

Science ATM (Attendance and Test Monitoring) Card: A Motivational Tool in Teaching Science 8

Cincy Merly Belaro - Gecolea

Calamba Bayside Integrated School, Schools Division of Calamba City, Philippines

Running head: Science Attendance and Test Monitoring (ATM) Card

Abstract: *This study aimed to determine the effects of Science ATM (Attendance and Test Monitoring) Card on the performance of Grade 8 students of Calamba Bayside Integrated School in Science. Quasi- experimental, particularly the non-equivalent dependent variable was utilized in the study to determine the effectiveness of Science ATM Card as a motivational tool in teaching Science. The study also used mixed method which includes both qualitative and quantitative analyses. For two consecutive years, results of the study show that there is a significant difference in the achievement of students before and after the used of Science ATM Card in teaching and learning Science 8. The use of the motivational tool boosts the interest of the students. It encouraged students to regularly attend classes. A sense of fulfillment was obviously seen from the students. They were able to show ownership of the cards. The study is limited only to Grade 8 students enrolled on School Year 2016 - 2017 and School Year 2017 - 2018 and their Science teacher. Total enumeration was used as a sampling method. It is recommended that Science ATM Card be used in all academic subjects to help students developed intrinsic motivation in learning. Teachers, on the other hand are encouraged to use the card in order to monitor the attendance of the students.*

Keywords: attendance, monitoring card, motivational tool, test

1. Introduction

“You’re a teacher. Grow, learn, transform yourself, or die by ossification.

If you’re afraid to try new teaching techniques, you are petrifying yourself to death”

- Chris Biffle

Poor student achievement is often attributed to lack of motivation and rewards are given in an attempt to increase that vital student’s motivation. Students learning science are very often unmotivated because they find it difficult most specifically in terms of numbers and familiarization of some scientific terminologies. Some students cannot score good results in Science because they are lack of motivations that will push them in learning this subject. However, when rewards are given, they often have the positive effect of what was intended.

Similarly, students nowadays lack motivation in studying because there are so many distractions around them such as gadgets, social media and video games. There are some students who even commit frequent absences in order to suffice the desire for computer games. Most teachers observed that those who are frequently absent are those who incurred low and even failing grades by the end of the quarter. This statement is a clear proof that the academic standing of student is affected by his/her attendance in the school. Because of these statements, there is really a need to encourage students to value the importance of learning by motivating them to regularly come to school and do their best to perform academically.

In addition, teachers are now faced with the problem of achieving effective teaching that would result to a low performance of students in both internal and external examinations. It has been observed that among the factors that influence the achievement of learners, teachers’

effectiveness as measured through the acquisition and use of good instructional skills and methodologies appear very prominent.

The method used in teaching by a teacher is very important as this affects the interest of the students in the subject. Supporting this, Emaikwu (2012) reported that teaching method affects the response of students and determines whether they are interested, motivated and involved in a lesson in such a way as to engage in learning.

2. Concept of Motivation

Motivation refers to reasons that underlie behavior that is characterized by willingness and volition (Lai, 2011). Similarly, Guay, et. al., (2010) defined motivation as the reasons underlying behavior. Motivation was regarded by experienced and inexperienced teachers’ alike as a prerequisite for effective learning and the greatest challenge for teachers is to make students want to learn (Odera, 2011). In the study conducted by Glynn and Koballa (2006), they identified six components of motivation. These components include the following: intrinsic motivation, extrinsic motivation, relevance of the task to personal goals, self-determination, self-efficacy and assessment anxiety. A wide range of literature discusses these different motivational components.

According to Yahaya, et. al., (2010), teachers do make a difference to motivate students in learning even though teachers are not as powerful as parents because parents are the first teachers to a baby since it was born. However, teachers can make school life miserable or appealing by filled the classroom with excitement and hope. Their study also revealed extrinsic motivational factors in learning mathematics among students in secondary school in Negeri Sembilan. Despite of the methodological limitations and nature of the instrument used in the study, results show that

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there are existing relationships among all the five extrinsic motivational factors and students' academic performances in learning Mathematics. All extrinsic motivational factors were found to be significant to students in learning Mathematics and found to have relationship with the students' academic performances most dominantly peer-group.

Additionally, extrinsic rewards hold value in increasing some students desire to succeed in the classroom. They perform better not just the idea of getting "prizes" for good behavior, but they need to work for something that matters to them in order to build motivation. What appealed to one student did not matter to another, so by giving them a variety of choices in what they would be working towards, students will be working harder to get what they specifically desired (Tybus, 2010).

Since motivation is essential in teaching - learning process, the proponents developed a tool in order to motivate the students to regularly attend classes and at the same time increase their academic performance. This study was conducted in order to determine the effects of Science ATM Card as a motivational tool in teaching and learning Science. This motivational tool used Quick Response (QR) Codes in order to monitor the attendance of the students. The researchers used the free mobile application which is known as the Scan Attendance Manager (SAM).

3. Quick Response (QR) Codes

Recent advancement in technologies has introduced the use of Quick Response (QR) codes in attendance system. QR Codes consist of black modules arranged in a square pattern on a white background. They are designed to decode the data quickly. It is quite easy to create and use these codes (Pons, 2011). Using QR Codes for education is another way of using the Internet. Quick Response (QR) codes are versatile. A piece of long multilingual text, a linked Uniform Resource Locator (URL), an automated Short Message Service (SMS) message, a business card or almost any information can be embedded into the two - dimensional barcode. With moderate equipped mobile devices, QR Codes can connect users to the information quickly and easily (Law, So and 蘇永華, 2010).

QR codes are used in a wide range of areas like media, street banners, all places leading to web sites, music, video and social networks (Arslan, 2011). According to Walsh (2011), some of the beneficial uses of QR codes include bridging printed materials to electronic materials, reaching voiced materials, opening embedded videos, providing libraries with external resources and reaching appropriate help.

Most foreign countries are already using QR codes in education. In the Philippines, the use of QR codes in education is not yet recognize due to limited knowledge regarding development of own mobile system. However, there are already free online applications that can be downloaded in order to facilitate automation of attendance system. In the present study, the researchers used the Scan Attendance Manager (SAM) mobile application which is a

free software application from the System Maintenance subcategory that is part of the System Utilities category.

4. Research Questions

This study aims to determine the effects of Science ATM Card as a motivational tool in teaching and learning Science for two consecutive school years.

Specifically, the study sought to answer the following specific questions:

- 1) What are the pre-test and post-test results of the experimental group for School Year 2016-2017 and School Year 2017-2018?
- 2) Is there a significant difference between the pre-test and post-test results of the experimental group?
- 3) What is the impact of Science ATM Card to the performance of the students for School Year 2016-2017 and School Year 2017-2018 in terms of:
 - a) Quarterly examination; and
 - b) Attendance?
- 4) How does Science ATM Card motivate students to learn?
- 5) Based on the results of the study, what action plan can be offered to enrich the utilization of the ATM card as a motivational tool and eventually increase the performance of the students?

5. Methods

5.1 Research Design

The researchers used quasi-experimental approach particularly the non-equivalent dependent variable as the research design. According to Calmorin and Calmorin (2007), experimental approach represents principle of research known as the method of difference. This means that the effect of a single variable applied to one situation can be assessed and the difference can be determined. The research deals with the available data and their specific aspects in the learning setting. The study also utilized mixed method which includes both qualitative and quantitative analyses.

5.2 Sampling

The participants of the study were the Grade 8 students enrolled on School Year 2016 - 2017 and School Year 2017 - 2018 and their Science teacher. Total enumeration was used as a sampling method.

5.3 Data Collection

The main instrument used in the study was a self - made test questionnaire that determined the performance of the students on pre - test and post - test. This self - made questionnaire was submitted to the Head Teacher and Master Teacher for validation.

Before the implementation of this action research, the researchers asked first the permission of the Department Head of Science and the approval of the school principal. The ATM Card was made during the summer vacation after the distribution of class list to the teachers since the card will be personalized. The name of the students was placed in the

card and each student was given different card number in order to avoid exchange of cards. Mechanics as to how the card was used was also prepared. It was also submitted to the Head Teacher of Science for checking and approval.

Thereafter, the pre - test was conducted on the first regular session of Science subject while the post - test was conducted at the end of first grading period. At the middle of the first grading period, the researchers prepared a progress report. The report contained the results of the pre - test, the output of day - to - day activities and the observed difficulties that were experienced by the students in learning every lesson.

Then, after the weeks of implementation, the researchers conducted focus group discussions in order to know the insights of the students about the motivational tool used in teaching and learning Science.

Focus group discussions were held in the teacher - researcher's classroom. In the first phase of the interview, the participants were informed about the aim of the research. They were also informed about the topic. They were asked for their concern and informed that the interview would be recorded and the recording won't be used for any other purposes.

After the first grading period and the conduct of the post - test the researchers applied statistical treatment to determine the significant difference on the performance of the students in Science based on the results of pre - test and post - test. The final analysis of the class standing was also prepared. The observed difficulties in learning Science were consolidated and carefully given proper analyses.

All of the above cited outputs, together with the summary of findings, conclusions and recommendations were presented to the Department Head and submitted to the school principal.

5.4 Data Analysis

In the first phase of the study, quasi- experimental, particularly the non-equivalent dependent variable was utilized. The data were gathered, processed and analyzed for a systematic presentation in the form of tables. The statistical tools used in the interpretation of data were the mean and paired t-test. Mean was used to determine the academic performance level of the students while paired t-test was used to know if there is a significant difference between the pre - test and post - test academic performance level. The level of significance (α) was set to 0.05 level of confidence.

In the second phase – the qualitative part, thematic and descriptive analyses were used. Thematic analysis was used to identify, analyze and report patterns within the data. On the other hand, descriptive analysis summarized the data according to previously - set themes. For the purpose of emphasizing the views, direct quotations are frequently used (Yildirim and Simsek, 2008).

6. Results and Discussion

The results discussed in this study include the pre - test and post - test of the experiment, results of the quarterly examinations, monthly attendance and the overall results of the focus group discussions pertaining to motivation. The following figures and tables show the specifics of the results.

Pre - test and Post - test Results of the Experimental Group

Table 1: Results of Pre - test and Post - test of the Experimental Group, School Year 2016 - 2017

Experimental Group	Pre - Test	Post - Est
Mean (x)	19.44	27.69
Standard Deviation (SD)	1.72	1.06

Table 1 shows the pre - test and post - test results of the students. Findings revealed that the performance level of the students in pre - test is at the developing level ($x = 19.44$; $SD = 1.72$) while the post - test shows that the students are already at the approaching proficiency level ($x = 27.69$; $SD = 1.06$).

Table 2: Results of Pre - test and Post - test of the Experimental Group, School Year 2017 - 2018

Experimental Group	Pre - Test	Post - Test
Mean (x)	14.64	21.63
Standard Deviation (SD)	2.16	1.28

Table 2 indicates the pre - test and post - test results of the students. The performance level of the students in pre - test is at the developing level ($x = 14.64$; $SD = 2.16$) while the post - test shows that the students are already at the approaching proficiency level ($x = 21.63$; $SD = 1.28$).

Difference between the Pre - test and Post - test Results of the Experimental Group

Table 3 displays the statistical analysis of the pre-test and post - test results of the Grade 8 students in Science. Results show a significant difference between the tests where the MPS increased from 38.88% to 55.38%. The calculated t - value of 26.46 also exceeded the critical value of 1.99. This manifests that there is a significant difference in the achievement of students before and after the use of Science ATM Card as motivational tool in teaching Science.

Table 3: Test of Difference in the Results of Pre - test and Post - test, School Year 2016 – 2017

Parameters	Experimental Group	
	Pre - Test	Post - Test
Mean (x)	19.44	27.69
Mean Percentage Score (MPS)	38.88%	55.38%
Standard Deviation (SD)	1.72	1.06
Number of Students (n)	42	42
P _{value}	0.001	
t _{value}	26.46	
critical value	1.99	
Conclusion	Significantly different at 5% level of significance.	

Similarly, table 4 shows the statistical analysis of the pre-test and post-test results of the Grade 8 students in Science. It shows a significant difference in the results of the tests where the MPS increased from 29.28% to 43.26%.

Table 4: Test of Difference in the Results of Pre - test and Post - test, School Year 2017 – 2018

Parameters	Experimental Group	
	Pre - Test	Post - Test
Mean (x)	14.64	21.63
Mean Percentage Score (MPS)	29.28%	43.26%
Standard Deviation (SD)	2.16	1.28
Number of Students (n)	46	46
Pvalue	0.001	
t _{value}	18.88	
critical value	1.99	
Conclusion	Significantly different at 5% level of significance.	

The study of Liang (2013) supported the present study stating that the implementing reward systems in the classroom can prove to be an effective teaching tool, as long as teachers are thoughtful and reflective in designing their

reward structure with elements of competence and autonomy in mind. It plays an important role with respect to effective students' learning and productivity.

Also, setting right tone and instilling an eagerness to learn within students should be among the top priorities for teachers. If students are motivated to learn, the rest will take care of itself because motivation leads to perseverance which breeds success.

Impact of the Science ATM Card to the Students' Performance in the Quarterly Examinations and Attendance

Figure 1 confirms that the use of Science ATM Card has improved the academic performance of the students. The increase in the MPS of the quarterly examinations is a manifestation of this improvement.

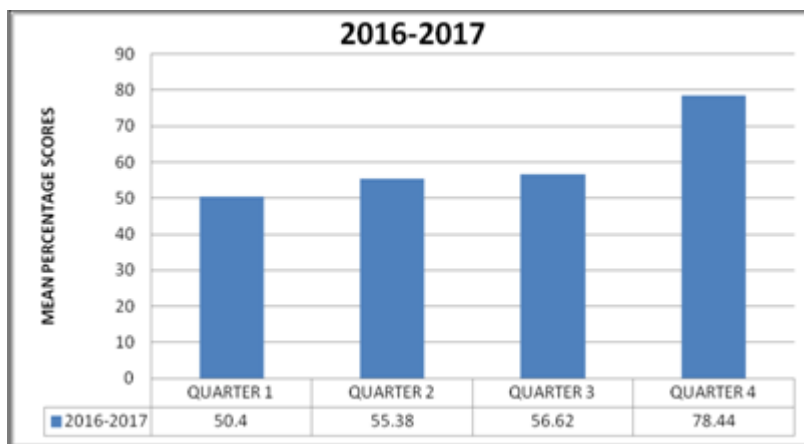


Figure 1: Mean Percentage Scores of Grade 8 - Kimchi in the Quarterly Examinations, School Year 2016 - 2017

Similarly, figure 2 shows that in the second year of its implementation, there is still an increase in the MPS of Grade 8 - Kimchi in their quarterly examinations.

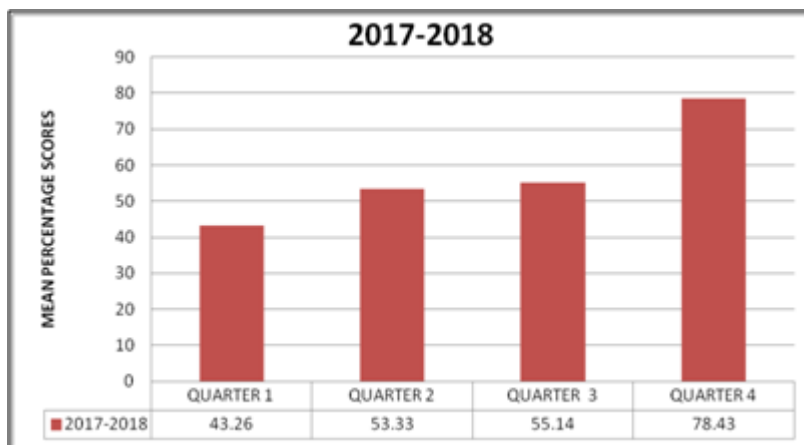


Figure 2: Mean Percentage Scores of Grade 8 - Kimchi in the Quarterly Examinations, School Year 2017 - 2018

The results imply that the use of Science ATM Card can really improve the academic performance of the students. Implementing reward systems in the classroom can prove to be an effective teaching tool, as long as teachers are thoughtful and reflective in designing their reward structure with elements of competence and autonomy in mind. It plays an important role with respect to effective students' learning and productivity.

Aside from its effect to the academic performance of the students, the most remarkable impact of this tool was in the attendance of the respondents.

Figure 3 demonstrates the results of the performance of the students in terms of attendance in Science class. It shows that the quarterly attendance rate of the students increases from first quarter (94.50%) to second quarter (95.70%).

Despite the sudden decrease in the attendance rate in third quarter, however in the fourth quarter there is still an increase in the attendance rate which is 98.40%.

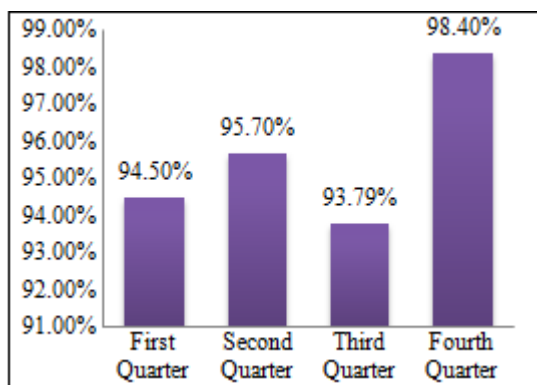


Figure 3: Quarterly Attendance of Grade 8 - Kimchi, School Year 2016 - 2017

Similarly, figure 4 indicates that there is an increase in the attendance rate of the students during the school year 2017 - 2018.

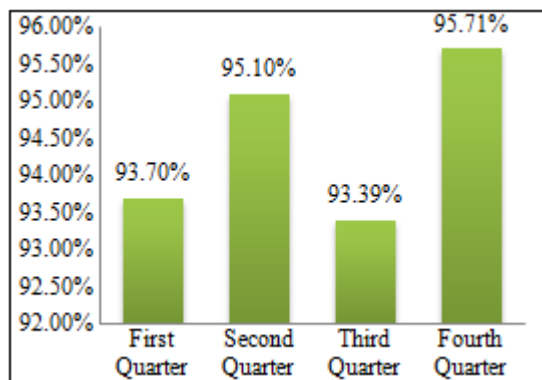


Figure 4: Quarterly Attendance of Grade 8 - Kimchi, School Year 2017 - 2018

How ATM Card motivates students to learn?

From a learners' perspective, the Science ATM Card was motivating and has really changed the notion about traditional school days. In analyzing the participants' views about using ATM Card with QR codes, it was found that all students stated that it is very motivating since it is the first time that their teacher used a card with QR codes in checking the attendance. Students express their amusement in the use of the card whenever they are present and whenever they get perfect score in the formative test given by the teacher. In line with this, Student A mentioned:

“...ako ay talagangnamamangha every time na nag - checheckng attendance si Ma'am, feeling ko kami ay mgaestudyantesa private school. Gusto kolagingpumasokpara ma-scan lagini Ma'am 'ung ATM card ko. Ginaganahan din akonapagbutihanlagisa quizzes kasinakakuha kami ng extra points...”

Similarly, most of the participants came to an agreement that the use of ATM cards must not only be used in Science subject but in all the subject areas. According to them, the use of this card with QR code motivates them to learn and attend classes regularly. Regarding this, Student B said:

“...dapatgumamit din angibang teachers ngganitongklasengpamamaraanparahindilangsa subject ni Ma'am silapapasok. Nakakatuwatalagaungpamamaraann' yangpag - checheckng attendance... Hindi 'ung usual way natatawagin pa kami isa-isa... Nakakapagsimuaagadsi Ma'am sa lesson dahilhabang nag - a - activity kami sakas'ya nag - iikotparamagcheck. It saves the time and effort consumed by our teacher just in checking the attendance. Very innovative.”

Moreover, on the reasons and positive effects in learning, all of the participants share the same idea that Science ATM card had positive effects on learning. When the reasons were investigated, the following themes were found: *positive effect on study habits, develop good attitudes, updatable record of attendance and motivation to the study.* Student C expressed:

“...maramitalagangmagandangnaidulotitongginamitni Ma'am. Hindi langpara ma - motivate kami napumasokaraw - arawpatinarinna mas pagbutihan pa naminangpag-aaral. Akomismo ay ginaganahansaorasngklasen ni Ma'am kasi may bagosakanyangpamamaraan, at dahilnakatulogitohindilangparamalamanni Ma'am 'yung attendance naminpatinarinangaming mga grades...mas nag-aaralakongmabutiparamakakuhangmagandang score at magkaroonng extra points para mas tumaas pa angakingmarka.”

Indeed, Science ATM card with QR code is a motivating tool in teaching and learning. The results of focus group discussions were supported by the study conducted by Law and So (2010) revealing that it is easy to use and an innovation in motivating students. Moreover, during the two-week review of the lesson unit, all of the learners used all the QR Codes. There is a time difference between users – some did it in a faster way than the others. At the confirmation phase, the participants were directed questions about whether they were thinking to continue using QR codes and all of the students answered to use QR Codes in the future. The interviews revealed that using QR Codes for education would be beneficial and attractive because of the positive effects on learning. Learners also want to re - experience QR code - aided learning and such applications better be used for education (Rikala and Kankaanranta, 2012).

Moreover, the study of Yahaya (2010) also supported the results of the study wherein the said tool provides a clear view about the relationship of extrinsic motivation and students' academic performance. Since the ATM Card is a form of extrinsic motivational tool, his study provides supportive information towards this tool in learning Science among the students in secondary schools in Negeri Sembilan that proves the worth of extrinsic motivation in learning. The recent study was conducted in order to prove that it is not only helpful in Mathematics but also in Science.

Similarly, according to Kearney (2008), intrinsic motivation focuses on building off the students' inner feelings, sometimes students need external reinforcements to get them excited about school. An extrinsic reward is a form of reinforcement or motivation builder. These extrinsic rewards

are defined as usually tangible or otherwise observable consequences to a behavior. The results of the study provide an idea that extrinsic motivation is also a way in building the intrinsic motivation of students.

The Proposed Action Plan

This study proposes an action plan that would be helpful in enriching the utilization of Science ATM Card and improving students' performance. The plan is presented in Table 5.

Table 5: The Proposed Action Plan

Objectives	Strategies/Activities	Personnel Involved	Time Frame	Success Indicators
To motivate the teachers regarding the use of QR code attendance system.	Orientation about Quick Response Code Attendance System.	School Head, Head Teacher, Master Teacher and Teachers	May 2019	100% of the teachers are given copies of Science ATM card lay - out and SAM mobile application.
	Share the sample lay - out Science ATM card and share the SAM application to teachers.			
To encourage teachers to develop other Science motivational tools using QR Code for other grade levels.	Symposium on the impact of using motivational tool in education.	EPS in Science, School Head, Head Teacher, Master Teacher and Teachers	May - June 2019	100% of the teachers understand the guidelines and steps in using SAM application.
	Conducts workshop regarding the use of SAM application.			
To produce motivational tool and QR code attendance system for other departments.	Craft departmental motivational tool using QR codes.	School Head, Head Teacher, Master Teacher and Teachers	May - June 2019	100% of the departments crafted motivational tool.
To utilize the developed motivational tool.	Full utilization of the developed motivational tool.	School Head, Head Teacher, Master Teacher and Teachers	June 2019- March 2020	100% of the teachers used the motivational tool.

7. Conclusions

Based on the findings of this study, the following conclusions were drawn by the researchers:

- 1) Students who are motivated performed significantly higher in their post-test compared to their pre-test and showed improvement in their achievement in Science.
- 2) Proper and consistent used of motivational tool has a positive impact to the students' achievement in the quarterly examinations and showed improvement in attendance in Science.
- 3) The teachers and students agreed that Science ATM card helped in improving the performance of the students because it can promote and build learning skills, study habits and good attitudes. It also motivates students to learn better because it shows positive effects in learning.
- 4) If teachers choose to implement a motivational tool in their classroom through reward system, they must be mindful of its purpose along with any potential benefits and drawbacks. Teachers should thoughtfully plan - out what the actual rewards will be. This requires knowing your students' needs and interests and communicating with their parents.
- 5) An action plan is necessary since it can be a way to enrich the utilization of Science ATM Card using QR code and definitely improve the performance of students.

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