



THE EFFECT OF ONLINE WORKSHEETS ON 10TH STANDARD EVENING LEARNING CENTER STUDENT'S ACADEMIC ACHIEVEMENT IN MATHEMATICS

Anita Balasaheb Khaire, Ph. D.

Assistant Professor, Dnyanganga College of Education, Pune

Paper Received On: 18 FEB 2022

Peer Reviewed On: 28 FEB 2022

Published On: 1 MAR 2022

Abstract

The aim of the present research was to find out the effect of online worksheet prepared for 10th standard Mathematics on student's achievement. The research was conducted with 90 evening learning centre students in Pune city in the academic year 2020-21. 42 in experimental group and 48 in control group. Pre-post-test control group design from Quasi experimental group was used. In this study in the study, online worksheets were applied along with regular online classroom teaching and control group was taught by regular online teaching. Before and after implementing worksheets and online regular classroom teaching Mathematics achievement test was administered as pre and post-test. Post-tests scores of experimental and control group were compared by using t-test. The achievement of experimental group was significantly greater. After implementing worksheets structured interview of 10 students from experimental group who were participated in all worksheets was conducted. The findings derived from the interviews all the students found worksheets useful for mathematics practice.

Keywords: Worksheets, Mathematics Achievement, Evening Learning Center

INTRODUCTION

COVID-19 tremendously affects the living conditions as well as the education system globally. The coronavirus emerged in Wuhan, China in 2019 accelerated online learning in regular as well as distance education systems. Many countries around the world, using various education portals (UNESCO, 2020), have decided that students will continue their education through an online system with distance mode. Many of the countries in the world. Online lessons and online courses have started to be run by teachers and school administration in almost every country to support communication with students and parents (Chang & Satako, 2020)

In India face to face interaction in education were suspended and online education was started at all educational level from March 23, 2020. To ensure that every student gets continued access to education, a multi-pronged approach has been adopted by the government of India. A comprehensive initiative called PM e-VIDYA has been initiated as part of Atma Nirbhar Bharat Abhiyan on 17th May, 2020, which unifies all efforts related to digital/online/on-air education to enable multi-mode access to education. (Report by Indian ministry of Education 2021). Indian Government and school administrations took lots of efforts to get students in the flow of education.

Rate of dropout students in 9 states and UTs in India recorded over 25% (UDISE report 2019-20). The drop out student rate is too high in India. Many NGO's are working in the field of education to educate drop out students in India. One of them is MASOOM is an NGO Working for drop out students in Maharashtra and Gujarat States. Masoom runs The ELC program to support the dropouts to pass class 10 especially in the areas where there are no alternative models like night schools or other platforms. The ELC model is similar to the NSTP model, keeping high focus on supporting the students to prepare for Class 10 exams. This model can be run with Govt. Partnership as well as with the community partnership. Masoom proposes to start the ELCs in different parts of Maharashtra where there are no existing Night Schools and reach for alternate opportunities such as open schools or NIOS starting from Mumbai and Pune City. The purpose is to create an opportunity for drop-out students to complete their 10th standard through the state board. These ELCs will largely focus on catering to the social needs of the students by helping them learn life skills, soft skills, vocational skills where education will be a by-product. ELCs offer one to two years opportunity to students to learn holistically and gain better life skills along with the Class 10 Certificate. During covid-19 ELC's also adopted online learning platform to educate students in distance mode.

OBJECTIVES

1. To Prepare online mathematics worksheets for 10th standard students.
2. To Study the effect of online mathematics worksheets on 10th standard student's Mathematics achievement.
3. To study the student's opinion regarding worksheets.

HYPOTHESIS

1. There is significant difference in Pre-test scores of experimental and control groups.
2. Post test scores of experimental group are significantly greater than the post-test scores of control group.

METHOD: In this research, the effect of online worksheets prepared for mathematics, on dropout student's achievement who were appearing for 10th standard was examined. For this reason, a quantitative research approach was adopted in the study. In the study, a quasi-experimental design with a pre-post-test control group was used. Both experimental and control groups were pre-tested for achievement in mathematics by giving an achievement test. The online worksheets prepared by the researcher were applied to the experimental group along with regular online teaching and the control group was taught only with regular teaching through online mode. Post-test was administered to both the experimental and controlled groups after practice.

In this research online worksheets along with regular online classroom teaching and only regular online classroom teaching were independent variables and student's achievement in mathematics was a dependent variable.

Participants The experimental group consists of 42 students studying in the 10th standard from Nirman ELC, Pune of Masoom NGO. and control group consists of 48 students from C.P. Thorve ELC, Pune, run by Masoom NGO. All the participants were appearing for 10th standard by distance mode. All participants were from Age group 16 years to 45 years, and left the school from 5th, 6th, 7th, 8th and 9th standards. Some of them left the school in 10th standard.

WORKSHEET PREPERATION

At this stage, worksheets prepared by experts on many different subjects and practiced to different samples were examined (Aktepe, 2012; Aydina, 2015; Ev, 2003; Ozdemir, 2012; Keskin, 2019). Textbook content was examined. The first 3 units from the Mathematics-1 textbook and the first 3 units from the Mathematics-2 textbook were finalized for the worksheets. Content from each unit was analysed. It was decided to prepare 18 worksheets, 3 on each unit. Worksheets were prepared by considering student's prior knowledge, teaching-learning activities conducted during regular online teaching. Concepts were explained shortly in the beginning along with sample solved sums. fifteen practice sums were given in each worksheet. Care was taken that the language used in the worksheet should be more simple and understandable to the students. the final version was examined by the two experienced mathematics teachers and get approved from the Masoom SSC head. The suggested changes were done and worksheets were finalised for a pilot study. Before implementing the worksheets a pilot study was conducted in the Kasewadi ELC. According to the feedback from the students, students are studying independently and teachers are not with them in distance mode, so more

clear and understandable instructions were included. Along with this some guidelines were change and made short for time constraints.

WORK SHEET IMPLEMENTATION

Before implementing worksheets and regular online teaching process in the experimental and controlled group pre-test was administrated for both the groups. Pre-test was given to investigate that whether there was significant difference between the two groups in terms of mathematics achievement. From the result of pre-test scores it was concluded that there was no significant difference in pre-test scores of experimental and control groups.

For the experimental group regular online classes were started along with worksheets practice. Worksheets were given twice in a week and regular online classes were started for control group. The implementation of this practice was last for four months. From 1st September to 31st December. After implementation of this practice mathematics achievement test was administered for both the groups as post-test

DATA COLLECTION

Mathematics achievement test was used as a data collection tool in this research, the achievement test related to the 10th standard mathematics subject was used as pre-test and post-test. Before the question items of the Mathematics Achievement Test were created, different sources, especially the 10th standard SSC board school textbook, were examined. The Mathematics achievement test consists of total 23 questions. 11 questions are of 1 mark and 12 questions are of 2 marks. The total marks for the achievement test were 35. The prepared questions were examined by two ELC teachers and two field experts and one ELC SSC head. A pilot study was conducted with 32 students of Kasewadi ELC, Pune in order to determine the deficiencies of the test items prepared according to the SSC Mathematics test book and state board exam papers. As a result of the examinations in the item analysis, it was decided to exclude one question of 1 mark and two questions of 2 marks from the test, since the discrimination of those questions in the test was low, the final Mathematics achievement test containing 20 question items and of 30 marks was prepared. The reliability of the Mathematics achievement test was calculated by the test-retest method and the reliability coefficient was 0.81. Therefore, the conclusion was drawn that the test is reliable for measuring the Mathematics achievement of 10th standard ELC students.

Structured interviews were conducted after the practice of 10 students for the experimental group who solved all the worksheets during the experimentation period. These interviews were conducted to know the student's opinion about the online worksheets with respect to whether

the questions in the worksheets were related to the content, suitable for their level, clear and easily understandable.

DATA ANALYSIS

Data Analysis in the research conducted for the calculating test-retest reliability, item difficulty index, item discrimination index, of mathematics achievement test, values of mean, Standard deviation, range, skewness, kurtosis of scores in pre and post-test, Comparisons of means of pre and post-test scores were calculated by using SPSS (Statistical Package for Social Science) version- 20.00. Comparison of pre-test and post-test scores was done at 0.05 significance level. to determine the applicability of the t-test, it was checked whether the data, had a normal distribution and the variances were homogeneous as it is one of the assumptions of the parametric hypothesis tests. In the research, the data were analysed using the t-test, as it is one the assumptions of the parametric hypothesis tests. To analyse the data collected through structured interview descriptive techniques were used.

DESCRIPTIVE ANALYSIS OF PRE TEST SCORES

Table 1. Descriptive statistics of mathematics achievement test pre test scores.

Groups	Experimental Group	Control Group
N	42	48
Mean	7.83	7.29
Median	7.5	7.33
Mode	5	5
Standard Deviation	3.75	3.14
Variance	14.09	9.87
Maximum Score	16	15
Minimum Score	1	2
Range	15	13
Skewness	0.232	0.243
Kurtosis	-0.903	-0.705

FINDINGS

The mean, median and mode values of both experimental and control group in the pre-test are very close to each other. From this it is interpreted that the scores show normal distribution in both the groups. Values of Skewness and Kurtosis in both experimental and control group are

between -1 and +1, it means the distribution of pre-test scores in both experimental and control group follow normal distribution.

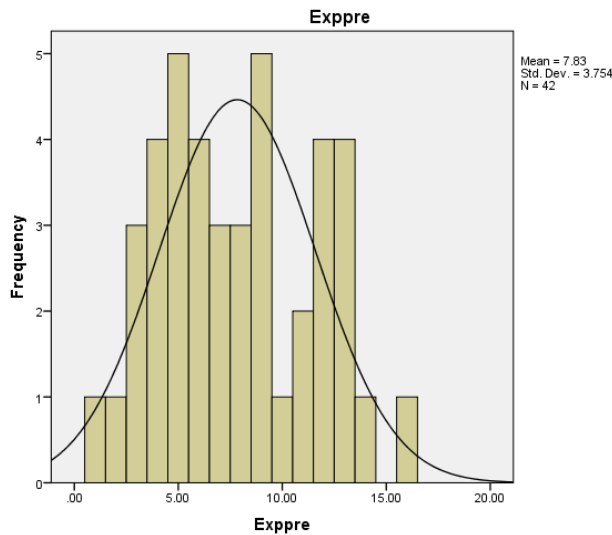


Fig.1-Histogram of Pre-test scores of experimental Group

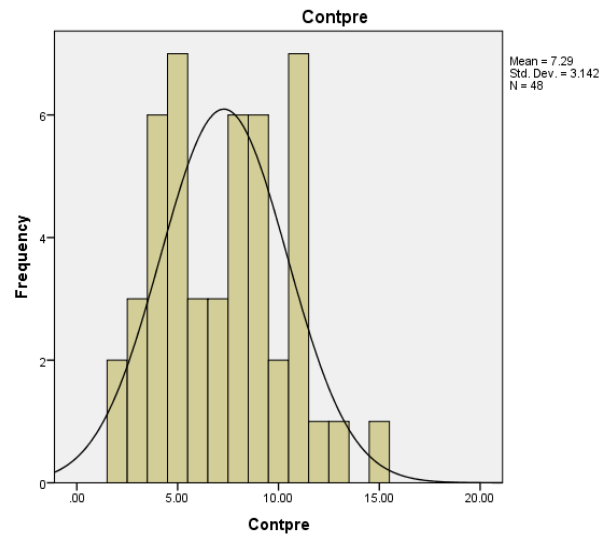


Fig.2-Histogram of Pre-test scores of experimental Group

The histogram graphs of the pre test scores also examined for the normal distribution from the graphs it was observed that they followed bell shaped frequency curve.

The Shapiro-Wilks Test was used as The third method applied for normality was the Shapiro-Wilks Test, since the group size was less than 50. The data of the Shapiro-Wilk Test applied for the Mathematics Achievement Test pre-test scores are shown in the table below.

Table 2. Shapiro-Wilk test results for Mathematics achievement test pre-test

Group	Test	Statistic	Df	P
Experimental	Pre-test	0.962	42	0.201
Control	Pre-test	0.964	48	0.171

In the Shapiro-Wilk test, the p value for the experimental group was $p=0.201$, and the p value for the control group was $p=0.171$. The Value of $p>.05$. This was interpreted as the scores were normally distributed.

INFERENCEAL STATISTIC OF MATHEMATICS ACHIEVEMENT PRE-TEST

Hypothesis 1 There is significant difference in Pre-test scores of experimental and control groups.

For testing purpose above hypothesis is converted in to Null hypothesis

Null Hypothesis 1. There is no significant difference in Pre-test scores of experimental and control groups.

For this purpose, the pre-test scores of the experimental and control groups were compared with the t-test.

Table 3. T-test results for Mathematics achievement test pre-test

Groups	N	Mean	SD	t value	Df	P
Experimental	42	7.76	3.62	0.660	88	1.98
Control	48	7.29	3.14			

After applying t test for pre-test mean scores of experimental and control groups the calculated t value for df 88 was 0.660 and $p = 1.98$, so there is no significant difference between the pre-test scores of experimental and control groups at 0.05 level. Thus Experimental hypothesis is rejected and Null hypothesis is accepted.

FINDINGS: Both experimental and control groups are considered to be equivalent on the basis of pre testing.

DESCRIPTIVE ANALYSIS OF POST TEST SCORES

Table 4. Descriptive statistics of mathematics achievement test post-test scores.

Groups	Experimental Group	Control Group
N	42	48
Mean	22.07	17.39
Median	22.14	14.68
Mode	20	14.63
Standard Deviation	3.52	3.55
Variance	12.45	12.64
Maximum Score	29	24
Minimum Score	14	7
Range	15	17
Skewness	-0.045	-0.117
Kurtosis	-0.547	0.195

FINDINGS: The mean, median and mode values of both experimental and control group in the post-test are very close to each other. From this it is interpreted that the scores show normal distribution in both the groups. Values of Skewness and Kurtosis in both experimental and

control group are between -1 and +1, it means the distribution of post-test scores in both experimental and control group follow normal distribution.

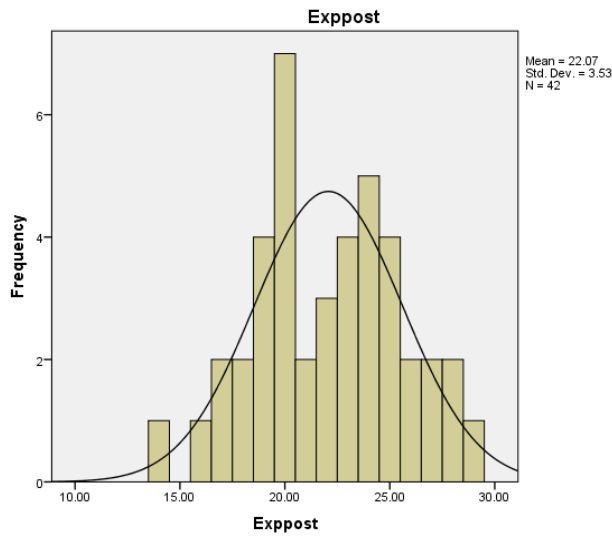


Fig.3-Histogram of Post-test scores of experimental Group

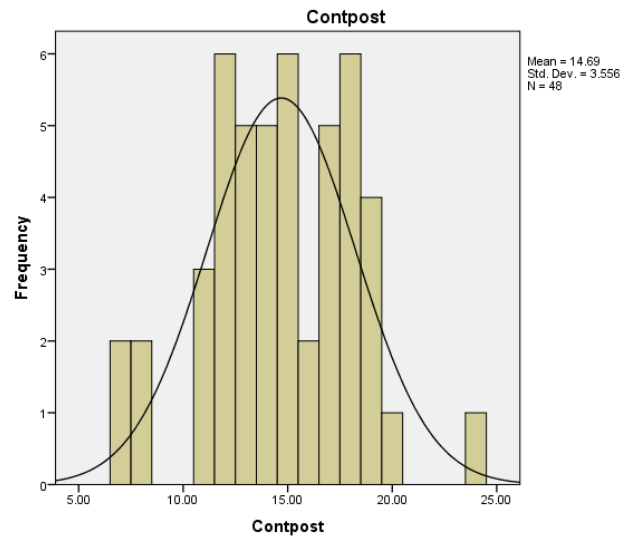


Fig.4-Histogram of Post-test scores of experimental Group

The histogram graphs of the post-test scores also examined for the normal distribution from the graphs it was observed that they followed bell shaped frequency curve.

The Shapiro-Wilks Test was used as The third method applied for normality was the Shapiro-Wilks Test, since the group size was less than 50. The data of the Shapiro-Wilk Test applied for the Mathematics Achievement Test post-test scores are shown in the table below.

Table 5. Shapiro-Wilk test results for Mathematics achievement test post-test

Group	Test	Statistic	Df	P
Experimental	Post-test	0.981	42	0.296
Control	Post-test	0.970	48	0.314

In the Shapiro-Wilk test, the p value for the experimental group was $p=0.296$, and the p value for the control group was $p=0.314$. The Value of $p>.05$. This was interpreted as the scores were normally distributed.

INFERENCE STATISTIC OF MATHEMATICS ACHIEVEMENT POST-TEST

Hypothesis 2 : Post test scores of experimental group are significantly greater than the post-test scores of control group.

For testing purpose above hypothesis is converted in to Null hypothesis

Null Hypothesis 1. There is no significant difference in Post-test scores of experimental and control groups.

For this purpose, the post-test scores of the experimental and control groups were compared with the t-test.

Table 6. T-test results for Mathematics achievement test post-test

Groups	N	Mean	SD	t value	Df	P
Experimental	42	22.07	3.52	9.86	88	1.98
Control	48	14.68	3.55			

After applying t test for post-test mean scores of experimental and control groups the calculated t value for df 88 was 9.86 and $p = 1.98$, so there a significant difference between the post-test scores of experimental and control groups at 0.05 level.

FINDINGS: It was found that Post Mathematics Achievement Scores of experimental group are significantly greater than the Post test scores of control group.

ANALYSIS OF QUALITATIVE DATA

After the study structured interviews were conducted for 10 students selected from experimental group.

First question was whether the worksheets developed are useful?

From the responses of the student it was found that students understood the subject better, lesson practiced through worksheets were useful for them. Initially students faced some difficulties while solving worksheets independently but after practice they got used to for this method. Along with increased academic achievement students found that their confidence level also increased. They enjoyed the worksheets too much.

Second Question was Which activity they like the most in the worksheet? Why?

After examining the answers given by the students it was seen that each students liked different activities. Some students liked to solve objective type questions because it was easy to solve, some students liked the details of activities given prior to the practice set because it was easy to understand the method and content from it, some students liked activity based questions as they don't have to solve the entire sum in this.

Third Question was what difficulties you faced while solving Worksheets? how you solved it? It was found from after examining the answers of the students that most of the students did not encountered any difficulty while solving worksheets. Some students faced difficulties like they don't have previous knowledge to solve the sums as the students were left the schools in 5th,

6th, 7th standards. They watched the videos from you-tube, when they understood the content then they solved the worksheets. Some students took help of their children who were appeared and passed the board exams. But they never gave up to solve the worksheets.

The fourth Question was would you like to have worksheets for other subjects? why?

All the students unanimously replied that they would like to have worksheets for all subjects for practice. Their schedule is busy, as most of the students were working they don't have enough time to study. If worksheet will have made mandatory to solve at least they study or practice the content in given worksheets. Their target is to pass the 10th standard and these worksheets will help them to achieve their target.

DISCUSSION AND FINDINGS

In the present study, effect of Mathematics worksheet prepared for 10th standard on their academic achievement was examined. There was no statistically significant difference between the pre-test scores of the experimental group, in which the worksheets were practiced, and the control group, in which the regular online teaching methods were applied. From this it was conclude that on the basis of prior knowledge of mathematics both the experimental and control groups are equal. When the post-test achievement scores of both the groups are compared, it is seen that there is a statistically significant difference between the experimental and control group students. It was found that the scores of the experimental group taught with worksheets were significantly greater. The worksheets proved effective to practice mathematics in distance mode.

This result supports many research results Isik and Celik (2017) concluded in their research that teaching algebraic equations with worksheets increased student achievement more than teaching with general teaching methods. (Ihwan, Prasetyo & Septiyono, 2020; Isik & Ozdemir, 2014; Trisnowati & Sumardi, 2019) showing that teaching with worksheets increases the academic success of students. Similarly, Aydina (2015) revealed that teaching fractions with worksheets significantly increased the academic achievement of 6th grade students. Inan and Erkus (2017), on the other hand, stated that mathematics worksheets prepared based on the theory of multiple intelligences positively affect the academic achievement of primary school 4th grade students.

REFERENCES

Atasoy, S., Kucuk, M., & Akdeniz, A. (2011). Remedying science student teachers' misconceptions of force and motion using worksheets based on constructivist learning

theory. *Energy Education Science and Technology Part B: Social and Educational Studies*, 3(4), 519-534

- Bernard, R. M., Abrami, P.C., Lou, Y., Borokhovsk, E., Wade, A., Wozney, L., Walseth, P.A., Fiset, M. & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, 74(3), 379-439. Retrieved July 6, 2021 from <https://www.learntechlib.org/p/70109/>
- Bozdogan, A. (2007). Fen bilgisi öğretiminde çalışma yaprakları ile öğretimin öğrencilerin fen bilgisi tutumuna mantıksal düşünme becerilerine etkisi. [The effects of worksheets on the logical thinking abilities on the education of science lessons.] (Master's dissertation). Cukurova University Graduate School of Social Sciences, Adana, Türkiye. Available from the Council of Higher Education, National Dissertation Center, Dissertation ID: 206441
- Buniel, J. M. C., & Monding, V. A. (2021). Effectiveness of developed worksheets to the academic achievement of students in science 9 concepts. *International Journal for Innovation Education and Research*, 9(4), 210–214. <https://doi.org/10.31686/ijer.vol9.iss4.3041>
- Celikler, D. (2010). The effect of worksheets developed for the subject of chemical compounds on student achievement and permanent learning. *Educational Research Association the International Journal of Research in Teacher Education*, 1(1), 42-51.
- Isik A., & Celik E. (2017). Çalışma yapraklarıyla cebir öğretiminin öğrenci başarısına etkisi [Effect on student achievement of teaching algebraic equations with worksheets]. *Kastamonu Eğitim Dergisi*, 25(5), 1893 - 1908.
- Isik, A., & Ozdemir, G. (2014). Effect on student achievement of teaching probability with worksheets. *Middle Eastern & African Journal of Educational Research*, 12, 4-16.
- Keskin, S. (2019). Çalışma yapraklarıyla ortaokul 8. Sınıflarda üçgenler konusunun o
- Ozdemir Baki, G., & Celik, E. (2021). Secondary mathematics teachers' mathematics teaching experiences in distance education. *Western Anatolia Journal of Educational Sciences*, 12 (1), 293-320
- Inan, C., & Erkus, S. (2017). The effect of mathematical worksheets based on multiple intelligences theory on the academic achievement of the students in the 4th grade primary school. *Universal Journal of Educational Research*, 5(8), 1372-1377.

Trisnowati, E., & Sumardi, Y. (2019). Developing the student worksheet with problem-solving approach to improve critical thinking skills and the concept understanding of physics. *Momentum: Physics Education Journal*, 3(1), 32-41. <https://doi.org/10.21067/mpej.v3i1.3344>