathematical models to assess data and generate risk scores, which indicate the probability of student dropout. The recent technical assessment of *MyBuddy*, conducted by 27 experts using seven measurement metrics, has yielded positive results affirming the application's overall interactivity. However, the assessment also pinpointed specific areas where enhancements are warranted. Notably, improvements are needed in the clarity of error messages and notifications, responsiveness of touch gestures, and the clarity of icons and labels within *MyBuddy*. This insight provides a clear roadmap for refining *MyBuddy*, ensuring that these identified aspects are enhanced to further elevate the application's user experience and overall effectiveness. *MyBuddy* provides a centralized platform for accessing and analyzing combined data from multiple schools, enabling the identification of patterns, trends, and systemic issues contributing to dropout rates. It seeks to bring a transformation in dropout prevention and promote a more inclusive and fair education system in Kedah, Malaysia, aligning with the fourth Sustainable Development Goal that strives to ensure quality education for all.

Keywords: school disengagement, school dropout, school disengagement detection, smart classifier

1. Introduction

Global educational systems face substantial obstacles as a result of the problem of secondary school dropout. High dropout rates in Kedah, Malaysia, for example, make it difficult for people to complete their education and have far-reaching effects on society. These areas are particularly affected by this issue. It is crucial to address this problem in order to promote a more inclusive and fair school system because dropout rates are a sign of educational disparity, economic inequities, and social isolation. Innovative strategies that leverage technology have arisen in response to this urgent issue to address the dropout problem proactively. This article aims to explore the development of *MyBuddy*, a mobile application designed to identify at-risk secondary school students in Kedah who are likely to discontinue their education prematurely. *MyBuddy* utilizes mathematical modelling techniques to accurately determine the probability of dropout, empowering school counsellors, district officers, and state officers to intervene and provide targeted support to students in need. By adopting a user-centric approach, *MyBuddy* aims to revolutionize dropout prevention and contribute to the advancement of an inclusive educational landscape in Kedah.

In this article, we focus on the technical assessment of *MyBuddy*, specifically zooming in on the user assessment of interaction elements. As technology continues to shape our daily lives, understanding how users engage with interactive features becomes crucial. This exploration explores into *MyBuddy*'s technical landscape, providing a detailed analysis of user interactions to uncover strengths, areas for improvement, and the overall impact of its interactive features on user engagement. Join us as we navigate the intricate intersection of technology and user experience, unravelling insights that align with evolving user expectations and technological advancements.



2. School Disengagement

School disengagement entails a scenario in which an individual experiences a sense of exclusion, non-participation in school-related events, absence from enrollment, or consistently low attendance. Addressing school disengagement often requires a multifaceted approach involving educators, parents, and the community. Strategies may include personalized learning plans, improved teaching methods, mental health support, anti-bullying initiatives, and efforts to create a more inclusive and supportive school environment. Recognizing and addressing the root causes of disengagement is essential to help students stay connected to their education and reach their full potential. School disengagement stands as a critical concern for achieving educational fairness on a global scale, as it often precipitates students dropping out of school. The repercussions of leaving school prematurely are far-reaching and encompass detrimental effects on employment prospects, lifelong earnings potential, and overall physical well-being (John et al., 2018). The factors contributing to dropout rates are multifaceted and are shaped by a combination of immediate and more distant influences pertaining to both the individual student and the broader family, school, and community contexts in which the student resides (Rumberger, 2020). Archambault et al. (2009), Blondal & Adalbjarnardottir (2012), and Henry et al. (2012) recognized school disengagement as a notable predictor of eventual dropout rates, engagement in delinquent behaviors, and the onset of problematic substance use during the adolescent and early adulthood phases.

Diverse individual factors are linked to the phenomenon of dropping out of school, including several demographic characteristics. In general, dropout rates tend to be elevated among males, individuals of Black and Hispanic ethnic backgrounds, im-migrants, and students from language-minority backgrounds. Attitudes also exert a significant influence on dropout rates. Furthermore, students who harbor lower educational and occupational aspirations tend to experience higher rates of dropping out. Family background stands out as a widely acknowledged paramount factor contributing to educational success. Socioeconomic status, often assessed through measures such as parental education levels and family income, emerges as a potent predictor of both academic achievement and the propensity to drop out of school. Parental education, in particular, wields considerable influence over students' aspirations and the level of educational support they receive. There is a broad consensus that schools wield substantial influence over student achievement, encompassing factors such as dropout rates. Student performance is shaped by four distinct categories of school attributes: the social makeup of the school population, its structural features, available resources, and the policies and practices it employs. Besides families and schools, communities and peer groups also play roles in impacting students' decisions to leave school prematurely. Variances in neighborhood characteristics can shed light on divergent dropout rates among communities, independently of the family's influence.

Many studies conducted on a global scale have explored the factors that contribute to school disengagement, underscoring the dynamic and continually evolving nature of research in this field. These research efforts have covered diverse geographical regions, including Indonesia (Habibi and Setiawan, 2017), Tanzania (Ouma et al., 2017), Central America (Adelman and Szekely, 2017), and Turkey (Boyaci, 2019). In conjunction to the advancements in Information and Communication Technology (ICT) and Artificial Intelligence (AI), the early detection of school disengagement becomes increasingly vital. Azizi et al. (2010) have demonstrated that AI models can effectively support individuals with cognitive vulnerabilities, underscoring the potential of these technologies in identifying students who may be at risk of disengaging from their academic pursuits and the school environment. This proactive approach gains greater significance in today's educational landscape, where ICT and AI-powered tools can analyze student data, engagement patterns, and behavior to pinpoint potential disengagement indicators. Therefore, early detection through these technological means emerges as a critical imperative in education, leveraging ICT and AI to enhance students' academic success and overall well-being.

The challenge of addressing school dropout rates persists despite various methods have been employed over time. While numerous strategies have been implemented, achieving definitive success remains elusive. Recognizing the ongoing struggle, there is a compelling need to explore innovative solutions, and one promising avenue is the integration of Information Technology (IT), particularly Artificial Intelligence (AI). This infusion of advanced technology presents a unique opportunity to revolutionize the approach to handling school dropout by enabling early identification of at-risk students, thus facilitating timely and targeted interventions. In response to this imperative, the current study introduces *MyBuddy*, a mobile application designed to harness the potential of IT and AI in the critical task of identifying students at risk of dropping out. *MyBuddy* represents a paradigm shift in leveraging technology to address educational challenges. By integrating AI algorithms, the application can analyze various factors and patterns to identify warning signs indicative of a student's potential risk of dropping out. This proactive approach allows for early detection, enabling educators and support systems to intervene promptly, thereby mitigating the factors that contribute to dropout rates. *MyBuddy* not only exemplifies the fusion of cutting-edge technology with educational



concerns but also signifies a promising step towards a more technologically-driven, responsive, and effective educational ecosystem.

3. Design and Development of *MyBuddy*

This section focuses on the intricacies of the design and development process of *MyBuddy*, a mobile application designed to identify at-risk secondary school students in Kedah, Malaysia, who may be prone to dropping out. *MyBuddy* adopted an iterative method that encompassed the development of numerous design iterations and prototypes. Initially, low-fidelity wireframes and mockups were crafted to offer a visual depiction of the app's structure, arrangement, and user interface. These initial prototypes formed the basis for soliciting feedback and garnering insights from the app's end users. *MyBuddy* represents a practical application of our proposed computation model for predicting at-risk students, encapsulating fourteen predictors. Functioning as a tangible product, *MyBuddy* brings our model closer to its users, providing a practical and accessible interface for engaging with the predictive elements embedded in the computation model. Requirements collected from the target users of *MyBuddy* was subjected to thorough analysis, with close attention given to their suggestions, concerns, and observations. The development team meticulously reviewed this feedback and pinpointed areas where enhancements could be implemented to improve the app's overall usability, effectiveness, and user satisfaction. During this analytical phase, a comparative assessment was carried out to align the users' expectations and preferences with the current design, facilitating a deeper comprehension of the users' requirements and objectives.

Drawing from the insights gleaned through requirements analysis, subsequent design iterations were developed. These iterations integrated the suggested improvements and resolved the identified issues. Over time, these iterations systematically enhanced the app's design, bringing it into closer alignment with the users' needs and expectations. Figure 1 shows selected interfaces of the *MyBuddy* application.

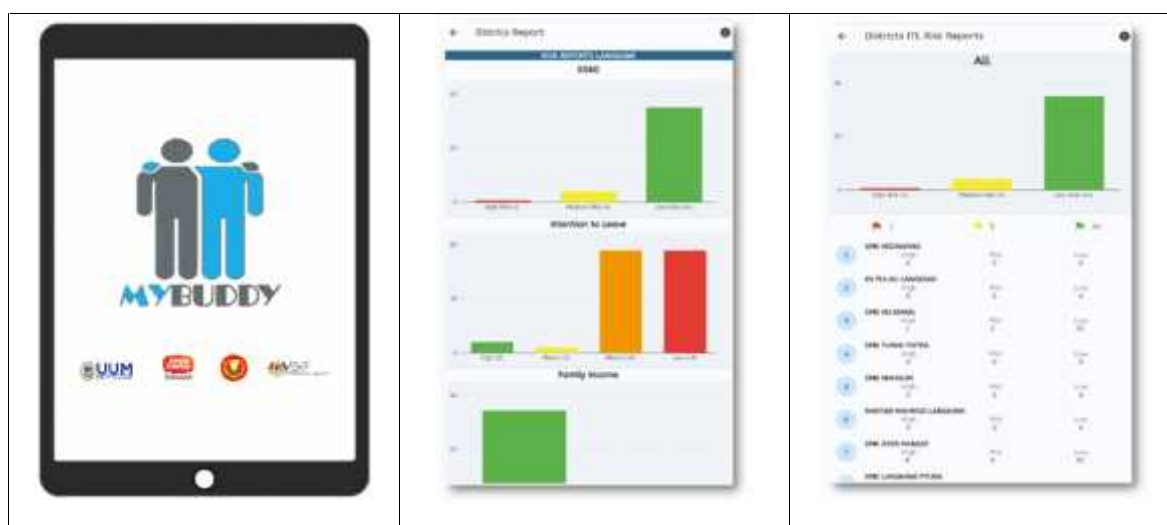


Figure 1. Selected Interfaces of *MyBuddy* application

MyBuddy's primary function is to intelligently predict at-risk students by categorizing them into three distinct risk levels: high risk, medium risk, and low risk, each denoted by the respective colors red, yellow, and green. This predictive risk assessment is accessible to various user levels, specifically facilitating monitoring and planning interventions for educational management at the department office. This streamlined classification system ensures efficient identification of students who may require targeted support, enhancing the overall management and intervention planning processes.

4. Technical Assessment of *MyBuddy*

A comprehensive technical assessment of *MyBuddy* was conducted on the 25th of July 2023,, engaging the expertise of 27 computer professionals hailing from three prominent institutions: Universiti Utara Malaysia (UUM), Universiti



Malaysia Perlis (UNIMAP), and Politeknik Tuanku Syed Sirajuddin. Despite the participation of only 20 individuals, this sample size is deemed sufficient to draw conclusions for the study. In the context of experimental research with rigorous control measures, achieving meaningful outcomes is viable even with relatively small sample sizes, as indicated by Sekaran and Bougie (2003), who suggest that successful research can be conducted with as few as 10 to 20 participants. The assessment was meticulously designed to evaluate the application across three key measurement dimensions: design and layout, simplicity, and functions and performance. This involved the collection of quantitative data to ensure a thorough analysis of these aspects. Additionally, the assessment incorporated qualitative data to gather overall suggestions for further improvement, providing a holistic perspective on the application's strengths and areas with potential enhancements. Figure 1 shows how technical assessment was conducted.



Figure 2. Technical assessment of *MyBuddy* application

This article specifically focuses on the assessment of the interaction dynamics and simplicity features of *MyBuddy* application. By concentrating on the design's intricacies and functionality, we aim to understand how users engage seamlessly. Simplicity, in this context, goes beyond functionality, emphasizing clarity and accessibility for an uncomplicated user experience. This focused analysis aims to reveal how *MyBuddy* caters to user needs through user-friendly interactions and straightforward usability. A comprehensive assessment session commenced with an introductory overview of the *MyBuddy* application, providing testers with a foundational understanding of its purpose and functionalities. Following this introduction, a systematic system demonstration unfolded, offering testers an in-depth look into the intricacies of *MyBuddy*'s features. Subsequently, testers were granted an invaluable opportunity to explore into the application firsthand through a guided hands-on session, lasting a generous one hour. This hands-on exploration allowed testers to navigate the various facets of *MyBuddy*, providing them with a real-time experience of its interface and functionality.

During this interactive session, testers had the chance to actively engage with the application, probing its functionalities, and gaining a holistic understanding of its user interface. The guided nature of this exploration ensured that testers could navigate the application effectively, emphasizing user-friendliness and ease of use. To culminate the assessment session, valuable feedback on testers' experiences in using and testing *MyBuddy* was systematically collected. This feedback gathering process served as a crucial component, capturing firsthand insights into the user experience, application functionality, and potential areas for enhancement. In this comprehensive assessment framework, the combination of the introductory session, system demonstration, hands-on exploration, and feedback collection strategically ensures a thorough and nuanced evaluation of *MyBuddy*'s usability and effectiveness.

5. Findings

To assess *MyBuddy*'s interaction and simplicity, a set of seven measurement items with 5-likert scales has been strategically employed. This thoughtful selection aims to explore into the intricacies of the application's user experience, covering a spectrum of factors. The measurement items encompass the simplicity level associated with *MyBuddy*'s utilization, the ease with which users navigate and retrieve information within the application, and the



overall clarity of its flow and navigation. Additionally, a specific focus is placed on evaluating the clarity of navigation labels and icons, ensuring users can easily comprehend and engage with *MyBuddy*'s diverse features.

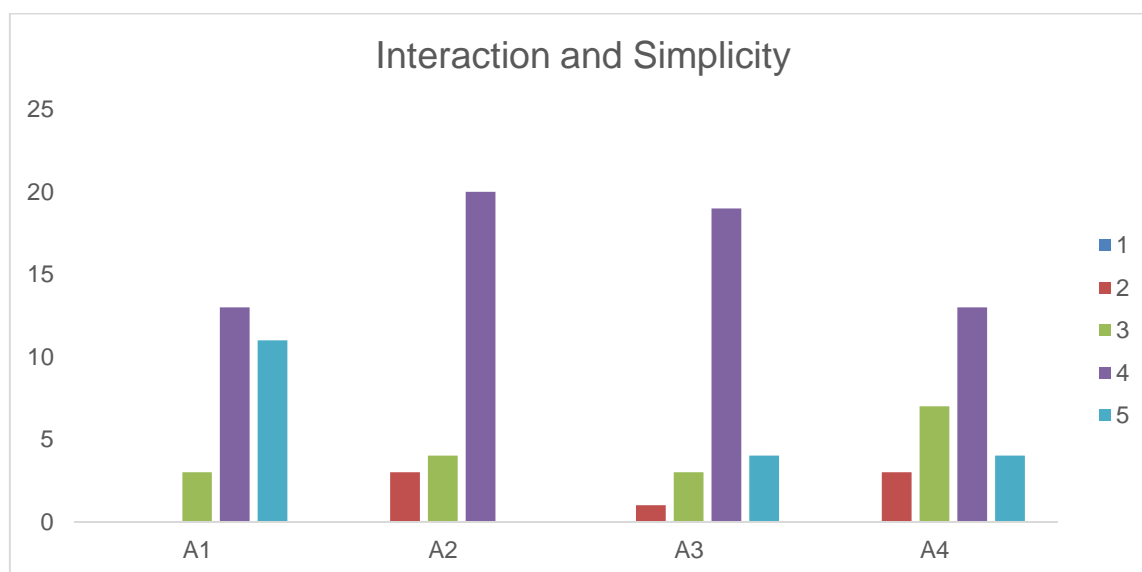


Figure 3. Result of four assessment metric of *MyBuddy* on interaction and simplicity

A1 serves as a metric to assess the simplicity of utilizing *MyBuddy*, and the obtained results reveal that a significant 88.9% of participants expressed agreement with the notion that *MyBuddy* is characterized by simplicity and ease of use. Moving to A2, which gauges the ease of locating information within *MyBuddy*, the findings indicate that a substantial 74% of participants concurred with the assessment that it is indeed facile to find information within the application. Transitioning to A3, the measurement of the clarity of flow and navigation within *MyBuddy*, a noteworthy 85.2% of participants acknowledged and agreed with the clarity embedded in the application's flow and navigation. Shifting focus to A4, which scrutinizes the clarity of icons and labels within *MyBuddy*, the results suggest that there is room for improvement, as only 63% of participants expressed agreement. This particular aspect calls for attention and potential enhancements to ensure that the clarity of icons and labels aligns more closely with user expectations and preferences. This comprehensive breakdown of the measurement items provides a detailed overview of participants' perceptions, indicating strong satisfaction in some areas and identifying specific areas that could benefit from refinement for an optimized user experience.

Furthermore, the assessment considers the responsiveness of touch gestures, underscoring the importance of a seamless and user-friendly touch interface. Aspects such as loading times and responsiveness are meticulously examined to provide a comprehensive insight into the application's efficiency and performance. The evaluation framework also takes into consideration the clarity of error messages and notifications, acknowledging their role in guiding users and enhancing the overall user experience. This holistic approach to measurement ensures a thorough assessment of *MyBuddy*'s interaction and simplicity, offering a detailed and comprehensive perspective on its usability and effectiveness.

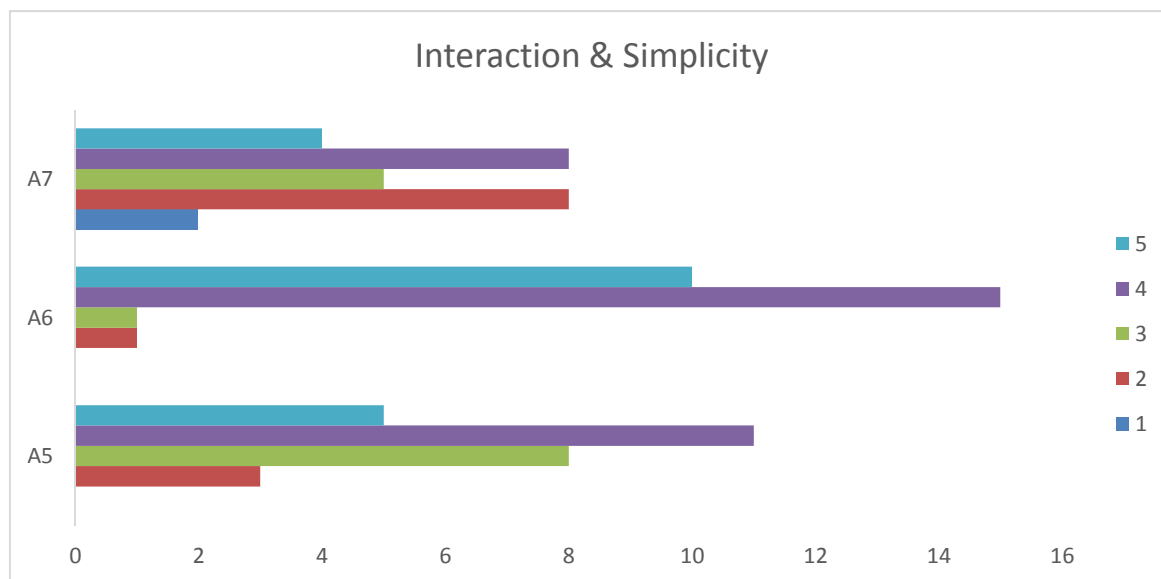


Figure 4. Findings of *MyBuddy*'s technical assessment on interaction and simplicity

Figure 4 illustrated the feedback on another three measurement items. A5, which specifically evaluates the responsiveness of touch gestures within *MyBuddy*, the findings indicate that only 59% of participants expressed agreement with this aspect. This result signals a potential area for enhancement, emphasizing the need for improved responsiveness in touch gestures to elevate the overall user experience. Addressing and refining this dimension could contribute significantly to the application's usability and user satisfaction. While for A6, tasked with measuring the loading times and responsiveness of *MyBuddy*, the results present a positive picture, with an impressive 92.6% of participants affirming that *MyBuddy* exhibits high responsiveness. This commendable outcome suggests that the application performs efficiently in terms of loading times and responsiveness, contributing positively to user satisfaction. The high agreement in this area highlights a notable strength in *MyBuddy*'s technical performance, providing a foundation for further success and user engagement. Turning attention to A7, which assesses the clarity of error messages and notifications within *MyBuddy*, the findings reveal that only 44% of participants agreed with the clarity provided in this aspect. This signals a crucial area for improvement, emphasizing the need to enhance the clarity of error messages and notifications to ensure that users can easily understand and respond to them. By addressing this dimension, *MyBuddy* can potentially fortify its user communication channels and create a more seamless and user-friendly experience.

6. Conclusions

This article has highlighted the significance of *MyBuddy*, a mobile application designed to identify at-risk secondary school students in Kedah, Malaysia, who are likely to drop out. By employing mathematical modeling and a user-centric approach, *MyBuddy* aims to revolutionize dropout prevention and foster a more inclusive and equitable education system. *MyBuddy* underwent a rigorous testing phase, specifically honing in on its interactions and simplicity through the meticulous application of seven measurement dimensions. The results of this comprehensive evaluation not only affirm the successful testing and overall functionality of *MyBuddy* but also bring to light specific areas where refinement can enhance its interactive capabilities with users. This insightful feedback serves as a valuable compass for future developments, guiding the trajectory of *MyBuddy* towards becoming an even more highly interactive and user-centric application. The acknowledgment of potential improvements underscores the commitment of *MyBuddy*'s developers to continuous enhancement, ensuring that the application remains at the forefront of user satisfaction. By identifying and addressing these nuanced aspects, *MyBuddy* can further evolve to meet the ever-changing needs of its user base. This commitment to refinement not only reflects a dedication to technical excellence but also positions *MyBuddy* as a dynamic and responsive platform that prioritizes user experience. As *MyBuddy* embarks on this journey of enhancement, users can anticipate a more seamless and responsive interaction, solidifying its position as a user-friendly application dedicated to meeting the diverse preferences and expectations of its growing user community.



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