Review of Education Studies
ISSN 2770-9779
Vol. 5, No. 3, 2025
Published by STSL Press

Original Paper

Effect of a "Hole In The Wall" Playground Computer on School Test Scores in the Age of Smartphones

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Abstract

Self Organised Learning Environments (SOLEs) involve groups of learners sharing computers to investigate subjects or answer questions, utilizing large, publicly visible screens and Internet connections. An experiment in 2007 demonstrated that unsupervised access to computers with Internet-based instructional material allowed children to self-organize and achieve similar test scores to those in a rural state government school. This study investigates whether a similar experiment would yield comparable self-organised learning achievements in 2025, given the widespread availability of Internet-connected smartphones. Would this cause a lack of interest in SOLEs leading to lesser effectiveness? The experiment was conducted in a rural school in Kodagu, India, with 39 students aged 8-11, who were given access to a "hole in the wall" computer with curated Internet links. Results showed significant increases in test scores, particularly in areas not taught in school, suggesting that collaborative Self Organised Learning Environments are as effective in 2025 as they were in 2007, in spite of increased Internet access.

Keywords: Self Organised Learning Environments, Internet based learning, Collaborative learning, Children's education, Rural India, Smartphone, SOLE

Introduction

Self Organised Learning Environments (SOLEs) are groups of learners, sharing a few computers to investigate a subject or answer questions. The computers should have large, publicly visible screens and Internet connections (see, for example Dolan et al., 2013, Kusumyati, 2023).

In an experiment conducted in 2007 (Mitra and Dangwal, 2010), It was shown that given

unsupervised access to a computer with Internet-based instructional material, children

self-organised into groups and, without supervision or instruction, achieved the same test score levels as children in a state government school (in rural India) but not those of similarly aged children in an affluent, urban school.

In 2007, computers and the Internet were novelties for most rural children in India. Curiosity would have driven most children, and, indeed, adults, to a publicly accessible computer. Nearly two decades later (2025), almost every adult has an Internet connected smartphone (Gohain 2023). And while children in rural India would not own smartphones, they would easily have access to one.

Would an experiment like the one above result in similar self-organised learning outcomes?

In this paper, we attempt to answer this question.

Description of the experiment

Location: Kodagu, also known as Coorg, is a rural district in the southwest Indian state of Karnataka. The experiment was carried out in a rural, residential school with 110 students, 8-11 years old. The school has classes from lower kindergarten (LKG) to Class 5.

Sample: Using stratified sampling, 39 students were selected. Out of these, 17 students (44%) were girls, and 22 (56%) were boys. Table 1 shows details of the sample.

Table 1. Sample Size Details

S. No.	Class	No. of Girls	No. of Boys	Total
1	Class 4	11	16	27
2	Class 5	6	6	12
Total		17	22	39

Assessment: Two types of tests were used for measuring achievement levels in three subjects – English, Environmental Science (EVS) and Mathematics. The test designs were:

- Paper 1: This test was designed to assess the learning levels of the children against the planned learning outcomes at the end of Class 5 (Priority 3[1]) level. It was designed and developed by school experts. Since the school ends with Class 5, this is the exit test from the school.
- Paper 2: This test is designed to assess the learning levels of children against the learning outcomes prescribed by the Karnataka State Board at the end of Class 6. A model test as available from the Karnataka State Board was used.

Tables 2 and 3 show sample sections from the two papers.

Table 2. Paper 1 [snippet]

12. The word '<u>animal</u>' is formed by using a set of letters

A. AMISHN B. AILANM

C. ARMTIL D. ONMLSI

Answer: ☐ _____

13. The opposite of the word '<u>stand</u>' is _____

A. run B. come

C. sit D. go

Answer: ☐ _____

79)Observe the following bill and fill up the blanks.

No. 24 Date: 12/0 1/22

Name: Mary

Sl No.	Particulars	Quantity	Rate (`)	Amount (`)
1	Apples	.....	70	140.00
2	Mangoes	3	28	.....
3	Bananas	3	35	145.00
			Total	369.00

[1] The school administers tests on the basis of Priority levels that indicate the level of difficulty of the test. Priority Level 1 indicates the easiest, while Priority Level 3 indicates the most difficult question paper.

Table 3. Paper 2 [snippet]

3. Relate the words in column A with the words in column B and to C. (1-mark

Column A	Column B	Column C
a. King	1. Children	A. House
b. Teacher	2. Patients	B. Hospital
c. Mother	3. Courtiers	C. Palace
d. Doctor	4. Students	D. School

4. Fill in the blanks with 'a', 'an' or 'the. (0.5-mark x 4= 2 marks)

a. _____ apple and _____ egg.

b. _____ Taj Mahal and _____ Red Fort

26. Put the appropriate sign. (<, >, =) (1-mark x 3= 3 marks)
a. 530 _____ 503
b. 0 _____ -8
c. +3 _____ -6

27. Which number is a factor of every number? _____ (1-

28. The sum of any two odd number is _____. (1-mark)

29. Is 4569874 completely divisible by 2? _____. (1-m

30. Name the figure. ⟶ _____. (

It is important to note that Paper 1, the end of Class 5 test, is what teachers "prepare" children for in Class 5. Some of the content is also touched upon in Class 4. So, increases in test scores over time for Paper 1 by Class 4 or 5 students, can be attributed to teaching, in the absence of any other learning inputs or resources.

On the other hand, Paper 2, the end of Class 6 test, is not relevant to the school as the school ends at Class 5. Teachers do not deal with or teach the contents relevant to this paper. So, increase in test scores over time for Paper 2 by Class 4 or 5 students, if any, cannot be attributed to teaching.

Duration and process of the experiment

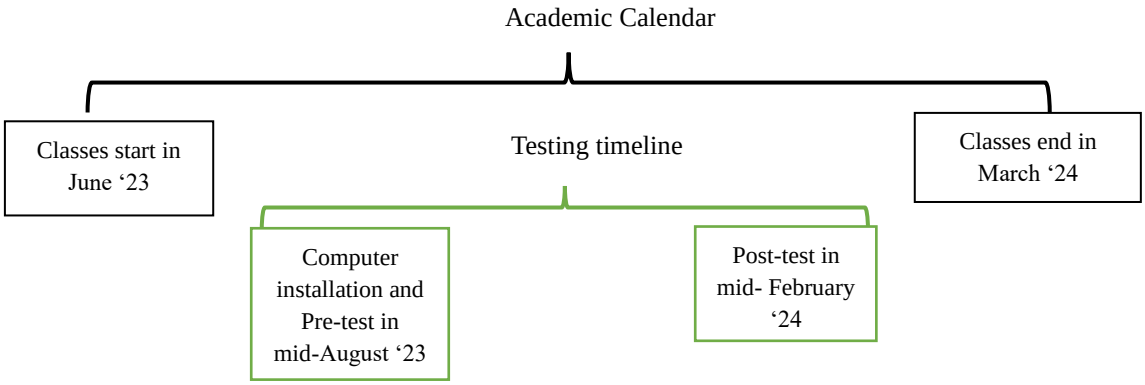

Diagram 1. The academic calendar of the school and the schedule of testing followed

A "hole in the wall" computer (Mitra et al 2005, Mitra and Dangwal 2021) was installed by the HiWEL division of NIIT Foundation (India). The computer has an Internet connection with curated links to relevant material for the school. This is called a HiWEL Learning Station and will be referred to as HLS in this paper. During the testing timeline (Diagram 1), children had access to the HLS on all working days. There were 15 public holidays during this period, excluding weekends, during which children did not attend school and had no access to the HLS.

At the beginning of the academic calendar, classes began in June 2023. An HLS was installed in the playground, and the sample group of students were tested using Papers 1 and 2 in August 2023. These scores formed the Baseline for this study. The same tests were administered again after six months, in February 2024. These scores formed the Endline of this study. During this period, all students were allowed free access to the HLS, whenever they had time available.

As a precautionary measure, analysis of the scores of boys and girls were also done separately. No

significant differences were found between them; hence the gender data is not being reported here.

Figure 1 shows typical usage by children.

Figure 1. The playground computer in Coorg

Results

Tables 5 to 8 show the data for all of the testing for both classes. Since the number of children in Class 4 is 27 and those in Class 5 is 12, the reader will find the proportional standard deviations to be larger for Class 5. All scores are in percentages.

Table 5. Mean scores and standard deviations for Baseline and Endline tests for Class 4, Paper 1

Class 4	**Paper1**				
	Baseline		**Endline**		**N**
	Mean	**SD**	**Mean**	**SD**	
English	49.4	17.5	53.4	15.9	27
EVS	42.4	17.8	64.6	10.8	27
Maths	49.5	17.2	74.8	12.9	27

Table 6. Mean scores and standard deviations for Baseline and Endline tests for Class 5, Paper 1

Class 5	**Paper1**				
	Baseline		**Endline**		**N**
	Mean	**SD**	**Mean**	**SD**	
English	53.2	17.0	57.5	22.9	12
EVS	38.6	17.4	76.2	10.1	12
Maths	53.5	15.6	81.0	11.9	12

Table 7. Mean scores and standard deviations for Baseline and Endline tests for Class 4, Paper 2

Class 4	**Paper2**				
	Baseline		**Endline**		**N**
	Mean	**SD**	**Mean**	**SD**	
English	20.0	8.8	76.7	9.7	27
EVS	33.8	10.3	81.2	12.1	27
Maths	17.5	11.8	84.5	5.2	27

Table 8. Mean scores and standard deviations for Baseline and Endline tests for Class 5, Paper 2

Class 5	**Paper2**				
	Baseline		**Endline**		**N**
	Mean	**SD**	**Mean**	**SD**	
English	24.7	15.1	77.7	9.4	12
EVS	27.0	13.7	83.6	7.7	12
Maths	15.1	12.0	79.8	6.5	12

The data from Tables 5 to 8 have been converted into charts in order to facilitate visual comparison and pattern recognition. Figures 2 and 3 show the Baseline and Endline test scores respectively for classes 4 and 5 in the three subjects selected for testing.

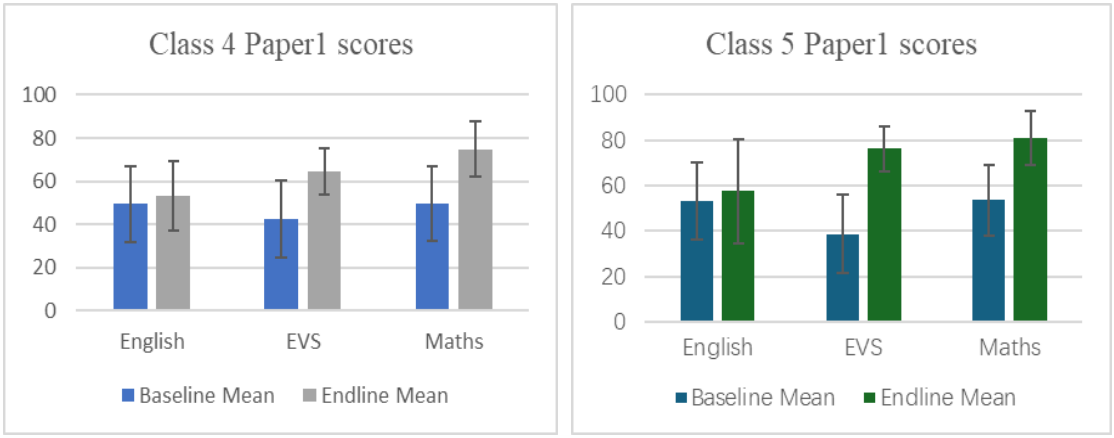

Figure 2. Mean scores for Paper1, Baseline and Endline tests for classes 4 and 5. Error bars show one standard deviation above and below the mean.

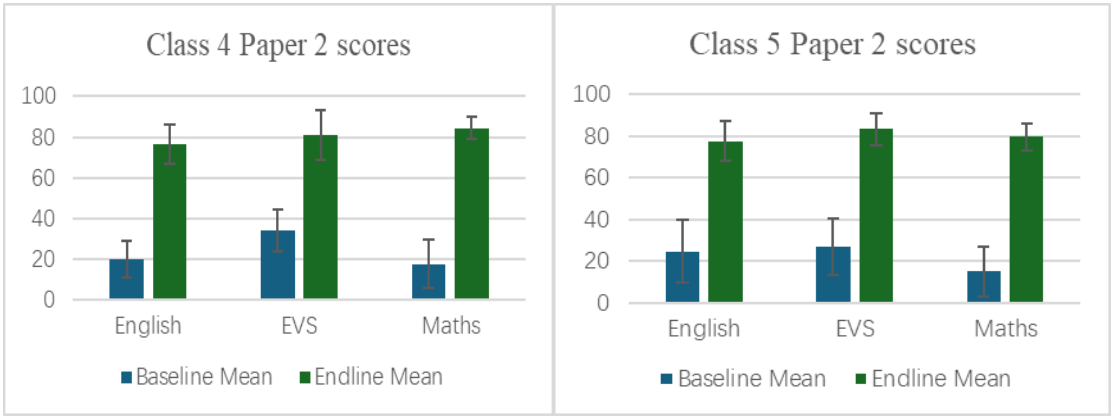

Figure 3. Mean scores for Paper 2, Baseline and Endline tests for classes 4 and 5. Error bars show one standard deviation above and below the mean.

Finally, the charts in Figures 2 and 3 are combined into a single chart of the entire data. This is shown in Figure 4.

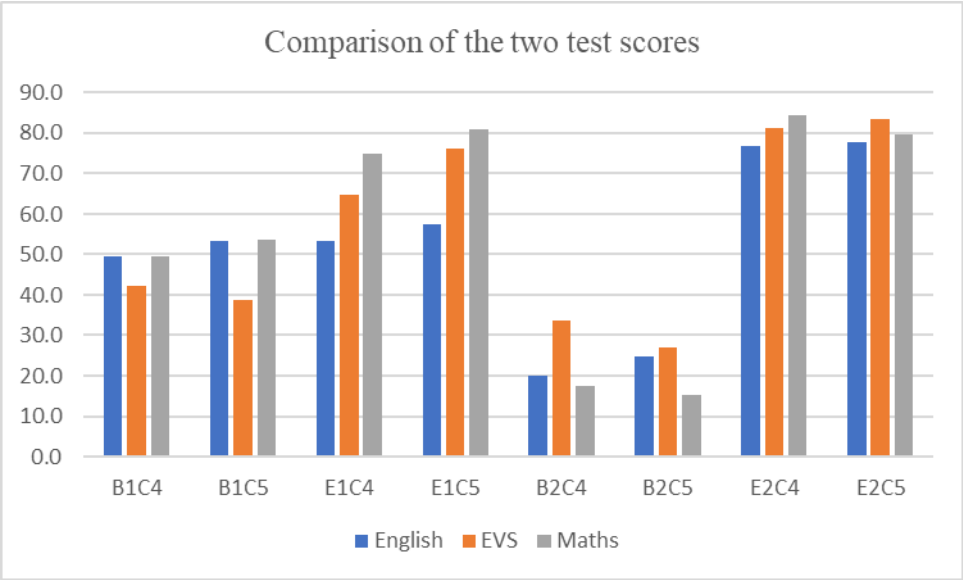

Figure 4. Baseline and Endline test scores for Papers 1 and 2 for Classes 4 and 5 for three subjects. The legend BxCy indicates mean test scores for Baseline Paper x for Class y. Similarly, ExCy indicates mean test scores for Endline Paper x for Class y. For example, B2C5 indicates Baseline Paper2 scores for Class 5.

All Endline scores are found to be significantly higher than the Baseline scores, the differences being larger in the case of Paper 2 than Paper 1.

Analysis and Discussion

We will start by describing the six-month period (Diagram 1 above) when this experiment was conducted. During all school days in this period, children's learning inputs were from taught lessons in class and usage of the HLS in the playground during breaks and playtime. In addition, children may have had inputs from smartphone usage at home, but we do not have any data about such inputs. However, there is substantial evidence that smartphones in rural India are primarily used for entertainment purposes, especially among younger users:

1. **Survey Data on Smartphone Usage by Rural Students**:

- A pan-India survey conducted by the Development Intelligence Unit (DIU) revealed that 76.7% of rural students aged 6–16 primarily use smartphones for entertainment, such as playing video games and watching movies. In contrast, only 34% use their smartphones for study-related downloads, and just 18% access online learning tutorials (Namrata 2023).

2. **ASER Report Findings**:

- The Annual Status of Education Report (ASER) 2023 highlighted that close to 80% of rural youth aged 14–18 used their smartphones for entertainment activities like watching movies or listening to music during the reference week. This indicates a strong preference for leisure activities over educational or productive uses (Gohain 2023).

3. **Qualitative Studies on Media Consumption**:

- Research by Microsoft and other organizations found that emergent smartphone users in rural and low-income communities extensively use their devices for infotainment and leisure. This includes watching short videos on platforms like TikTok (before its ban), ShareChat, and Instagram reels, as well as streaming TV shows and movies via apps like Zee5 (Gupta et al., 2022).

In the context of our experiment, it is therefore, reasonable to suppose that the children in our sample

received none or minimal inputs in English, EVS or Mathematics from smartphone use at home.

Why did the children in our experiment not use the HLS solely for entertainment? The answer lies in the public visibility of the HLS computer, and the fact that it is a shared resource. Most children, and indeed adults, do not use publicly visible computer screens for chatting, social media and other private use. As for games, on a shared computer, children need to first agree on what game to play and then be wary of passing adults. The fact that publicly visible screens are much less prone to "misuse" has been repeatedly observed and reported in the past (Mitra, 2005, 2019).

Figure 2 shows that there were significant increases in children's scores in English, EVS and Mathematics as measured by Paper 1, the examination at the end of Class 5. These increases are seen both for Class 4 and Class 5 children, the increase being more in the case of Class 5. Since these subjects were being taught during this time in both classes, the increase in scores is, likely, a consequence of teaching, with the more senior Class 5 scoring higher than Class 4. Whether HLS exposure during this period affected the Paper 1 scores is not evident from Figure 2.

Figure 3 shows that there were large and significant increases in children's scores in English, EVS and Mathematics as measured by Paper 2, the examination at the end of Class 6 in Karnataka State Schools. However, our experimental school ends with Class 5 and none of the material tested for by Paper 2 is taught in this school. Moreover, the difference in scores between Class 4 and Class 5 for Paper 2 are relatively smaller (Tables 7 and 8) than the differences observed for Paper 1 for these classes (Tables 5 and 6). The children of both classes learned a lot about English, EVS, and Mathematics, that they did not know and were not taught. Inputs from the HLS was the only source that could explain this increase in scores. Moreover, since the children of Classes 4 and 5 were free to use the HLS together, and often did, the increase in Paper 2 scores would have been similar for both Class 4 and Class 5 children. This was indeed the case.

Figure 4 shows this difference in pattern of test scores for Papers 1 and 2. For Paper 1, we find a high Baseline, rising to higher values for the Endline because of teaching, with Class 5 gaining over Class 4. For Paper 2, we find a low Baseline, rising as a result of HLS exposure, to a sharply higher value for the Endline, with both Classes 4 and 5, working together, reaching similar levels.

An interesting question arises out of these results. Why is the 'equalising' effect of the HLS not evident for the scores in Paper 1? We do not have an explanation for this in the present study, however, there is some evidence ("The Gateshead Granny Cloud", BBC, https://www.youtube.com/watch?v=I_tEIBib-tI) that, in unsupervised, Internet based collaborative learning, as happens in SOLEs, children find it more interesting to deal with what they consider "harder" (more difficult) than what is already being discussed in class (Inamdar 2007).

We conclude that the powerful learning gains from collaborative Self Organised Learning Environments are as valid in 2025 as they were in 2007, in spite of the vast proliferation of Internet access throughout the world.

Acknowledgement

We are grateful to the NIIT Foundation for providing us with the opportunity to conduct this experiment. We are deeply thankful to the school management for granting permission to install and operate the Hole-in-the-Wall (HIWEL) station. Their cooperation and willingness to integrate this technology into their environment are highly appreciated.

Our sincere appreciation goes to the school staff, whose dedication and assistance were indispensable. Their help with daily operations, sharing insightful observations, and conducting assessments significantly contributed to the depth and quality of our research.

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