

## Streamlining Grading Processes: A Study on the Efficacy of Microsoft Excel as a Tool for Minimizing Teacher Workload and Shortening Test Paper Checking Time



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**ABSTRACT:** This research study investigates the effectiveness of Microsoft Excel as a tool for streamlining grading processes in educational institutions. The study examines whether MS Excel can minimize teacher workload or shorten the time required from checking periodical exam, recording of exam's results, accomplishing item analysis, and generating SMEA (School Monitoring, Evaluation, and Adjustment) data particularly the MPS (Mean Percentage Score) results. The research adopts a mixed-methods approach, combining quantitative data analysis and qualitative feedback from participating teachers. The study begins by exploring the current grading practices and challenges faced by teachers in traditional paper-based grading systems. These challenges include time-consuming manual calculations, repetitive data entry, and the potential for errors during the grading process. The hypothesis is that utilizing Excel's features, such as formulas, functions, and automated formatting, can significantly improve the grading workflow. The two-sided p-value is reported as  $<.001$  with 95% confidence interval. Therefore, there is strong evidence to reject the null hypothesis and conclude that there is a significant difference between the Traditional\_Process and ExcelBased\_Process. The results of this study suggest that implementing Microsoft Excel as a grading tool has the potential to streamline grading processes, minimize teacher workload, and shorten test paper checking time, recording scores, accomplishing item analysis, and generating SMEA-MPS results. The findings can inform educational institutions and educators about the benefits of leveraging technology to enhance grading efficiency. Further research can explore additional features of Excel or other software tools that could further optimize grading procedures.

**KEYWORDS:** Streamlining Grading Processes, MS Excel Application, Optical Mark Recognition

### I. INTRODUCTION

Implementing innovations or interventions aimed at assisting teachers in handling their responsibilities more effectively and efficiently provides a great help to the teachers to reduce burden in schools. The objective is to lighten the pressure of excessive workload, scale back on accomplishing paper works, and establish a setting that enables teachers to concentrate on the teaching and learning process of the students. In this connection, streamlining grading processes is really a big help to all educators for it refers to the process of making grading more efficient, effective, and consistent. It involves implementing strategies and using tools to simplify and automate grading tasks, saving time, and reducing the workload for educators while maintaining the integrity and fairness of the grading process.

A research study of Haleem et. al., (2022) highlights the significance of quality education as a fundamental component of the United Nations' sustainable development agenda for 2030. To achieve this goal, digital technologies have emerged as crucial tools. Digital technologies have transformed education from being solely a provider of knowledge to becoming a co-creator of information, a mentor, and an assessor.

Selwyn (2013) explores the impact and implications of digital technologies on education from a global perspective. It aims to inform educators, policymakers, researchers, and anyone interested in the field about the multifaceted nature of technology integration in education and encourages critical thinking in approaching the digital transformation of learning environments. According to Churches (2020) in his research findings which indicates that implementing workload reduction strategies led to a significant reduction in teacher time, improved teacher wellbeing, and maintained or improved pupil attainment and progress. These findings highlight the potential benefits of reducing teacher workload and implementing effective strategies to enhance both teacher and student outcomes.

D.O. 44 s, 2015 aims to improve the three key result areas in basic education: access, quality, and governance. Thus, educators are encouraged to do action research that addresses pressing issues of concern and create innovations to improve certain processes. Under the area of Quality, the collection and recording of evidence of learning is integral for monitoring student learning

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and development. According to D.O. 31 s. 2020, Assessment must be accompanied with timely, constructive, and meaningful feedback. In giving feedback, teachers need to maximize available time and communication options. Consistent with D.O. No. 8, s. 2015, “teachers should ensure that learners receive remediation when they earn raw scores which are consistently below expectation.” One factor that can contribute in providing timely feedback especially after administering quarterly exam or summative assessments is a tool that helps the teacher to fast track the checking of answer sheets that can also generate item analysis result.

## II. LITERATURE REVIEW

Several studies have explored the use of technology in the grading process of multiple-choice exams.

Alomran, M., & Chai, D. (2018) propose a technological solution that can streamline the process of scoring multiple-choice exams and provide quick feedback to students. Their research explored how the system provides quick feedback to students, allowing them to assess their performance and identify areas of improvement with the help of an effective optical mark recognition system to score multiple choice questions.

Similarly, Abbas (2009) explores the development of an automated system for grading multiple-choice questions on paper-based exams. It addresses the challenges faced by educators in manually grading large numbers of multiple-choice exams accurately and efficiently. His research likely involves the design and development of a computer-based system that automates the grading process. It may include aspects such as optical mark recognition (OMR) technology, machine learning algorithms, or other automated techniques to scan and process the answer sheets.

Another group of researchers like Zampirolli et. al., (2013) able to address the need for efficient and accurate methods of grading multiple-choice exams, which traditionally involve manual scoring by teachers, leading to time-consuming and error-prone processes. They propose an automated solution that leverages digital cameras and image processing algorithms to streamline the correction process.

Komney et. al., (2023) successfully developed a mobile software solution for automatically marking optical mark recognition (OMR) sheets used for school objectives or multiple-choice questions. The processing layer responsible for image processing and marking was open-sourced, allowing developers to customize and adapt the models according to their requirements without licensing restrictions. The camera quality of the user's phone was highlighted as a factor influencing the accuracy and precision of the application, with the recommendation of using a phone capable of capturing the small, sharp shapes on OMR sheets.

Meanwhile, the use of Zipgrade software as an assessment tool has been popularly used by the teachers in the Philippines. Estarez et. al., (2023) action research findings highlighted the application's effectiveness in assessing and evaluating student performance, and their respondents expressed a strong recommendation for its use as a convenient method for assessing learning outcomes of the students.

## RESEARCH OBJECTIVES

1. What is the average time to accomplish the tasks from checking of periodical exam, recording of scores, doing item analysis and generating SMEA data like MPS result before and after the conduct of the innovation?
2. Is there a significant difference in the average time to accomplish the tasks from checking of quarterly exam, recording of scores, doing item analysis and generating SMEA data like MPS result before and after the conduct of the innovation?
3. What is the impact of using the MS Excel for auto-scoring multiple-choice exams on the efficiency and time-saving potential for teachers compared to manual grading methods?

## III. METHODOLOGY

### a. Participants and / or other sources of data

The researcher randomly selects 10 teachers from various disciplines and grade levels to participate in the study. They are provided with training on how to leverage Excel's functionalities for grading purposes.

### b. Data Gathering Methods

The research adopts a mixed-methods approach, combining quantitative data analysis and qualitative feedback from participating teachers. Quantitative data is collected to compare the time required for grading using traditional methods versus Excel. Additionally, the accuracy of grading is assessed by comparing the error rates between the two methods. Qualitative feedback is obtained through surveys and interviews to capture the teachers' perceptions of using Excel for grading. The teachers then grade a set of test papers using both traditional methods and Excel-based methods.

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## c. Statistical Treatment

### Quantitative Analysis:

**Descriptive Statistics.** The researcher applied descriptive statistics (e.g., mean, standard deviation, median) for variables related to teacher workload and grading time before and after using Excel.

**Paired-Samples t-test.** The researcher applied a paired-samples t-test to compare the mean workload and grading time before and after implementing Excel. This analysis will assess if there is a significant difference in workload and grading time between the two conditions.

### Qualitative Analysis:

**Coding and Categorization.** The researcher thoroughly analyzed the qualitative feedback from participating teachers. Code and categorize the responses based on themes related to the impact of Excel on workload, grading time, user experience, and overall satisfaction.

## d. Research Instruments

**School MS Office 365 Account.** This will be used as an official account of the server.

**Microsoft Office One Drive.** This will be used as a server and storage of data.

**Microsoft Office Excel.** This will be used a tool for checking periodical exam, recording of scores, generating item analysis and SMEA-MPS result.

**Mobile Phone.** This can be used to capture the answers of the students in their periodical examination.

**Researcher-made answer sheet template.** This will be used by the students in writing their answers in their periodical examination.

**Project START.** An innovation developed by a continuous improvement team of Butuan City Senior High School – Stand Alone through MS Office 365 Excel.

**Interview Questionnaire Guide.** This will be the guide of the researcher for the interview questions.

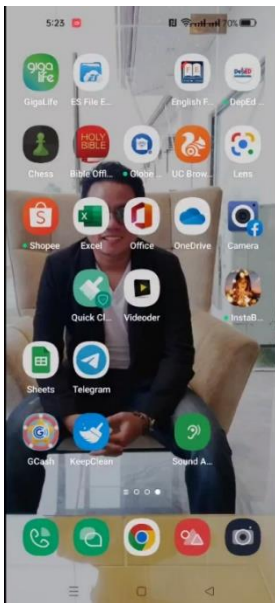
**SPSS(Statistical Package for the Social Sciences, version 29.0.1.0) software.** The statistical data analysis for this research study was performed using the SPSS software.

## Checking Process Flow

The steps of the process in checking test paper are illustrated here with some discussions.

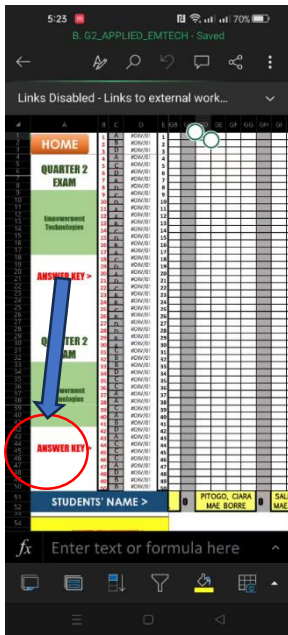
Step 1. Open MS Excel Mobile Application

Step 2. Locate the developed innovation excel file in the OneDrive System

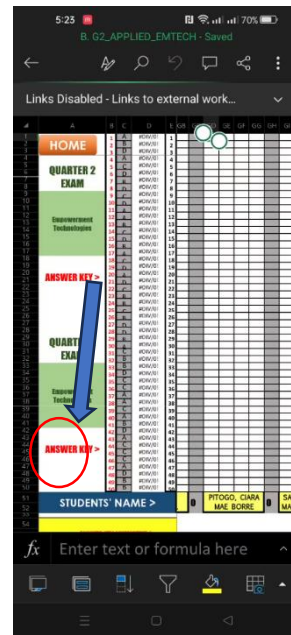


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Step 3. Locate the name of student



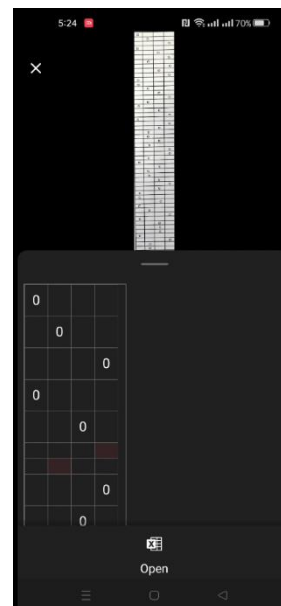
Step 4. Press the camera button of MSExcel App



Step 5. Position the camera ready for capture

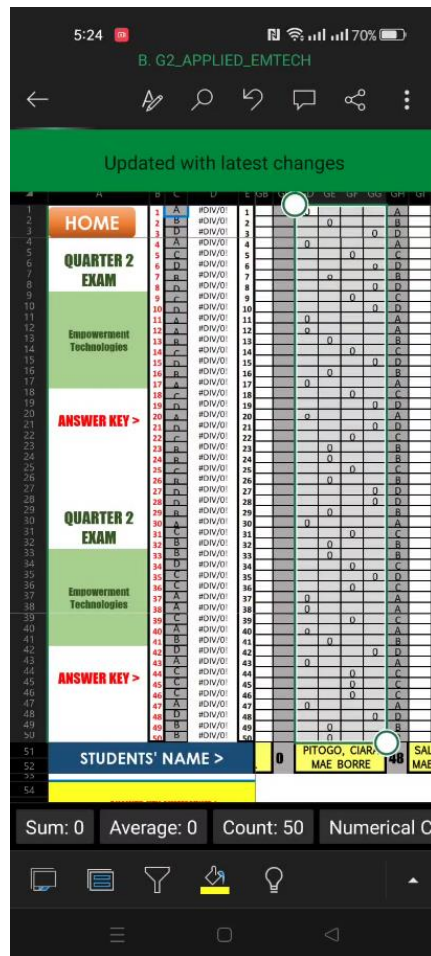


Step 6. Click Open button to store captured data in Excel



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Step 7. Captured data is converted to editable raw data in MS Excel with score of the student



## IV. RESULTS AND DISCUSSION

### a. Findings

1. What is the average time to accomplish the tasks from checking of periodical exam, recording of scores, doing item analysis, and generating SMEA data like MPS result before and after the conduct of the innovation?

**Table 1. Breakdown of average time in terms of minutes to accomplish the tasks from checking periodical exams, recording of scores, accomplishing item analysis, and SMEA-MPS results under traditional process.**

Students	Checking of answered summative assessments	Recording of Test Results	Accomplishing Item Analysis	Generating SMEA-MPS result
Teacher no. 1	48	3	70	8
Teacher no. 2	52	6	75	12
Teacher no. 3	50	4	64	9
Teacher no. 4	46	3	67	12
Teacher no. 5	48	5	69	11
Teacher no. 6	52	4	66	10
Teacher no. 7	50	5	73	8
Teacher no. 8	47	4	68	9
Teacher no. 9	55	5	70	7
Teacher no. 10	49	6	72	11
Average	<b>50 min.</b>	<b>5 min.</b>	<b>69 min.</b>	<b>10 min.</b>

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The table above shows the breakdown of average time in terms of minutes to accomplish the tasks from checking periodical exams, recording of scores, accomplishing item analysis, and SMEA-MPS results under current process, in which on the average it will take 50 minutes for the teacher to finish the checking of answered summative assessment, and 5 minutes for recording of test results and another 69 minutes for accomplishing item analysis, and additional 10 minutes for generating SMEA-MPS results.

**Table 2. Breakdown of average time in terms of minutes to accomplish the tasks from checking periodical exams, recording of scores, accomplishing item analysis, and SMEA-MPS results under the use of MS Excel**

Students	Checking of answered summative assessments	Recording of Test Results	Accomplishing Item Analysis	Generating SMEA-MPS result
Teacher no. 1	33	0	0	0
Teacher no. 2	38	0	0	0
Teacher no. 3	36	0	0	0
Teacher no. 4	35	0	0	0
Teacher no. 5	32	0	0	0
Teacher no. 6	37	0	0	0
Teacher no. 7	34	0	0	0
Teacher no. 8	35	0	0	0
Teacher no. 9	34	0	0	0
Teacher no. 10	32	0	0	0
	<b>35 min.</b>	<b>0 min.</b>	<b>0 min.</b>	<b>0 min.</b>

The table above shows the breakdown of average time in terms of minutes to accomplish the tasks from checking periodical exams, recording of scores, accomplishing item analysis, and SMEA-MPS results under the new process, in which on the average it will take 35 minutes for the teacher to finish the checking of answered summative assessment and zero minute/s for recording of test results, accomplishing item analysis and generating SMEA-MPS result.

2. Is there a significant difference in the average time to accomplish the tasks from checking of quarterly exam, recording of scores, doing item analysis and generating SMEA data like MPS result before and after the conduct of the innovation?

**Table 3. Paired Samples Statistics**

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Traditional_Process	133.30	10	5.73585	1.81384
	ExcelBased_Process	34.60	10	2.01108	0.63596

**Table 4. Paired Samples Test**

Paired Samples Test										
		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	Traditional_Process - ExcelBased_Process	98.700	5.79367	1.83212	94.55545	102.84455	53.872	9	<.001	<.001

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The mean difference between the Traditional\_Process and ExcelBased\_Process is 98.00. This indicates that, on average, the ExcelBased\_Process has a higher value than the Traditional\_Process.

The standard deviation of 5.79367 represents the variability or spread of the observed differences between the paired samples. The standard error of the mean difference is 1.83212. This value indicates the average amount of error in estimating the mean difference between the populations based on the sample. The t-value of 53.872 is a measure of how much the mean difference deviates from zero, relative to the variability within the samples. A larger t-value suggests a more significant difference between the means. The degrees of freedom are 9, which is calculated as the number of pairs of observations minus 1. Degrees of freedom reflect the number of independent pieces of information used to estimate the parameter.

The two-sided p-value is reported as  $<.001$ . This indicates that the probability of observing a difference as extreme as the one observed, assuming the null hypothesis (no difference between the means), is less than 0.001. Therefore, there is strong evidence to reject the null hypothesis and conclude that there is a significant difference between the Traditional\_Process and ExcelBased\_Process.

The 95% confidence interval of the difference provides a range within which we can be reasonably confident that the true population mean difference falls. In this case, the lower value of the confidence interval is 94.55545, and the upper value is 102.84455. This means that, with 95% confidence, we can state that the true mean difference between the Traditional\_Process and ExcelBased\_Process lies between 94.55545 and 102.84455.

### CONCLUSION

To summarize information above, we can conclude that there is a statistically significant difference between the Traditional\_Process and ExcelBased\_Process. The t-value, degrees of freedom, and p-value all support this conclusion. Additionally, the 95% confidence interval of the difference provides a range of plausible values for the true mean difference.

3. What is the impact of using the MS for auto-scoring multiple-choice exams on the efficiency and time-saving potential for teachers compared to manual grading methods?

Using MS Excel for auto-scoring multiple-choice exams offers several positive impacts on teachers in terms of efficiency and time-saving potential compared to manual grading methods. Here are some key advantages:

1. Swift and Automated Grading: MS Excel's auto-scoring feature allows teachers to automate the grading process for multiple-choice exams. By simply inputting the answer key, the software can instantly calculate and assign scores to each student's exam. This eliminates the need for manual tallying and speeds up the grading process significantly.

2. Consistency and Accuracy: Manual grading can be prone to human error and inconsistencies. However, MS Excel's auto-scoring feature ensures consistent and accurate grading across all student responses. Teachers can have confidence in the reliability of the scores generated by the software, reducing the risk of grading mistakes and ensuring fair assessment.

3. Time Efficiency: With MS Excel's auto-scoring, teachers can save substantial time and effort compared to manual grading methods. The software handles the bulk of the grading work, allowing teachers to allocate their time to other critical tasks such as providing personalized feedback, designing engaging lessons, or focusing on individual student needs. This helps enhance overall instructional efficiency.

4. Immediate Feedback: Auto-scoring in MS Excel enables teachers to provide prompt feedback to students. As soon as the exams are scored, teachers can share individual results, identifying correct and incorrect answers, along with explanations. Immediate feedback facilitates timely intervention and student progress monitoring, fostering a more responsive and effective learning environment.

5. Data Analysis and Insights: MS Excel provides powerful data analysis capabilities for multiple-choice exams. Teachers can analyze student performance at both the individual and class levels, identify common areas of weakness, and adjust teaching strategies accordingly. By leveraging the data generated through auto-scoring, teachers can make informed instructional decisions to improve learning outcomes.

6. Enhanced Record-Keeping: MS Excel facilitates efficient record-keeping of student scores and exam data. Teachers can easily organize and maintain electronic records, ensuring easy retrieval and access to past assessments. This enables efficient tracking of student progress over time and simplifies the reporting process during parent-teacher conferences or end-of-term evaluations.

In conclusion, utilizing MS Excel for auto-scoring multiple-choice exams offers significant advantages to teachers in terms of efficiency and time-saving potential. It enables swift and accurate grading, provides immediate feedback to students, facilitates data analysis for instructional decision-making, and enhances overall record-keeping. These benefits contribute to streamlined assessment processes and allow teachers to focus more on personalized instruction and student support.

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## RECOMMENDATIONS

Building upon the success and effectiveness of this research project, the following recommendations have been developed to guide the implementation and dissemination of the findings. These recommendations aim to empower educators, enhance collaboration, and encourage the adoption of streamlined grading processes within our educational institution.

1. Disseminate the Findings: Share the research findings and outcomes with other teachers, educators, and administrators within your school or district. Prepare a concise report or presentation summarizing the key points, benefits, and evidence of the effectiveness of using Microsoft Excel for grading. Highlight the time saved, reduction in workload, and improved accuracy achieved through the implementation.

2. Conduct Training Workshops: Organize training workshops or professional development sessions for teachers to familiarize them with the Excel grading process. Provide hands-on training, demonstrations, and step-by-step guidelines on using Excel efficiently for grading. Encourage teachers to ask questions and share their experiences to foster a collaborative learning environment.

3. Collaborate with IT Support: Establish a collaboration with the IT support team within your school or district. They can provide assistance with technical issues, troubleshoot problems, and offer guidance on utilizing Excel's advanced features for grading purposes. Ensure that teachers have access to the necessary resources, templates, and Excel macros to enhance their grading process.

4. Create a Resource Bank: Build a repository of resources related to Excel grading, including templates, sample spreadsheets, and video tutorials. Make these resources readily available to all teachers, either through a shared network drive, a dedicated website, or a Learning Resources Management and Development System (LRMDS). Encourage teachers to contribute their own resources and share best practices for maximizing efficiency.

5. Monitor and Evaluate: Continuously monitor and evaluate the implementation of Excel grading in your school or district. Gather feedback from teachers about their experiences, challenges faced, and suggestions for improvement. Periodically assess the impact of streamlining grading processes on teacher workload, student performance, and overall satisfaction. Use this feedback to refine and adjust the approach as necessary.

6. Share Success Stories: Encourage teachers who have successfully implemented Excel grading to share their experiences and success stories with their colleagues. Create a platform, such as a newsletter or a teacher-led workshop, where educators can showcase their innovative practices, share tips, and inspire others to adopt efficient grading methods.

7. Explore Additional Tools and Technologies: While Microsoft Excel is a powerful tool for grading, consider exploring other technological solutions that can further streamline and automate grading processes. Investigate grading software, online platforms, or learning management systems that integrate with Excel or provide more advanced features for assessment and feedback. Stay updated on emerging technologies that can enhance the efficiency of grading tasks.

Remember that the success of implementing Excel grading relies on continuous support, collaboration, and sharing of knowledge among teachers. By implementing these recommendations, you can help maximize the benefits of streamlined grading processes, reduce teacher workload, and improve overall efficiency in your educational institution.

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