

Guided Offline Approach to Learning (GOAL): Demonstration of Success in Class 10 Results from a Rural School in South India

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Abstract

Providing first-rate education for everyone is necessary to reap the demographic dividend for countries like India, but has remained a stiff challenge to achieve. For students in rural areas, successfully completing their first public examination at the end of class X, referred to as Senior School Leaving Certificate (SSLC), is an important landmark. Unfortunately, the pandemic seriously affected the schooling system for nearly two academic years. Thus a majority of students in the under served communities were ill prepared to take this examination in March 2022.

In this context, a special intervention, namely, Guided Offline Approach to Learning (GOAL), was implemented in a school catering to village students near Bengaluru, India. This intervention was introduced to the first batch of first generation students for a limited period. It resulted in improving the overall class performance on the final exam by 21.2% with reference to a baseline performance just 5 weeks prior; without altering the dispersion in the data. This paper discusses the scheme, the implementation details and quantifies the achieved successes. It also presents the lessons learned and the way forward if such initiatives are to be scaled up.

Keywords: Karnataka, SSLC, Mentoring, Rural, Students, Pandemic

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I. INTRODUCTION

Quality education is foundational. Without access to quality and relevant education through schooling, young people cannot build the skills needed to succeed in life and work. The challenges to equitable quality learning increased unexpectedly with the onset of COVID-19 pandemic and the resultant disruption of the school system. The structure of schooling, including teaching and assessment methodologies got seriously affected. In addition to increasing the variance of the learning outcomes, the resource-disparity, in terms of access and devices, affected the students from more vulnerable and disadvantaged communities. It created an additional divide in the equity and equality of education systems. There was an urgent need therefore to find an alternative scheme to provide a solution, lest we were to lose an entire class of learners to be rendered unemployable.

II. THE SCHOOL

Sai Krushna Vidya Mandir (SKVM) is a school located in Hosadoddi village about 20 kms south of Bengaluru, Karnataka State, India. It offers K-10 classes in English-medium to the children of the 5-6 villages around the school. The parents of these students are mostly farmers or household workers. The education in this school is offered completely free. The school is also implementing an integral model of education that emphasizes the all round development of the child, emphasizing physical, social, environmental and spiritual modules and, in turn, bring about positive changes in their own homes and villages.

The school management introduced several novel schemes to tackle the COVID crisis like:

- Production of 3000+ videos covering all grades, all subjects and all lessons in the curriculum
- Distribution of tabs to senior students to enable online learning
- LMS based learning tool, called Classmarker
- Enrolment of volunteers as virtual tutors/mentors/parents

The schematic in Fig.1 depicts the workflow that was adopted for each subject and for each lesson during the COVID induced closure of the school.

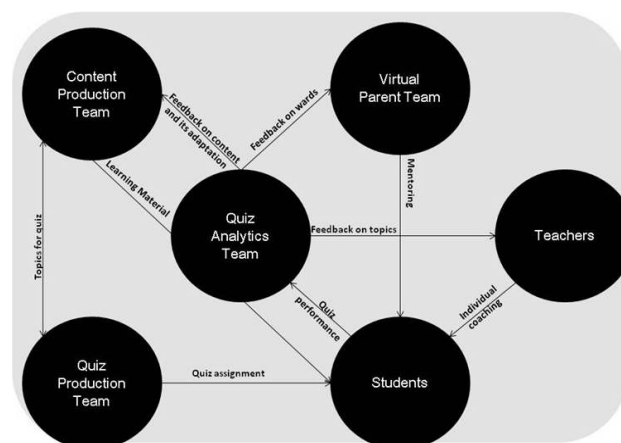


Figure 1 Schematic during the Online Education phase at SKVM

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III. THE CHALLENGE FACED BY THE TENTH GRADERS

Despite all these measures, the students were still struggling to cope up with the syllabus. Online classes were particularly ineffective for first generation learners with little support at home, even beyond the non-availability of devices and appropriate connectivity. Under the best of circumstances, online classes have not been a substitute for regular classes. SKCT students had to face additional problems due to factors like:

- There was generally no dedicated smart phone for the student.
- The tablet given to them was meant to be connected only in a WiFi environment which was possibly unavailable at home
- Sharing a parent's phone placed severe time constraints on going through learning material
- The mobile plans were usually not affordable and placed constraints on online classes that are bandwidth heavy
- The students were often pulled to help the household during peak farming activities
- Electric power supply was unreliable in these villages
- Assembling at the school premises was disallowed for several months at stretches

When regular classes resumed with only a few months to go for the Class X (SSLC) public examination, there was a wide gap between where the students were and where they ought to be for passing the examination. A snapshot of how the 15 students of X standard answered a few basic questions on 11 Jan 2022 is shown in Fig. 2.

Test on 11 Jan 2022		Student ID														
Question		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Solve $2x-8=0$																
2 Find $\sin 20^\circ - \cos 70^\circ$																
3 Find coefficient of r in $2^r r$																
4 Age now is x ; Age after 5 years?																
5 $\sin^2 X + \cos^2 X = ?$																
6 Find R given $1/R = 1/2 - 1/3$																
7 Distance from origin to the point (4,3)																
8 Find $\csc A$, given $\sin A = 2/3$																
9 Area of a rectangle given its length and breadth																
10 What is $(x+y)(x-y)$ equal to?																
11 Simplify: $2x-5y+3y+6$																
12 Evaluate $3x-2y-4$ when $x=1$ and $y=2$																

Figure 2 Performance in a Basic Mathematics Test, 10 weeks prior to the SSLC examination

The green slots (less than one-fourth) were the only right answers, the yellow ones partially correct and the red ones correspond to wrong/no answers. It is noted that none of the 15 students got all the questions correctly, nor was any question answered correctly by all. The marks ranged from 0 to 9.5 out of 12 with a mean of 3.5, a standard deviation of 2.5. This low performance was corroborated by a low class average of 13.9 marks in Preparatory Examination-1 in Mathematics with just 3 out of 15 securing pass marks. The data on the other subjects were similar.

The school management realized that the reason for such bad scores is mainly due to the ineffectiveness to learn through video classes at home. There were frequent breaks in online classes for these students due to poor living conditions and additionally, there was no support or guidance at home to fill

the learning gaps. The long duration of skipping the school environment widened this gap so much that merely giving more practice tests by itself was not likely to work for them. It was then decided to help the students pass this key examination, adopting a new scheme involving the willing volunteers, summarizing each lesson of each subject crisply to be read along with the help of the volunteer, and emphasizing on the guidance component that educated parents would have provided in such circumstances. SKVM with its positive management and disciplined students thus decided to implement a novel scheme called Guided Offline Approach to Learning (GOAL).

IV. THE SCHEME

It was decided to assess the initial impact of GOAL initiative when the first batch of SKVM students take their first-ever public examination conducted at the end of their 10th grade [1]. Unlike online modes where the student needs net connectivity to attend live classes, the "offline" mode of GOAL is asynchronous, with the delivery of the learning materials decoupled from its consumption by the student. In other words, the students can access the contents on their own schedule, without the need for net connectivity. This introduced the much-needed uniformity of access to all students. However, access does not guarantee success automatically. Guidance is needed for each of the students, and the teachers needed external help in this regard. As academic support from parents was absent and tuition/tutoring classes were unaffordable/unavailable, there was need to support this void with a volunteer. SKVM fortunately has access to willing volunteers from far and near. But those volunteers, in turn, needed occasional guidance and hand holding from someone conversant with the subject matter and pedagogy. GOAL adopts a Hub and Spoke model with one Virtual Mentor (VM) for each student, as illustrated in the Fig.3. Super mentor is part of the school management. Super Mentor is the critical interface between the school and the mentors.



Figure 3 Hub and Spoke model for GOAL

SKVM enlisted volunteers as Virtual Mentors (VM) for one-on-one coaching and mentoring of the students. These volunteers are spread out across the globe and sign up out of interest in mentoring the village children to enhance their school performance. It was also necessary to assess the students on a continuous basis. This workflow is depicted in Fig. 4. GOAL intervention was started on Jan 15, 2022 and continued all the way till the final examinations that started 72 days later. As the board conducted a Preparatory examination 5 weeks prior to the final examination, we have taken that as a baseline to measure how much improvement could be achieved in that interval.

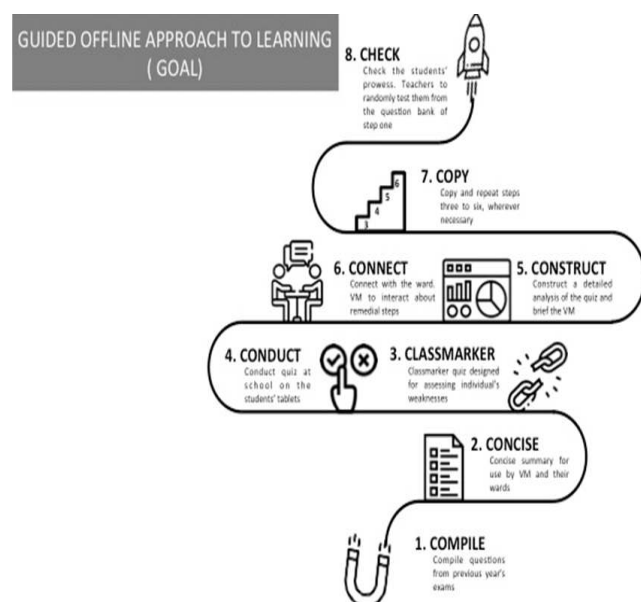


Figure 4 Overall workflow in the implementation of GOAL

Throughout the intervention, the students regularly took quizzes in the school with their tablets connected to a local WiFi hotspot. There were several specially designed quizzes for assessment that the students took regularly on a Learning Management System. Table 1 illustrates the way student responses to the quizzes were used in GOAL. They were used by the super mentor as keys to guide VMs when mentoring students, and get the students back on track at the earliest.

Table 1 Contrasting Assessment of Learning with Assessment for Learning

	Assessment of Learning	Assessment for Learning
Purpose	To grade the students to rank and filter them	To pinpoint where a student lacks in order to remedy the poor performance
Example Using the quadratic formula, find the roots of the equation $x^2 - 5x + 6 = 0$	- Score 2 if 2 and 3 are the two roots - Score 1 if only one of the above roots is found - Score 0 if neither is found	Different students may fail to answer for different reasons like not knowing: - How to read off the a,b,c values of a standard quadratic equation - That "a" is to be read off as 1 - The solution in terms of a, b, c - To find the value of $b^2 - 4ac$ as the discriminant - To know that $(-5)^2$ is 25 - To find square root of the discriminant - That (-5) is 5 - Using + and - in the standard form of solution to get the two solutions - Applying BODMAS to evaluate $(-(-5) + 1) / (2 \times 1)$ - Verifying that when $x = 2$ or $x = 3$, LHS = RHS

A central team in the school analysed the responses and generated feedback to VMs, teachers and quiz creators. This scheme was able to pin point and address specific weaknesses of each student. Once the learning gaps were identified, they were quickly remedied by VMs through the aforementioned one-on-one coaching/mentoring. The continuous process of evaluation and feedback and the short turnaround time is the lynchpin of the scheme. GOAL was continued in the school as a supplement to classroom instructions. The teachers were very much in the loop. They went out of the way to correct errors in the answers with utmost patience.

Besides lacking confidence in arithmetical and algebraic manipulations, many students had difficulty in understanding English terminology. It was found that merely making them do more exercises of the same type was counterproductive to the extent that the students were losing confidence. Hence the focus was on getting these fundamentals right using the guidance provided by VM. It was interesting to see how the VM's went about this task without hurting the student's ego with comments like "even a third standard student knows that 2 divided by 2 is 1", but by anticipating the point where the ward may go wrong and making him/her say the right things at the right time.

The super mentor and his team were able to use this granular data to profile each student in terms of lacunae in their concepts/skills that was affecting their performance across subjects. This aspect was briefed to the VM of each student and the remedial measures were arrived at. The quick turnaround time of this assessment-feedback-remedy cycle helped the students see for themselves how they were improving each day. This positive spiral helped in boosting up their confidence. Prior to the implementation of GOAL, each student was concerned about getting more marks than his/her classmate. Now they were in fact willing to learn from each other, and so the class average as well the individual scores for each of the students were showing an upward trend. The already tried out scheme of Peer-to-peer Learning Among Youth (PLAY) [2] in this school led to the students helping each other instead of competing for a better ranking within the class.

V. THE RESULTS

The table below summarises the performance parameters in the SSLC examination, as compared with the baseline data derived from the Preparatory examination-2 conducted 5 weeks before the final examination. One of the foremost objectives of GOAL is that it should push up the mean score of every student. This should then show up in the variance in their scores to be around the same value. This is precisely what was achieved as shown in Table 2.

Table 2 Improvement of 21.2% across 6 subjects

	Mean	S.D.
Baseline	40.7%	18.7%
SSLC	61.9%	18.4%

During the final 5-weeks of intensive application of the GOAL scheme, the class average marks improved from 40.7% to 61.9%, and the standard deviation of this score

remained just the same. This goes to suggest that every student was able to gain the same extra yard by the GOAL scheme, with about 21% more marks improvement between the Preparatory-2 and final examinations, both of which were conducted by the Karnataka Secondary Education Examination Board.

Fig. 5 shows the class average score in Mathematics that was typically showing a positive slope of about 0.03 marks per day during the 91-day period of 4 Oct 21 till 3 Jan 22. After the introduction of GOAL in mid January 2022, the same slope shot up to about 0.42 marks per day, a 14-fold increase, sustained for 72 days (from 15 Jan to 29 Mar 2022).

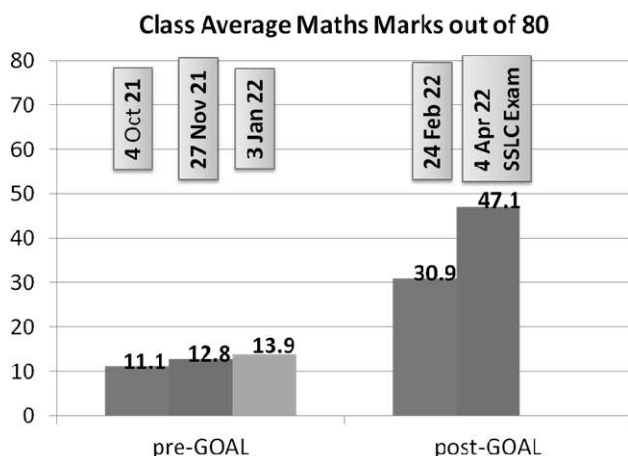


Figure 5 Steep Rise in Trend after GOAL intervention

One other objective set for the intervention was that no one is to be left out and even as we work towards pushing the mean score of the class upward, the variance in the score should not significantly increase. In other words, the normal distribution of the student scores should move to the right, without making it wider. It is gratifying to note that the SSLC examination scores have moved up uniformly for all the 15 students in all the 6 subjects over the 72-day period of this intervention. The standard deviation of the scores in every subject in the SSLC examination as compared to the baseline performance of the previous month is around the same value. E.g., in Mathematics stand deviation was 15.8 in Preparatory-2 and in the final examination it was 16.8.

Table 3 presents the improvement in performance in two representative subjects, taking the Preparatory exam-2 conducted by the board in February 2022 as the baseline. The same comparison is depicted in Fig. 6.

Table 3 SSLC Performance versus the Preparatory-2 Examination

	Maths Mean (out of 80)	Science Mean (out of 80)
Baseline (Prep-2 exam) Feb 2022	30.9	23.6
SSLC Exam Mar 2022	47.1	38.4
Improvement	16.2 or 20%	14.8 or 18%

Table 4 presents a comparison how the intervention helped the students clear the examination with pass marks. At the baseline only 6 students cleared all subjects, whereas in the final 12 of the 15 students passed in every subjects and the other 3 have a few subjects to clear in a supplementary examination. In the Social Sciences examination, all the 15 students passed with one student scoring 100%.

Table 4 Pass in SSLC examination compared to Baseline

	Pass in all 6 subjects (out of 15)	Pass in Social Sciences (out of 15)
Baseline (Prep-2 exam) Feb 2022	6	8
SSLC Exam Mar 2022	12	15
Improvement in Pass	6 more students	7 more students

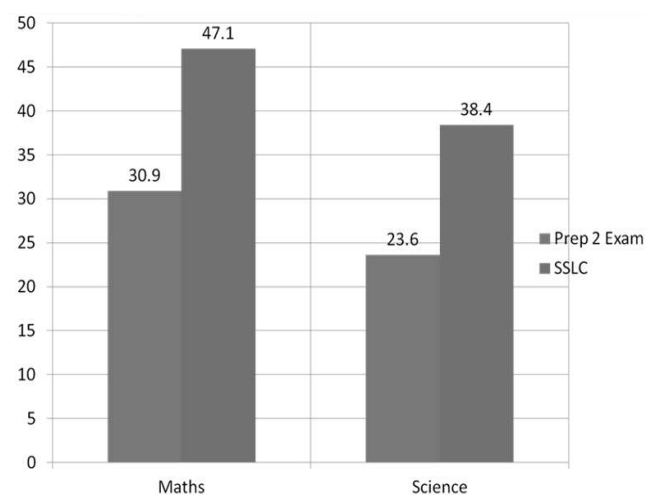


Figure 6 Distribution of SSLC Marks compared to Baseline

Fig. 7 depicts how the distribution of marks aggregated for all the 6 subjects was showing an improvement in the final examination as compared to the Preparatory-2 examination, with the variance of the data being nearly the same. This was an important objective set for the intervention when it was implemented for SKVM.

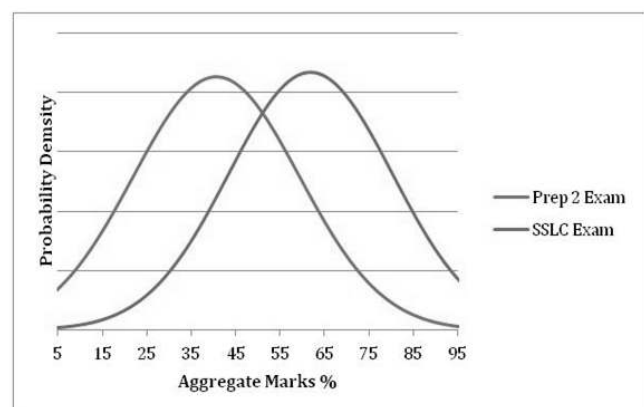


Figure 7 Performance in SSLC with reference to the baseline

VI. THE LESSONS LEARNED

By implementing GOAL for these 15 students who took their first public exam in March 2022 and with the good performance of theirs in the final examination, we learned specifically:

- Time is not a major factor. Despite working on the model for only about 10 weeks, examination performance could be improved. E.g. in Mathematics, from 3 out of 15 to 13 students passing out of 15.
- It is vital to assess continuously students to find out why they got a question wrong or why it went unanswered
- The answer to a question can be different for different students thus remedial measures will also be different. "The one shoe fits all" approach will not work
- The quick turn around time for fixing the problem is only feasible if the VM associated to that student is made aware of it using technology, and coached appropriately
- The scheme does not ask for sophisticated gadgets, broadband connectivity, or high bandwidth digital contents
- Guidance and handholding is critical and must be timely. This may require scheduling mentor sessions to suit the student's as well as the mentor's convenience
- The VMs need not have to possess specific depth of knowledge or pedagogy for all the subjects
- The mentors must be supported from the super mentor as and when needed to boost up their confidence and commitment
- The success was largely due to the commitment of the teachers and the VMs, their availability at the crucial times, and their ability to establish the right rapport with the student. Students must also commit to work with the remote VMs, despite the high stress of examination and the expectations.

VII. SCALING UP

The success of this small-scale pilot is noteworthy as significant improvement was achieved with the GOAL intervention, boosting up the pass percentage in the first ever public examination to a creditable 80% against all odds. Though the sample size is small the results are significant. The key to this scheme are:

- (a) the regular availability of curated contents directly to the students,
 - (b) providing guidance as needed by an assigned mentor working under the overall management,
- © feedback obtained by conducting frequent assessment for learning.

To scale up the GOAL scheme, we note that the students do have a common curriculum and a common schedule for the examination so that their needs are mostly simultaneous across multiple schools in a region.. A satellite signal is broadcast by nature and effectively supports a one-to-many architecture[3]. Schemes proposed by the author in earlier papers [4,5] are built around an always-on satellite link which can deliver the digital contents, including notes, just-in-time

tips, and quizzes for assessment of learning. We can then deliver from the central node the best of the selected curricular content to as many, all at once, and as needed without worrying about network congestion and costs. The students then have an offline access to the learning material. As far as regularly supporting the mentors from the central node, we could use just-in-time coaching based on the analysis of student responses to the feedback quizzes and delivered to them by the satellite link itself, supplemented by web-based doubt clearing sessions as needed.

As far as the guidance component of GOAL, every school may not have the advantage that SKVM had, in terms of a pool of willing volunteers. Whenever feasible, the first level the VM's role can as well be played by the parents if they are reasonably educated, provided the scheme is managed centrally, includes the quiz-response-feedback loop, and implemented as an ongoing project. The rural schools can employ and train facilitators as teaching assistants who can play the role of VMs. Over and above this, there are always NGO's and retired personnel wanting to volunteer if only it is part of a well-defined mission.

This entails and enables:

- A central repository of curated contents and support team for the mentors on the field
- A local satellite-linked server with preloaded contents made available in the school
- Targeted broadcast via satellite to keep the server up to date
- Each student with one's own tab, used only for the academics (no SIM card and no distractions)
- Students, teachers and mentors logging in on the local WiFi
- Machine-to-Machine (M2M) transfer of files between tabs and the server
- Access to the quiz responses by the central team
- Targeted delivery of the feedback on the student from the centre to the mentor

VIII. CONCLUSION

Unlike online classrooms, which are subjected to digital divide and possible distractions, the proposed hotspot for offline learning scheme makes the preselected learning material available for use in environments of no connectivity. If this is coupled with mentor-assisted individualised learning, we have the advantages of both teacher-centric and student-centric learning. The results of this small pilot are testimony to the benefits of the GOAL approach.

IX. ACKNOWLEDGMENTS

It is a pleasure to acknowledge all the teachers of X standard at the SKVT who went out of their way and involved themselves in the project. Thanks are due to the team of Virtual Mentors, who rose to the occasion and made sure that their wards would succeed. All the members of the school management were actively involved and their efforts are gratefully acknowledged.

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