

# Performance Mapping Of Optical Mark Recognition (Omr) Machines In The Division Of Batangas City: Basis For Program Enhancement

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**Abstract:** This study aimed to determine the performance mapping of OMR machines in terms of usage, advantages and disadvantages and map the results of the seven machines, compare the results done by the teacher manually in order to recommend a program on the utilization of the OMR to uplift the performance of the students different schools of the division of Batangas City. The study used qualitative design using descriptive-thematic synthesis and quantitative using correlation of statistics results. Purposive sampling was utilized in choosing seven (7) participants from seven (7) schools with OMR machines in the Division of Batangas City. A total of seven (7) OMR machines were used to map the performance, seven (7) teacher- operators were interviewed in gathering data. The statistical tools used were frequency mean and t-test. The study revealed that OMR machine is useful in data scanning scannable answer sheets of students quarter examinations, it gives quick and accurate assessment results but enable to process thin paper, and improper shading, and sometimes experienced technical problem just like any other machines. Meanwhile, all the seven (7) machines tested generated exactly the same results for a specific examination sample in mathematics. Further results shows that there is no significant difference between the results taken from the OMR machines and teacher's computed results. Thus, the proposed program maybe used to enhance the utilization of OMR machines in the division and uplift students achievement. The results of this study may remove the doubt of the users and the division personnel on the reliability and validity of the data scanned by the machines. Thus, the results may be used to plan and implement a more comprehensive program in order to raise the achievement of the learners within the division.

**Keywords:** Performance, performance mapping, performance mapping of OMR machines, Optical Machine Recognition, OMR Performance.

## 1. Introduction

Classroom assessment techniques reflect pedagogy, measure the application of both new knowledge and course objectives, as well as identify learning outcomes. It is an integral part of curriculum implementation. Also, it allows the teachers to track and measure learners' progress and to adjust instruction accordingly. In addition, it informs the learners, as well as their parents and guardians of their progress (DO 8,s,2015). In schools, the most visible assessments are summative. Summative assessments are used to measure what students have learnt at the end of a unit, to promote students, to ensure they have met required standards on the way to earning certification for school completion or to enter certain occupations, or as a method for selecting students for entry into further education. Moreover, assessment may also serve a formative function. In classrooms, formative assessment refers to frequent, interactive assessments of student progress and understanding to identify learning needs and adjust teaching appropriately. Teachers using formative assessment approaches and techniques are better prepared to meet diverse students' needs – through differentiation and adaptation of teaching to raise levels of student achievement and to achieve a greater equity of student outcomes. Therefore, gathering data from summative and formative assessments is an important aspect of education in order to assess student knowledge and skills, as well as other information like student health and behaviors. The teachers and administrators must be able to gather, analyze and interpret data both in the K-12 and higher education institutions. Analyzing data gives schools a competitive edge by allowing administrators to proactively create curriculum and policies that meet the needs of the student body. If schools can gather accurate data in a timely

manner, that data can become a powerful tool for improving the quality of education they provide. One way to gather accurate data quickly, is the use of a multiple-choice questions. According to Jose Antonio Catalan (2017) educators both in K to 12 and higher education institutions have long used multiple-choice questions in assessing student performance. Designed properly, MCQ exams can be very effective and can be scored rapidly allowing quick feedback to students. Because of this, the Division of Batangas City through its local government acquired 10 Optical Mark Recognition (OMR) technology amounting almost 12 million in 2015 which intelligently reads multiple-choice questions, check boxes or filled-in bubbles on documents and converts the results into meaningful data. With OMR automation tools, extracting data from exams and surveys is a simple process that helps get schools well on their way to accurate and useful data analysis. OMR technology makes multiple-choice test grading a quick and painless process. A great benefit is that teachers have to use a specific type of form for the software to extract the information. This machine detects the presence or absence of a mark in a specific position. (Wikipedia) Many traditional OMR devices work with a dedicated scanner device that shines a beam of light onto the form paper. The contrasting reflectivity at predetermined positions on a page is then used to detect these marked areas because they reflect less light than the blank areas of the paper. Many of today's OMR applications involve people filling in specialized forms. These forms are optimized for computer scanning, with careful registration in the printing, and careful design so that ambiguity is reduced to the minimum possible. Due to its extremely low error rate, low cost and ease-of-use, thus, OMR is a popular method of tallying votes. As part of an

educational institution, the Deped advocate a culture of evaluation that refers to the development of a shared language regarding the goals of learning and teaching, as well as a shared understanding of the purposes of evaluation in meeting these goals. Thus, the system is examining how teachers and school leaders create or strengthen cultures of evaluation within their schools using a high technology machine in assessing the results of the performances of the students through their quarter examinations. In view of this, it was found out that some school and division personnel claimed that the assessment results conducted manually by teachers have a big difference from the results taken from the machines. It was in this context that the study was deemed significant. Primarily, this study aimed to describe the performance mapping of OMR machines of different schools in the division of Batangas City and compare these machine-generated results with those done manually by teachers in order to recommend a program on the utilization of the OMR.

**Objectives of the Study**

This study aims to determine the performance mapping of optical mark recognition (OMR) machines in terms of usage, advantages and disadvantages. Determine the performance mapping of seven (7) OMR machines and find out the significant difference between the summary of statistics taken from OMR machines and teacher’s computed summary of statistics in order to propose a program on the utilization of the OMR and uplift the performance of the students.

**Result and Discussion**

**1. Performance of Optical Mark Reader**

*Table 1 Performance of Optical Mark Reader (OMR) Machines N=7*

Domain	Themes	Significant Statements	Freq uency
A. Description of OMR machines in terms of usage	Used in checking scannable answer sheets during quarter examination	Eto scan roll machine nag sscan ng data ng results ng test Nagtetsek ng results ng assessment test Ginagamit sa pagtsek ng periodical test ng mga bata every quarter Ginagamit sa tseking ng results ng quarter exam Ang gamit ng scanroll machine ay sa pagtsetsek at naglalabas ng statistical results ng test ng mga bata. Ang mamahaling makina ay nagtsetsek ng answer sheets ng mga mag-aaral tuwing quarter exam.  Mabilis na nagtsetsek ng resulta ng exam tuwing quarter exam ng mga bata sa aming paaralan.	7

The table 1.1 reveals that the key informants describe the optical mark reader (OMR) machines as useful for checking scannable answer sheets specifically during quarter examinations. They further claimed that these OMRs are dependably capable of checking the said periodical and quarterly tests. According to Catalan (20170 Optical Mark Recognition ( OMR) is the process of capturing human marked data from document forms such as surveys and tests. This technique is widely used in various applications like exam evaluation, automated attendance marking, voting and community surveys etc. Pencil or pen marks made in predefined positions on paper forms as responses to questions or tick list prompts can be read by the reader. These marks are digitally entered into a computer for further analysis. OMR is very useful when data is to be collected from a large number of sources simultaneously and a large volume of data must be collected and processed in a short period of time. Optical Mark Recognition is the technique used to scan a marked paper to detect the presence or absence of the mark in a predetermined position.

*Table 2 Performance of Optical Mark Reader (OMR) Machines N=7*

Domain	Themes	Significant Statements	Frequency
B. Advantages of OMR machines	Quick assessment results	Mabilis, at napakadali ng retrieval ng results, ang mga computation ng test analysis ay napakadali Sa pagtsetsek na mabilisan ng lahat ng answer sheet ng bawat distrito Mabilis lumabas ang results lalo na ang item analysis. Mabilis makuha ang consolidated results ng assessment gaya ng item analysis,mean, standard deviation	5
	Accurate results	Madali pong matsekan ang mga papel at mabilis makuha ang data Dahil eto nga po ay computerized accurate po talaga ang results Sure na accurate ang macine ,at hindi eto pwede dayain ang results ng mga guro,sapagkat kung ano iinput dito ay sya lang babasahin nito	2

It is evident on the table that the key informants claimed the quick and accurate assessment results for periodical and quarterly examinations through the utilization of OMR machine as its advantages. In fact, they find it convenient to use especially in terms of the machine’s ability to compute for the test or item analysis, mean and standard deviation which used to be a tedious process in the past. Invariably, data about the results can be readily and instantly available not only for individual schools, but also for clustered districts. This is supported by the study of Kailash (2013) that the most obvious advantage of using optical mark recognition technology to collect data from documents is speed. Without OMR, each document must be visually read by a human being, who transfers that data into a computer system by hand. Although trained individuals can become efficient at analyzing and entering data from forms, there is a physical upper limit to how quickly a human being can perform the task. With OMR, documents are scanned and inputted at several times the speed achievable by a human being. In addition, the OMR machine guarantees accurate

results since as the informants emphasized, manipulation of data results cannot be executed here for whatever information is fed into it, is what will be processed. Thus, no manual intervention can be performed during the entire course of the procedure. This is what the informants made certain about.

**Table 3 Performance of Optical Mark Reader (OMR) Machines N=6**

Domain	Themes	Significant Statements	Frequency
C. Disadvantages of OMR machines	Inability to process thin paper, and improper shading	Depende sa paper na ginagamit, kapag manipis po ayaw nya basahin Ang results ay hindi reliable sapagkat hindi maayos ang pagkakashade ng mga bata pero naggawan namn po ng paraan sapagkat naiidentify ang item na hindi gaanong maayos ang pagkkashade at si teacher ang nagsshade po ng ayos. Kapag may tupi o punit hindi rin po binabasa ng machine ang bar code yon ang problema, kaya po ang mga guro dalawa ang pinasasagutan, isa sa scanable answer sheet, at ang isa po sa intermediate paper. Kapag hindi po nashade ng ayos at malabo hindi po talaga binabasa ng machine.	5
	Technical problem/ Accuracy depends on shading	Minsan kung natupi o madumi ang papel hindi na eto binabasa ng machine Ang disadvantages po ay purely technical, halimabawa nag overheat ang machine hindi eto gagana ng maayos. Ang accuracy ay nakadepende sa shading nga mga bata sa kanilang answer sheet	1
			1

The table above illustrates the disadvantages of the OMR machines which primarily include its inability to process thin paper and improper shading. Hence full shading or 100 percent threshold of shaded items is fundamental for students' answers to be recognized. In such cases however, the teacher attends to the items not recognized by the machine due to shallow or improper shading by making the shading complete or darker. Likewise, once the answer sheet is folded or torn even partly, it will not anymore be read by the machine. In turn, the teacher instructs the students to secure two answer sheets, that is, one scannable answer sheet and one intermediate pad paper. The results was supported by the study conducted by Divya Patel et.,al. (2016). It was revealed problems with the OMR technique, according to their study it cannot process thin papers and low printing precision answer sheets. This paper analysis a new technique that overcomes the limitation of OMR process. It scans the hard copies of papers which are designed and marked in a specific format and saves that scanned copy in JPEG format, then identifies the responses marked from the JPEG image and stores the result in a database. Errors and their solutions which could creep in due to scaling, rotation, translation of the scanned copy are also presented. According to Hussien (2016) There are also

some disadvantages and limitations to OMR. If the user wants to gather large amounts of text, then OMR complicates the data collection. There is also the possibility of missing data in the scanning process, and incorrectly or unnumbered pages can lead to their being scanned in the wrong order. Also, unless safeguards are in place, a page could be rescanned, providing duplicate data and skewing the data. Nonetheless, the informants mentioned that the disadvantages of the machine are purely technical; overheating for instance can cause deficiency on its function. Lastly, the accuracy of the machine depends on the students' shading of the items on the answer sheet which is considerably not a total disadvantage at all since the teacher may intervene by guiding the students during the examination on the proper way of shading their answers.

**2. Performance mapping of the OMR Machines**

**Table 4 Performance Mapping of Seven OMR Machines**

Summary Statistics	Machine 1	Machine 2	Machine 3	Machine 4	Machine 5	Machine 6	Machine 7	Average
Number of Items	50	50	50	50	50	50	50	50
Mean	28.10	28.10	28.10	28.10	28.10	28.10	28.10	28.10
Standard Deviation	4.51	4.51	4.51	4.51	4.51	4.51	4.51	4.51
Mean%	56.21	56.21	56.21	56.21	56.21	56.21	56.21	56.21
Lowest	18	18	18	18	18	18	18	18
Highest	40	40	40	40	40	40	40	40
Median	29	29	29	29	29	29	29	29
Variance	20.37	20.37	20.37	20.37	20.37	20.37	20.37	20.37
Skewness	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Kurtosis	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47

It is clear on the table that all the six machines tested generated exactly the same results for a specific examination sample in mathematics. Thus all of these machines have parallel performance which indicates that all of them produce accurate results. In view of this, the claims of the key informants in the interview conducted are According to Hamad (2016 ), OMR technology is particularly useful for applications in which large numbers of hand-filled forms need to be processed quickly and with a great degree of accuracy. This paper proposed OMR .The proposed method was to detect more than one or no selected choice. Among 800 test samples with 8 types of grid answer sheets and total 58000 questions, the system exhibits an accuracy is 99.96% in the recognition of marked, thus making it suitable for real world applications. The actual error was caused by some pale marks form input. And the proposed method also able to detect more than one or no selected choice. hereby evidently justified.

## 2. Comparison between the results taken from the machines and the teacher's computed results

**Table 5** Summary of Statistics Taken from the OMR Machines and Teacher's Computed results

Summary Statistics	OMR Average Summary of Statistics	Teachers' Computed Summary of Statistics
Number of Items	50	50
Mean	28.10	27.79
Standard Deviation	4.51	4.91
Mean%	56.21	55.58
Lowest	18	18
Highest	40	40
Median	29	29
Variance	20.37	24.16
Skewness	0.21	0.26
Kurtosis	0.47	0.11

The table shows the minimal difference between the OMR machine's average summary of statistics and teacher's computed summary of statistics. This indicates that there is a very slight variation between the two results which proves the accuracy and reliability of the OMR machines.

## 3. Difference on the assessment results taken from the OMR machines and teacher's computed results

**Table 6** Significant Difference Between the Assessment Results Taken From the OMR and Teacher's Computed Results

Variable	Computed t-value	tt	Degree of freedom	Decision
OMR average summary of statistics and Teacher's computed summary of statistics	0.0332	2.101	18	Accept Ho

It can be gleaned from the table above that when the OMR average summary of statistics and teachers computed summary of statistics were compared, the  $t_c=0.0332$  was less than the  $t_t=2.101$  at 18 degrees of freedom. Therefore the null hypothesis was accepted which means that there is no significant difference on the OMR average summary of statistics and the teacher's computed summary of statistics. Both methods may therefore be used to assess and evaluate the students' test results.

## 3. Proposed Program for the enhancement of the utilization of OMR machines

**Table 7** Proposer Program to Enhance the Utilization of OMR Machines

Objectives	Program/Activities	Persons Involved	Time Frame	Expected Outcome
Enhance teachers' skills in test construction, administration and interpretation of data gathered	Seminar/Workshop/SLAC/ In-Set <ul style="list-style-type: none"> <li>Writing Memoranda</li> <li>Preparation of Venue</li> <li>Seminar /SLAC Proper</li> </ul>	School Heads Teachers Guest Speakers	To be scheduled based on availability	Teachers enhanced assessment competencies in implementing K-12 BEP
Utilize the statistical summary results of OMR to develop a more valid standardized summative tests in the division	Conference/Test Construction Workshop <ul style="list-style-type: none"> <li>Information Dissemination</li> <li>Preparation of Venue</li> <li>Conference Proper</li> <li>Meetings</li> <li>Designation of task</li> <li>Test construction workshop</li> <li>Piloting</li> <li>Administration of test constructed to a group of students</li> <li>Validation of test using OMR</li> </ul>	EPSVR's, PSDS, School Heads Teachers  Students Parents	To be scheduled based on availability	Valid standardized summative tests in the division were developed
Develop a software to monitor the implementation of remedial program for the identified least masters skills by the students in each subject in enhancing the to uplift the achievement of students	Development of Software that would identify and monitor student performance on identified least mastered skills <ul style="list-style-type: none"> <li>Planning</li> <li>Development of Software</li> </ul> Remedial Program <ul style="list-style-type: none"> <li>Meeting</li> <li>Implementation of remedial instruction</li> </ul> Monitoring and Evaluation using the developed software	Division ICT personal  EPSVR's, PSDS, School Heads, Teachers, Students EPSVR's, PSDS, School Heads, Teachers	To be scheduled based on availability	Remedial program monitored and evaluated using software developed  Improved student performance specifically on the identified least mastered skills

## Conclusions

1. OMR machine is useful in data scanning/checking scannable answer sheets of students quarter examination, it gives quick and accurate assessment results but enable to process thin paper, and improper shading, and sometimes experienced technical problem just like any other machine.
2. All the seven 7 machines tested generated exactly the same results for a specific examination sample in mathematics.
3. There is no significant difference between the assessment results taken from the OMR and teacher's computed results.
4. The proposed program maybe implemented to enhance the utilization of OMR machines in the district.

## Recommendation

1. Teachers may continue the utilization of OMR machines in scanning the results of the test and must instruct their students properly on how to utilize the scannable answersheet to avoid error recognition of machines ,however, there must be a regular calibration of machines in order to ensure the reliability and validity of the results.
2. The summary of statistical results may be used to plan an action in the conduct of intervention program for an identified least learned skills and raise the mastery level level of students in each subject.
3. Constructed test in every subject may be validated using OMR before its distribution in different schools.
4. Information Communication Technology technician of the division may devise a software that can be used by both teachers and instructional supervisor personnel in tracking the implementation of intervention program for the upliftment of least mastered skills
5. Instructional supervisor personnel maybe provided with a software in order to monitor and evaluate the progress made in the conduct of teachers intervention program to ensure the achievement of goals.

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## Author's Profile



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