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Exploring Academic Operations: A Focus on the Implementation of Class Record Optimization and Automation System (CROAS)

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Abstract

This research analyzes the impact of the Class Record Optimization and Automation System (C.R.O.A.S.) on administrative efficiency and educational delivery at the Laboratory Science High School of Romblon State University. The present study applied a mixed-methods approach, using quantitative surveys and qualitative interviews with teachers and administrators to determine how C.R.O.A.S. affects teachers' workloads, time allocation, class record management, and overall educational processes. Moreover, the study investigated the role of leadership strategies in successfully implementing C.R.O.A.S. The results imply that inclusive decision-making and strategic planning are critical strategies for the system's effectiveness. Recommendations for future practice include ongoing support for system improvements, continued research, and international sharing and benchmarking findings to broaden educational technology integration efforts.

Keywords: Class Record Optimization and Automation System; Educational Technology; Administrative Efficiency; Teacher Workload; Academic Operations.

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1. Introduction

This research was conducted within the Laboratory Science High School of Romblon State University in the Philippines to examine the potential of the Class Record Optimization and Automation System (C.R.O.A.S.) in simplifying the school's administrative procedures and improving educational outcomes. The study assessed the impact of C.R.O.A.S. on teacher workloads, time management, and the efficiency of class record management to understand better how the system can alleviate administrative tasks that may hinder teaching and learning. The research objectives include evaluating the effect of C.R.O.A.S. on teachers' operational efficiency, investigating leadership strategies for its deployment, understanding user experiences, and scrutinizing its impact on the accuracy of data management. The study also aims to use the findings to provide recommendations on enhancing technology integration in secondary education, contributing to the development of educational policies, teaching methodologies, and technology use in education within the Philippine context. [1,2,3]

This study aims to provide results that may affect educational policy, teaching practices, and technological innovation. The study also presents empirical evidence of C.R.O.A.S.'s role in boosting teacher productivity and promoting a shift towards more learner-centered teaching methods, which can guide policymakers and educational leaders in strategic decision-making and policy refinement [4,5,6]. The study further provides direction for technology developers in creating more user-friendly and efficient educational technologies by identifying challenges and user needs associated with C.R.O.A.S. This thorough evaluation of C.R.O.A.S. within a specific laboratory high school context not only addresses the immediate needs of the educational community at Romblon State University but also contributes to the broader discussion on leveraging technology to address educational challenges, laying the groundwork for more effective, efficient, and equitable educational systems worldwide [7,8,9].

1.1. Synthesis of Related Literature

Technological integration in education has significantly transformed education by improving efficiency and results across various instructional processes [10,11]. This is demonstrated through the use of digital tools, learning management systems (L.M.S.), and, in this study, automated systems such as the Laboratory Science High School's Class Record Optimization and Automation System (C.R.O.A.S.). The implementation of these technologies facilitates streamlined processes and enhanced learning experiences, proving essential in modern educational environments.

The purpose of the study is supported by the frameworks of Wofford [12] and Guericke [13] for class record optimization and automation. These frameworks prioritize scalable and modular approaches. Guericke suggests mathematical optimization in microservice architectures, which ensures efficient resource allocation and performance. Meanwhile, Wofford focuses on state management and synchronization, providing a stable and reliable system. Kumargazhanova's algorithms for class scheduling and design optimization further complement these frameworks. This study also aligns with the findings and recommendations of Iyer's (2022) and Sinha's (2020) studies, which highlight the importance of automation reliability and efficiency in educational settings

[15,16].

The introduction of automation in class record management and its possible effects on users and the entire educational system are supported by concepts presented by the Technology Acceptance Model (T.A.M.) and the Unified Theory of Acceptance and Use of Technology (U.T.A.U.T.). Despite criticism that the U.T.A.U.T. model faces because of its strong relationships between its constructs, it remains widely accepted and used to predict technology acceptance behaviors in various contexts [17,18]. Similarly, T.A.M. remains a significant predictor of technology acceptance because of its perceived usefulness and ease of use, especially in educational contexts [19,20]. These models provide a comprehensive understanding of how educators and students interact with new technologies.According to research on the social influences on technology adoption by Foster (2010), people's acceptance of technology is primarily shaped by their innovative nature and the values of society [21]. On the other hand, Taherdoost (2018) and Dube (2020) have identified challenges and barriers to technology adoption, such as user acceptance, ethical considerations, and specific contextual barriers that must be thoroughly understood to effectively carry out technology integration in education [22,23]. Addressing these challenges is crucial for successful implementation [24,25,26].While the modern educational context has made significant strides in technology integration, there is still a need to analyze gaps in terms of contextual and cultural factors that may influence technology adoption in various educational environments. Hashim (2018) and Liu (2020) recommend future research to address these gaps by exploring technology adoption in diverse contexts, such as underprivileged areas and underfunded schools [27,28]. Understanding these factors can lead to more effective and inclusive technology integration strategies.With the understanding of interwoven frameworks, models, findings, and implications of literature provided in this synthesis, this research has identified potential gaps that the study may address. The conduct of this study using C.R.O.A.S. bears the potential to fill such gaps by testing theoretical frameworks in a practical setting and examining the unique challenges faced by the Laboratory Science High School of Romblon State University [29,30,31]. This approach ensures that the findings are grounded in real-world applications, enhancing their relevance and impact.

2. Methods

This study used a mixed methods design, specifically a sequential explanatory design, utilizing three components of mixed method research: development, initiation, and expansion. The development component aims at using the results from one method to help develop or inform the other method. This was realized through sampling and implementation for measuring decisions. Initiation involves the discovery of paradox and contradiction that can lead to the formulation of new perspectives and frameworks, recasting questions or results from one method with questions or results from another.Expansion explores the breadth and range of inquiry using different methods for different inquiry components. This methodological framework enabled a comprehensive exploration of C.R.O.A.S., intending to enrich discussions on educational technology's challenges and opportunities. By integrating these components, the study provided a robust analysis that informed future policy, practice, and research.

The use of development in the mixed methods design was crucial in ensuring that the results from one method informed the other. This approach facilitated accurate sampling and implementation for measuring decisions, enhancing the study's overall validity. Furthermore, the initiation phase helped identify contradictions and paradoxes, leading to new perspectives and frameworks. These insights were critical for understanding the complexities of educational technology integration.In the expansion phase, different methods were employed to explore various inquiry components, providing a broader understanding of the research topic. This comprehensive approach ensured that the study covered a wide range of issues related to C.R.O.A.S. The integration of these methods allowed for a detailed exploration of the educational technology landscape, offering valuable insights for stakeholders.Ultimately, the sequential explanatory design, with its focus on development, initiation, and expansion, provided a structured and effective framework for the study. This design not only facilitated a thorough exploration of C.R.O.A.S. but also highlighted the interconnectedness of different research methods. By addressing various aspects of educational technology, the study offered practical recommendations for improving policy and practice.

2.1. Conceptual Framework

The conceptual framework is shown below in Figure 1. The conceptual framework for this study visualized the interplay of critical concepts and variables surrounding the implementation of the Class Record Optimization and Automation System (C.R.O.A.S.). This visualization highlights the key areas affected by the system and provides a comprehensive understanding of its impact.

- School Leadership: Leadership strategies employed to support and manage the rollout of C.R.O.A.S.
- Teacher Workload: Changes in teachers' administrative burden and time allocation before and after C.R.O.A.S. implementation.
- User Experience: Teachers' and administrators' perceptions of the usability, accessibility, and overall experience with C.R.O.A.S.
- Data Accuracy and Efficiency: Impact of C.R.O.A.S. on the accuracy and efficiency of class record management and data retrieval.
- Implications for Educational Leadership: Emerging insights and recommendations for enhancing technology integration in educational leadership practices.

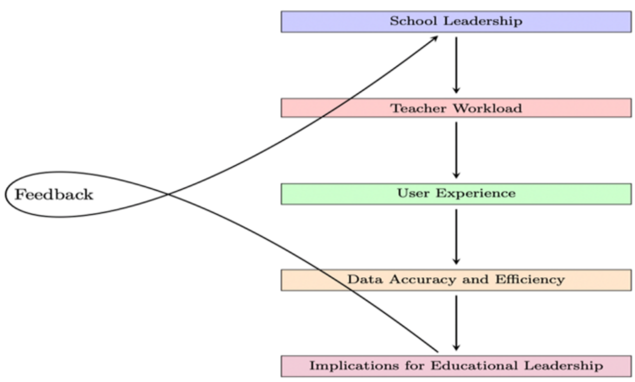

Figure 1: Conceptual Framework of the Study

The research paradigm for studying the Class Record Optimization and Automation System (C.R.O.A.S.) at Laboratory Science High School utilized a sequential explanatory design for in-depth exploration within this context. Data collection is twofold: the quantitative encompassing document analysis of relevant materials like school reports and training documents and survey questionnaire for foundational insights, and semi-structured interviews with key stakeholders—teachers, principals, and other personnel—to capture detailed experiences and perceptions related to C.R.O.A.S. This approach allows for flexibility in addressing complex topics .

Thematic analysis and interrater reliability checks were applied to the collected data, facilitating data coding and identifying emerging themes, leading to critical findings about C.R.O.A.S.'s implementation and impact. This method aims to enrich the understanding of how automated class record systems can be integrated and optimized in educational settings, summarizing the methodological journey from data collection through analysis to the extraction of findings . A typical research diagram is shown in Figure 2 .

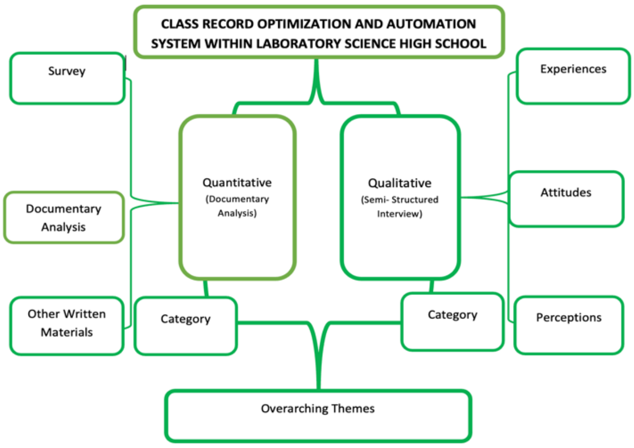

Figure 2: Research Paradigm

3. Results and Discussions

Thematic During the cycle of the second and third quarters, all Laboratory Science High School teachers were utilized as subjects and participants of the study. The census method was chosen for its precision in capturing the complete impact of C.R.O.A.S. on teachers' workloads and the system's accuracy in class record management at Romblon State University. This method provided an all-encompassing view of the educators' experiences, essential for evaluating leadership strategies and implementation challenges. Additionally, it ensured that the recommendations for optimizing C.R.O.A.S. integration were representative and grounded in the full scope of user interactions.

3.1. How does the Class Record Optimization and Automation System (C.R.O.A.S.) impact teachers' workloads and time allocation at the Laboratory Science High School of Romblon State University?

A comparative analysis of pre- and post-CROAS implementation revealed a notable reduction in teacher administrative workloads. On average, teachers had to spend 2.61 hours working on class record management before C.R.O.A.S. was implemented. Of these, 7.7% of the teachers worked less than 1 hour on class record management, while 42.3% of the teachers worked between 1 hour to 3 hours, 34.6% 4-6 hours, and 15.4% had to work on class record management for more than 6 hours. Investigation revealed that during the implementation of C.R.O.A.S., the time spent on class record management decreased to an average of 1.17 hours, where 69.2% worked less than 1 hour, 23.1% 1-3 hours, and 7.7% 4-6 hours. Importantly, it was observed that all of the teachers had to work on class record management for 6 hours at maximum. This shows that teachers could save 1.62 hours per week on class record management, reallocating this time towards instructional activities and student interaction [32,33]. Documents detailed a rigorous, multi-stakeholder decision-making process for C.R.O.A.S. selection, emphasizing criteria like user-friendliness, cost-effectiveness, and potential to reduce administrative burdens. Documents also outline a strategic implementation plan, highlighting phased rollouts and feedback mechanisms [34,35,36].

Figure 3 illustrates the percentage of teachers by class record management time before and after implementing C.R.O.A.S. It clearly shows the shift in time allocation: a notable decrease in the number of teachers spending more than 3 hours on class record management to zero and a significant increase in the percentage of teachers spending less than 1 hour on these tasks. This visual representation underscores the efficiency gains achieved through the C.R.O.A.S. implementation, highlighting the reallocation of time towards more instructional and interactive activities with students [37,38,39].

The reduction in time spent on class record management indicates the effectiveness of C.R.O.A.S. in streamlining administrative tasks. Teachers can now focus more on direct educational activities, thereby enhancing the overall teaching and learning environment. Such a shift is crucial as it aligns with the goals of modern education to maximize teacher-student engagement and minimize administrative burdens [37,38,39].

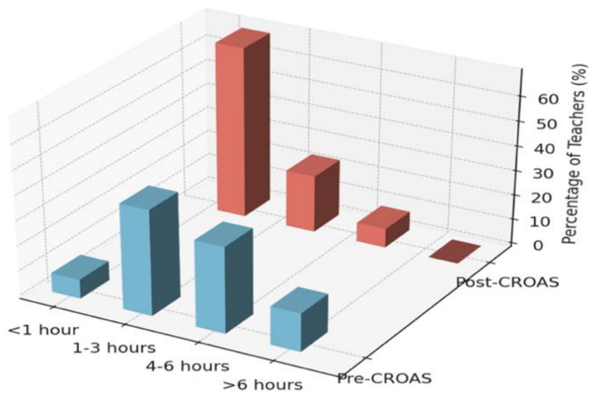

Figure 3: Percentage of Teachers by Class Record Management

Moreover, the increased efficiency not only benefits teachers but also positively impacts student outcomes. With teachers having more time for instructional planning and interaction, students receive more personalized attention and support. This change can lead to improved academic performance and a more dynamic classroom experience, fostering better learning conditions [37,38,39].

3.2. How does C.R.O.A.S. affect the accuracy and efficiency of class record management?

For the efficiency of class record management, most (73.08%) gave the highest rating, indicating they perceived C.R.O.A.S. as very efficient. A significant minority (26.92%) rated it the second-highest in efficiency, demonstrating overall positive feedback on efficiency, with no respondents rating it as neutral or lower. This consensus suggests a strong approval of C.R.O.A.S. for streamlining class record management processes.

Regarding the accuracy of class records with C.R.O.A.S., an even more significant majority of respondents (76.92%) rated the accuracy as the highest, suggesting that they find the system significantly enhances the accuracy of class records. A smaller portion (23.08%) gave it the second-highest rating, indicating generally favorable perceptions of accuracy improvements. Here, too, no respondents rated it neutral or worse, underscoring the system's effectiveness in maintaining accurate class records [40].

Figure 4 visually compares the respondents' evaluations regarding Data Accuracy and Efficiency, with ratings from 1 to 5, where 5 represents the highest or most favorable rating and 1 represents the lowest or least favorable. This figure highlights the overwhelmingly positive reception of C.R.O.A.S. in terms of both data accuracy and operational efficiency, reinforcing the quantitative data gathered from the respondents [41,42].

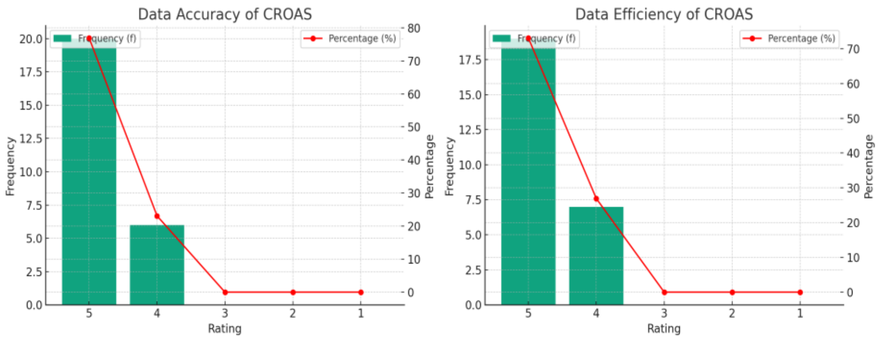

Figure 4: Data Accuracy and Efficiency of C.R.O.A.S

3.3. What leadership strategies have been employed by schools to ensure the successful implementation of C.R.O.A.S.?

Schools must adopt multifaceted leadership strategies to successfully implement the Class Record Optimization and Automation System (C.R.O.A.S.) [43,44,45]. Leaders of the participating school realized the need for rapid and error-free grade management. They decided to align the system with broader educational policies in the inclusive decision-making processes. The school selected knowledgeable instructors who facilitated training sessions and simulations using C.R.O.A.S. to encode students' grades. All teachers participated in these intensive hands-on training sessions to address technical and user acceptance challenges. Additionally, administrative leaders coordinated with I.T. department personnel for system approval, observance of cyber security policies, and legal compliance [46,47].

The school administration made necessary adjustments to enhance internet connectivity, a component crucial in the system's use for onsite and remote system access. I.T. support and web developers assisted in mitigating technical challenges such as system bugs and data loss due to poor internet connectivity. The school also provided technical assistance to teachers by conducting mini-tutorials to ensure that teachers with difficulties using technology and even intermediate users can use the system more comfortably. The school administration also closely monitored the implementation timeline to ensure timely submissions and compliance of all teachers using C.R.O.A.S [48,49].

The administration employed strategic measures to address issues on the technical aspects of the C.R.O.A.S. and secured continuous support for the teaching staff. It worked with technical specialists to reduce the system's potential risks and errors. Because of this, C.R.O.A.S. resulted in better learning outcomes, faster administrative and teaching processes, and more efficient and accurate grading and student performance monitoring.

3.4. What are the experiences of teachers and administrators with C.R.O.A.S., and what challenges and areas for improvement have been identified?

Through a series of interviews, the teachers responded based on their positive and challenging experiences, which the study could utilize to explore potential opportunities for the improvement of C.R.O.A.S. Initially, the participants expressed gratitude for the development of C.R.O.A.S. because of the system's automatic grade computation feature which significantly reduced not only the average time for the generation of grades based on the numerical data encoded but also the storage space needed for keeping records of students. This leads to a significant reduction in workload among teachers. Since the system is stored in Google Drive, it is more accessible to all users, and changes are synched and reflected in real-time, thereby simplifying the encoding of students' academic performance and improving assessment management [50].

While the participants had overwhelmingly positive responses on using C.R.O.A.S., they also cited some issues they felt must be resolved immediately. They stressed that technical difficulties such as system bugs, errors in the sheets, and occasional crashes were common concerns. Despite internet adjustments implemented by the school, internet connectivity still appeared as a significant barrier, which caused further issues such as failure to save edited work. Some teachers also expressed their need for continuous training and support to address difficulty and confusion in using the system [51,52].

Even with the points for improvement suggested by the interview participants, responses still suggest that C.R.O.A.S. has been a beneficial tool for the educational community. With constant support, targeted training, and system upgrades, the school can ensure the robust performance of C.R.O.A.S [53,54].

3.5. What overarching insights and implications do the emerging themes reveal about the role of technology in educational reform and teacher-student dynamics within the context of C.R.O.A.S. implementation in the Laboratory Science High School?

The study presents several vital themes that underscore the multifaceted aspects of technology adoption, spanning technical, practical, strategic, and ethical considerations. Each facet discusses the overall effectiveness and success of C.R.O.A.S**.** implementation in the Laboratory Science High School [55].

1. The User-Centric Design of C.R.O.A.S.:

One of the themes in this study was the user-centric design of C.R.O.A.S. The participants shared their experiences on using C.R.O.A.S. through a series of interviews. The responses yielded numerous responses that similarly focused on the user experiences. Their responses suggested high acceptability because of the user-centric design and functionality of C.R.O.A.S. Because the system was easy to use and navigate, respondents agreed that there was more intuitive use, allowing a smoother transition from the traditional class records to C.R.O.A.S. The system's features, including automated alerts and easy-to-navigate dashboards, added to the respondents' overall efficiency and user experience [56].

2. Strategic Management of Educational Innovations

Inclusive leadership techniques and well-executed change management were identified as factors in successfully implementing C.R.O.A.S. as a grade recording system. In other words, strategic management emerged as one of the themes because leaders must have a proactive, responsive, and holistic approach to adopting a new system in the school, introducing the system to the users, and continuously monitoring the system's quality during the implementation. Besides this, C.R.O.A.S. also required various measures such as encouraging active involvement from stakeholders, the establishment of clear goals, and continuous support and training programs for its educators and users. Responses have also included suggestions such as phased rollouts and strategic planning to lessen resistance, facilitate smoother technology integration, and lessen the difficulty of the C.R.O.A.S. adoption [57,58].

3. Transformation of Educational Practices through C.R.O.A.S.:

The implementation of C.R.O.A.s has led to a significant transformation in terms of educational practices. Based on the teachers' responses, because C.R.O.A.S. has significantly reduced the time they allot to grading, they can use their time on other functions, such as direct student instruction and the construction of learning resources. Aside from optimizing the teaching-learning practices, using C.R.O.A.S. also maximizes learning outcomes through personalized attention to students. With the assurance of data accuracy, users can trust the system further, thereby supporting better data-driven decision-making within educational contexts.

4. Building a Robust Support System for Technological Integration:

The results of this study present the need for timely technical support, comprehensive user guides, and accessible helpdesks for immediate resolution of issues that users may encounter as they utilize the C.R.O.A.S. Having a robust support system in the integration of C.R.O.A.S. plays a crucial role in its effectiveness and acceptability. Besides this, a supportive practice community among users facilitates shared learning and problem-solving, further enhancing the integration experience [59].

5. Navigating the Ethical Landscape in Educational Tech:

Leaders, administrators, and educators implementing C.R.O.A.S. must further enhance its ethical considerations, such as data privacy, security, and the ethical use of automated systems for educational purposes. Similarly, clear policies and guidelines must be implemented to monitor its ethical and responsible use. Discussions among the participants implied the importance of transparency in protecting users' information and responsible use of technology and integration in education. Discussion responses indicate that ensuring ethical considerations are as important as the technical aspects of developing C.R.O.A.S [60].

4. Conclusions

The study aimed to explore the impact of the Class Record Optimization and Automation System (C.R.O.A.S.) on the administrative and instructional processes at the Laboratory Science High School of Romblon State University. By employing a sequential explanatory design, the research integrated quantitative and qualitative methods to provide a comprehensive analysis of C.R.O.A.S.'s effectiveness.

Quantitative Findings: The quantitative phase revealed significant reductions in administrative workloads. Teachers' time spent on class record management decreased from an average of 2.61 hours to 1.17 hours per week, allowing them to reallocate approximately 1.62 hours towards instructional activities and student engagement. Additionally, the efficiency and accuracy of class record management improved substantially, with most teachers rating C.R.O.A.S. highly on both metrics.

Qualitative Insights: The qualitative phase enriched the quantitative findings by providing context and detailed explanations. Interviews with teachers, administrators, and IT personnel highlighted several themes:

1. **User-Centric Design:** The user-friendly interface and automated features of C.R.O.A.S. facilitated smoother transitions and higher acceptance rates among educators.
2. **Strategic Leadership:** Effective leadership strategies, including inclusive decision-making and comprehensive training, were crucial for successful implementation.
3. **Transformation of Educational Practices:** The system allowed teachers to focus more on instructional activities, enhancing the quality of education and student interaction.
4. **Support Systems:** Continuous technical support and user training were vital in addressing challenges and ensuring effective use of the system.
5. **Ethical Considerations:** Concerns about data privacy and security underscored the need for clear policies and guidelines.

Integration of Findings: The integration of quantitative and qualitative data provided a robust understanding of C.R.O.A.S.'s impact. The reduction in administrative workload, coupled with qualitative insights into user experiences, highlighted the system's role in transforming educational practices. Teachers reported that the time saved on administrative tasks was redirected towards more engaging and personalized instructional methods, which likely contributed to better educational outcomes.

5. Recommendations

1. The Laboratory Science High School, with the support of Romblon State University, should commit to continuously refining C.R.O.A.S. This refinement process could be made possible through identifying technical challenges and enhancing user interfaces based on feedback. Establishing robust support systems, including

technical assistance and training programs, will ensure a better user experience and a more inclusive digital competency among teachers using the system.

2. Educational institutions in the MIMAROPA region and other parts of the country should endorse adopting automated class recording systems such as C.R.O.A.S. and other similar technologies. With the success and positive results yielded by implementing C.R.O.A.S. in the Laboratory Science High School, leaders and administrators may share the successful implementation strategies and lessons they learned as benchmarked practices for improved administrative and educational operations.

3. Institutions planning to adopt C.R.O.A.S. must establish clear policies and guidelines to address ethical considerations in technological integration in education. This involves a heightened focus on security, transparency, responsible technology use, and, most importantly, protecting the data of the teachers and administrators through tight data privacy measures.

4. Institutions planning to adopt C.R.O.A.S. must invest more financial, human, and technological resources to pursue research and development, explore more functionalities, and discover more applications of C.R.O.A.S. Leaders must engage in intensive collaboration with developers, experts, and researchers in educational technology to discover innovative solutions on instruction, assessment, and management.

5. Technological integration strategies must be well incorporated in developing new educational policies. This can be done through data and results drawn from research studies such as the adoption of C.R.O.A.S. Policymakers and educational leaders globally can make use of the research findings in this study to highlight the critical roles of leadership, user experience, and ethical considerations in achieving successful integration of C.R.O.A.S. towards more efficient class record management.

6. C.R.O.A.S., on its initial implementation, needs to improve based on the implications of the results of this study. Initially, a separate ranking system for different academic periods is crucial to facilitate clarity in student assessments. Another suggestion is to prevent accidental editing of final grades and use decimal points. Finally, teachers can significantly benefit from improvements in online accessibility and system stability to enhance their overall user experience in teaching and administrative contexts.

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