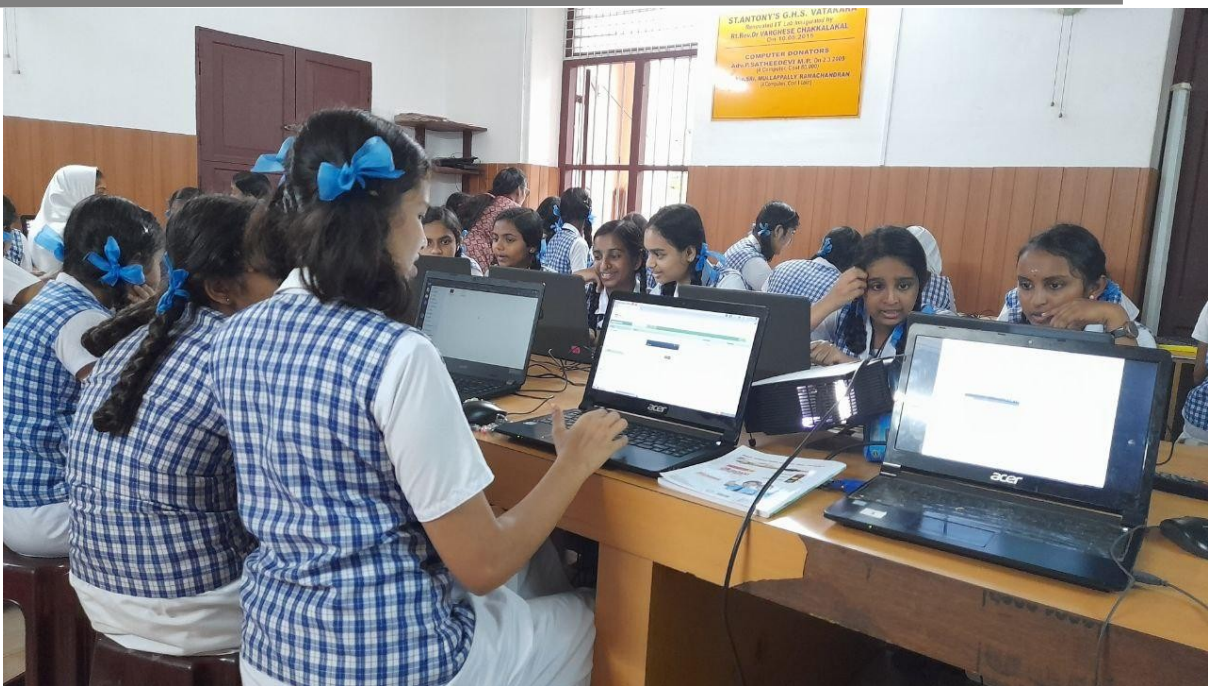


Soaring High - an Impact Study on Little KITEs, Kerala's Pioneering Digital Literacy Programme



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Document Information

Soaring High - a document on little KITEs, Kerala's Pioneering Digital Literacy Programme

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Abbreviations and Acronyms

Abbreviation	Expansion
Digi-Tech	Digital Technology
KITE	Kerala Infrastructure and Technology for Education
LK	Little KITEs
ICT	Information and Communication Technology
MTs	Master Trainers
STEM	Science, Technology, Engineering and Mathematics

Introduction

In 2018-2019, the Kerala government introduced 'Little KITES' (LK) IT clubs in government and aided schools to help students gain digital technology (digi-tech) literacy skills. These clubs aim to enhance students' curiosity and help them explore opportunities brought about by digi-tech, apart from learning about the larger social impact of these technologies. Students are expected to not only learn to use these technologies but also contribute to the development of new software and tools and share their learnings with one another. The programme also promotes important life skills such as critical thinking, creativity, problem solving, collaboration, communication and decision making; these are also emphasised in the UNICEF life skills framework.¹

LK is an initiative of the 'Kerala Infrastructure and Technology for Education' (KITE), a not-for-profit company, incorporated by, and a part of, the Education Department of Kerala. LK features over 1 lakh student members and runs in over 2,000 government and aided high schools in the state. These clubs have become the largest IT association of children, not only in the country, but also in the world. The objectives of the LK programme are:

1. To hone students' interest in Information and Communication Technologies (ICTs) and create a culture for the appropriate usage of technology.
2. To help students learn the different dimensions of ICT tools and use them in their learning activities.
3. To ensure the participation of students in the usage and upkeep of ICT equipment at schools, thereby increasing the ownership and productivity in ICT enabled learning.
4. To empower students to maintain ICT equipment, by rectifying any minor technical issues.
5. To enrich students' understanding of safe internet usage and Cybersecurity, and also to inculcate the importance of language computing.

LK clubs are established at the school level and comprise high school students (grades 8, 9, and 10). A school running the LK programme typically has two teachers, who are appointed as 'LK masters'. They facilitate the sessions and activities designed as part of the LK curriculum and guide students in their learning and projects.

Objectives of documenting the LK programme:

1. To study the programme and its activities since its inception in 2018-19.
2. To identify good practices and areas of improvement, including for up-scaling and sustaining the programme.
3. To provide information that can help to promote adaptation in other contexts / states of India

Scope and methodology of the documentation

The documentation focused on how various programme-related activities were implemented. 'IT for

1 <https://www.unicef.org/india/media/2571/file/Comprehensive-lifeskills-framework.pdf>

Change’ conducted personal interactions, group discussions, and online surveys with students as well as teachers, master trainers, government officials, and parents. Process documents and other relevant records were also examined at state and district levels.

Broad questions for the documentation

1. How are students benefiting from the programme?
2. What role do teachers play with respect to programme implementation?
3. What were the enabling and disabling factors, if any, associated with the implementation?
4. What are the perspectives of different stakeholders with respect to the programme? What would be some feedback or possible areas of improvement in the implementation process, including for scaling up and sustaining the LK programme?

Documentation methods

For this documentation, more than 1,000 stakeholders across Kerala were interacted with, through:

1. Face-to-face interactions - These interactions provided clear insights into the programme and helped us understand the perspectives of the stakeholders. They also provided opportunities to explain and clarify any questions or concerns the participants had.
2. Group interactions - These interactions were conducted with students who are members of LK Clubs. These interactions often consisted of lively discussions.
3. Survey - A questionnaire was distributed online which enabled a larger number of teachers from different parts of Kerala to participate in this documentation.

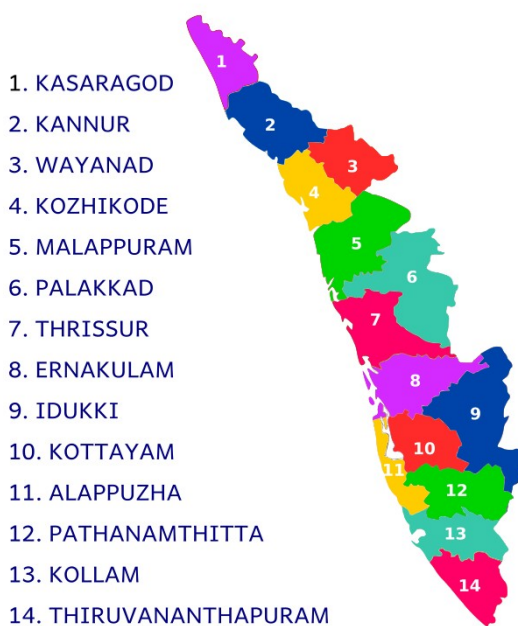
Selection of stakeholders for interactions

During field visits, the team focused on interactions with teachers and students in regions covering six districts such that they were representative of the varied educational contexts in Kerala. The districts (regions), which are highlighted in the adjacent Kerala map are:

1. Kozhikode (green) and Malappuram (North Kerala)
2. Thrissur and Ernakulam (Central Kerala)
3. Trivandrum and Kollam (South Kerala)

The study team visited 20 government and government-aided schools in which the LK programme is implemented. During the visits, the teams covered schools with large and small student strengths, schools located in rural and urban areas, and schools located in hilly areas near the

DISTRICTS OF KERALA



1. Figure: Kerala district map (source Wikimedia Commons)

Western Ghats. The twenty schools that the team visited were selected after consulting the state coordinator and the district coordinators of the LK programme. The team interacted with around 100 students, around 40 teachers and 10 parents in one-one-one interactions, and about 800 students in group discussions. 140 teachers participated in the online survey, which included an interaction followed by the filling of a questionnaire by teachers from all 14 districts in Kerala.

The Genesis of LK

In 2004, Kerala Government decided to train and equip school teachers working within the public education system to teach IT in schools.

The government did not want to outsource the task to any external agencies. This is in contrast with other state governments, most of who adopted the BOOT (Build Own Operate and Transfer) model,² in which the programme implementation was outsourced to a private company. The adoption of an ‘in-house’ model of IT education, allowed the system to benefit from capacity building of teachers and the ownership of the infrastructure by the school.³

The [ICT@School](#) scheme implementation provided ICT equipment to government and aided high schools in Kerala. The ‘in-house’ design required the schools to appoint a dedicated staff member to manage the use and maintenance of the new equipment. One subject teacher in each school was assigned the role of the School IT Co-ordinator (SITC), and a group of students (in grades 8 to 10) was given the responsibility of supporting the SITC and each member of this group was called a Student School IT Co-ordinator (SSITC). The SITC and the SSITCs ensured the effective implementation of IT activities in schools. KITE, then known as IT@School, gave detailed hardware and electronics training to SITCs and SSITCs. This training equipped them to solve minor technical glitches in the IT infrastructure.

In 2016, the State Government undertook the Public Education Rejuvenation Mission.⁴ As part of that, the SSITC network was renamed ‘Hi-School Kuttikootam’ The objective of this was to contribute to the modernization of public education by streamlining ICT-based activities. In the ‘Hi-School Kuttikootam’ programme, students were given intense training in five areas such as Animation, Cyber Safety, Malayalam Computing, Hardware and Electronics, was structurally upgraded following the ‘Student Police Cadets⁵’ model, in which students formally engage with an area of learning over a few years.’ In the two following years, more ambitious plans to implement hi-tech projects in schools led Hi-School Kuttikootam to be restructured as Little KITEs under in January 2018. LK units were formed in schools during 2018-19. A few more topics, such as “Development of Mobile Apps, Programming, Robotics, E-Commerce, E-Governance, Video Documentation, and Web TV” were later added to the LK curriculum.

2 Read a comparison of the Kerala ‘in-house’ model with the BOOT model adopted in Karnataka, in the [policy brief](#) written by IT for Change in 2009.

3 Certain features of the LK programme which are valuable for adapting in other geographies are *highlighted in italicised blue font* in this document.

4 Information about the ‘Public Education Rejuvenation Mission’ is available in its [evaluation report](#).

5 Information about the Student Police Cadets programme is available on its [website](#).

Formation of LK units in schools

Selection of Schools

Schools interested in hosting the programme apply through an online portal provided by KITE. On the portal, the schools supply specific data with respect to the availability of computers and computer labs, internet availability, hi-tech classrooms, and the willingness of PTA for setting up an LK unit. After receiving an application from a school, KITE verifies the details. If the school's infrastructure availability meets the specifications, KITE would approve the registration of an LK unit in the school.

While in other state programmes, the provisioning is 'supply-driven', that is, the state government /department decide which schools will implement the programme, in this case, it is 'demand-driven' – interested schools can apply and those fulfilling the norms, are selected. Demand-driven model usually leads to higher ownership and commitment on the part of the school and the teachers, as only those interested in hosting the programme will host it eventually.

Selection of Little KITEs members and Masters/Mistress

The Head Teacher of a school nominates two teachers to coordinate the programme in the school. To select Little KITEs members, an online aptitude test is conducted for eighth standard students. It consists of questions that test the students' knowledge of IT, mathematics and logical reasoning. Between 20 and 40 students who top the aptitude test become LK members in a school, and each unit has a Unit Leader and a Deputy Leader.

Financial assistance is provided by KITE to schools to set up Little KITES clubs. The performance of each club is monitored rigorously on set parameters and grades awarded. Those Clubs who fail to perform well, will be de-recognised. Considering the various clubs in schools, those students who are not part of any other clubs but have a keen interest in IT are given preference to join Little KITES. The activities of the Little KITES units are monitored by the KITE Master and KITE Mistress.

Each school's LK unit consists of three such batches of students in grades 8, 9, and 10, totalling a maximum of about 120 students. If a school has a greater number of eligible students, the school is permitted to have additional batches to accommodate all the qualifying students. A minimum number of 20 qualifying students (the minimum is 15, if the number of students in grade 8 is less than 30) is necessary for a school to form an LK unit.

Curriculum

The LK curriculum implemented by KITE has been prepared by the academic team of KITE and the Resource Persons. It consists of animation, robotics, programming, development of Mobile Apps, AI, Malayalam Computing, Hardware and Electronics, media training, cyber safety, E-Commerce, E Governance, Video Documentation, and Web TV, is spread across three years and includes activities conducted within and outside the school.

The schools conduct classroom activities once every week after regular school hours with all students of the LK unit, facilitated by the LK masters. The students are given digital and printed copies of the handbooks. All students are expected to participate in and complete the specified activities. The

activities are guided by the teacher in grades 8 and 9, while in grade 10, the students are assigned individual and group projects.

KITE conducts camps at sub-district, district, and state levels, where the students selected from each school get opportunities to explore beyond the activities conducted at the school level and learn to use advanced tools in the areas of their interest. For each higher-level camp, students are selected based on their performance and participation in school-level activities. Students also fill out a self-evaluation form.

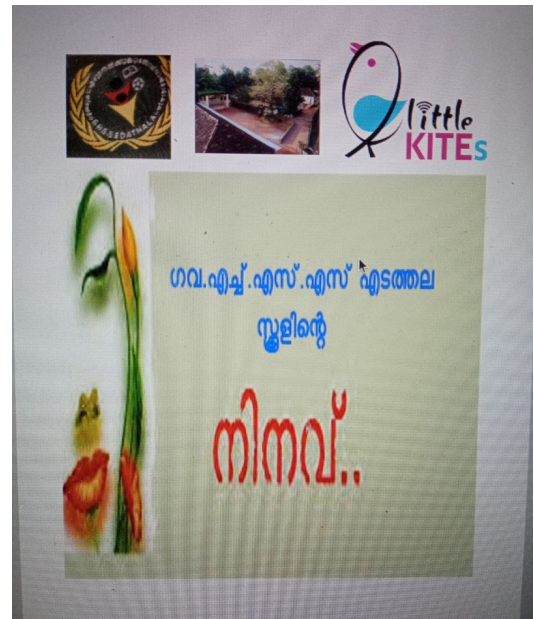
Using their training in animation, programming, Malayalam computing, media training, and cybersecurity, students prepare the school magazine, organise and document school events, maintain the school wiki page, and engage in additional activities that help fellow students and the local community. Many schools have developed and published digital magazines as a result of their students' training in Malayalam computing.

The widespread practice of using the LK infrastructure to design, develop and publish school magazines is another indication of the leveraging of ICT infrastructure by the school, to meet its own needs, going beyond the specific aims of the programme which provided the infrastructure.

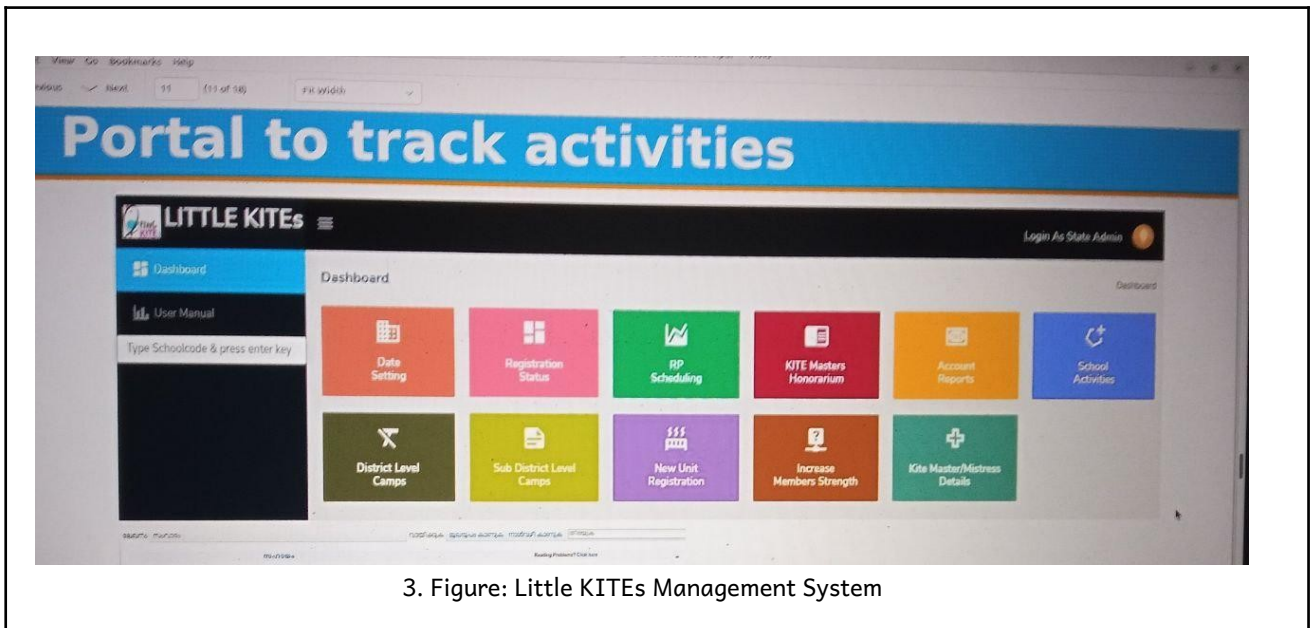
Teacher preparation and support

Typically, two teachers in a school are nominated by the HM to become LK masters based on their interests and digi-tech skills. The LK masters undergo a mandatory five-day face-to-face and hands-on training, conducted by KITE Master Trainers (MTs) covering all components of the LK curriculum. Refresher training sessions are conducted when there are curriculum revisions or teacher transfers. The LK curriculum undergoes periodic revisions based on the requirements of the students and technological developments. For example, recently, new activities were introduced in robotics, and to carry out these activities new components were provided with their Arduino kit. Each robotic kit consists of Arduino Uno Rev3, LEDs, SG90, Mini Servo Motor, LDR Light Sensor Module, IR Sensor Module, Active Buzzer Module, Push Button, Bread Button, Jumper wires and Resistors.

The LK masters are responsible for ensuring that students complete the activities specified in the LK curriculum while supporting them in their individual and group projects. Furthermore, a digital handbook is provided to teachers to facilitate classroom sessions and activities. Teachers update the list of students, attendance, activity logs, etc., on a common portal called Little KITEs Management System (LKMS). This, along with the regular school visits by MTs, helps KITE track the functioning of the LK unit and provide any required support to the LK masters.



2. Figure: The digital magazine of Govt. High School Edathala



However, LK clubs at the local levels have the freedom to introduce new activities if they broadly fall within the aims of LK (See box on Community connect for an illustration).

Community connect

In a school in a remote town near Ernakulam, the team found that most students were from socio-economically marginalised communities with several parents being illiterate and/or poor. The students of the LK unit there set up a 'help desk' on the campus, where anyone could walk in and seek help to pay their electricity/water bills, update details on their Aadhaar and other ID cards, and get assistance for any other IT-related issue. The event was received very well and saw many community members benefitting from the initiative. The students plan to hold more such events and also conduct awareness sessions in the community about Cybersecurity.

Infrastructure

All the necessary equipment for the LK activities such as Arduino kits, laptops, and cameras are provided by KITE to each LK unit. The strength of each unit determines the number of the equipment given to the students. The computers used for the students' IT classes are also used for LK such that the student-computer ratio is maintained at 2:1. Students themselves are entrusted with the upkeep of all gadgets and equipment. The use of the same ICT infrastructure for different programmes of the school can be considered an efficient use of resources.

ICT infrastructure must be considered 'general purpose infrastructure' and provided to a school for a variety of requirements, rather than make it as a provision for specific programmes. The same computer can be used to play videos, host educational software applications and support school administration data processing and decision support. However, in many cases, computers have been provided to schools by governments, under specific programmes and generally not much leveraged beyond that purpose.

Observations and Analysis

Voices of Students

High value perception

The LK programme is a great opportunity for promoting collaboration and self-learning among students. The documentation process revealed that students have an eagerness to learn, and while they are competitive, they also possess the spirit of teamwork and help one another to complete tasks and projects. The members also help other students in their school with what they learn as part of LK activities. Students revealed that the programme has helped boost their confidence and skills related to technology. Almost all students believe that what they have learned will benefit them in the future.

All students responded positively to the question whether LK was helpful for them. About 60% of the students found it helpful because they thought that the topics taught in the programme were important for their future and their careers. About 30% of the students found the programme helpful because they learned about new technologies and gained crucial IT skills. Graphics, animation, and creating games in 'Scratch' emerged as favourite activities among students. Interestingly, one student claimed that IT knowledge could teach them about computer models, which can in turn help them learn advanced physics and chemistry.

Aspiring to learn more and do more

A student from a school in Malappuram shared with us his observations about the LK programme and what it taught him. So far, he has used OpenToonz to create animation and added audio to it using Audacity. Now, he wants to learn how to code in Unity so that he can make better video games and animations. In the future, he says he plans to build a car racing game using AI that would allow gamers to race against earlier versions of themselves at different skill levels.

Moving from CBSE school to Aided school

A student from Malappuram said that he had studied in a private CBSE school till seventh grade. In his eighth grade, he moved to an aided school in Malappuram and the LK programme gave him lots of opportunities to pursue his deep interest in animation. He has used the Blender tool to create several creative animations at the district and state levels. For this student, the move to the aided school was something that he is very happy about.

This shows that LK has made the government-supported education system in Kerala an attractive option.

When it came to the question of what could be made better, most of the students felt that they needed more hours to work on LK activities and highlighted the need for additional laptops for them to work on.

Many students also felt that they needed more time in the LK programme. Meanwhile, nearly 10% of the students felt that they faced no problems because they had computers at home, which gave them enough time outside school hours to practice.

Time – the only challenge

One student from Malappuram said, “I feel time is the only challenge. We want to learn more about certain things that we like.” This remark was heard many times by the team.

A few students suggested making LK lessons available for all students, avoiding making it aptitude test based. They also suggested providing more learning opportunities to students who show greater interest, as well as providing in-depth engagement with topics to make difficult activities easier to understand. Some students expressed the view that the LK programme should include lower classes as well and begin in 5th grade. The participation of more students from different classes would expand the scope of the programme, allowing many more students to benefit from it. They also wanted more opportunities to teach others so that they could learn more.

One-fourth of the students who participated in interactions suggested that more concepts on robotics



4. Figure: Group discussion

and AI should be taught during LK classes, and close to one-fourth suggested that higher-level programming should be taken up as new activities. Apart from these, students expressed interest in conducting more awareness sessions for parents and primary school students through LK on web design, 3D printing, field trips, etc.

These suggestions indicate that students see great value in the LK programme and hence would like to have ‘more of it’.

A primary purpose of school education is to build/strengthen the desire to learn and the ability to learn (‘learning to learn’) in children, and LK has fulfilled this purpose of strengthening ‘self-directed learning’ to a large extent. Academic programmes that provide a high level of autonomy and agency to teachers and students, with curricular content seen to be highly relevant and pedagogies that are participatory, collaborative and constructivist are well-placed to support such ‘self-directed learning’ in students. The focus of the programme is ‘learning’ and ‘learning to learn’ and not writing examinations that largely test memory.

School and community

Social activities such as ‘Satyameva Jayate’, and ‘Amma Ariyan’ (see box below) were appreciated by students. They felt that topics like Cybersecurity and phishing awareness are very important. This shows that the programme has been able to inculcate a sense of social responsibility in addition to building technological capabilities.

Satyameva Jayate

This major digital media literacy programme was organised in 2021-22 for 19.66 lakh students and 2

lakh teachers, who were trained to distinguish between fake and genuine news. The goal was to make the public aware of the spread of fake news using digital media. The training was conducted in three phases.

In the first phase, classes were streamed on the KITE Victers YouTube Channel during the Covid-19 pandemic. In the second and third phases, teachers were trained on specially prepared modules on the internet in daily life, right and wrong practices on social media, filter bubbles, healthy internet usage, etc. Through this project, all LK members were able to ensure a basic understanding of cybersecurity and educate their parents on the safe use of mobile phones and the internet, as well as the application of cyber technology.

Amma Ariyan

The LK programme initiated a cyber safety awareness campaign in 2019 for parents, subsequently the LK programme has trained more than 4 lakh mothers on the safe usage of smartphones and the internet, setting up and using passwords, safe handling of OTPs and PIN, recognizing fake news and guarding themselves against cyber attacks. The main idea behind the 'Amma Ariyan' project was to raise awareness among parents about Cybersecurity issues through their children.

While the use of the school ICT infrastructure by the local community is a principle that has been discussed in policy documents, this has proven very difficult to implement. More than the use of devices, it is possibly much more valuable to focus on the building of larger literacy of the digital world, to reduce vulnerabilities of the adult population, the LK programme has been able to demonstrate this.

Though there is a long way to go in the integration of the school as a community institution of learning, the LK provides a role model to envisage this. The 'community connect' box item discussed earlier also indicates the potential of LK to meet the digital needs of the local community.

Philosophy of technology (Free and Open Source Software)

A few students felt that they would need to be proficient with the Microsoft Office suite while looking for jobs in the future, so they requested to be trained on it alongside Ubuntu. However, in line with the efforts of the Kerala government, the students need to be helped to understand the practical uses as well as philosophical reasons behind the adoption of Free and Open Source Software (FOSS). If they are sufficiently convinced by the arguments in support of FOSS, it is less likely that they would ask for training in proprietary software.

In case they have to work in an institution that uses proprietary software in the future, the training that they receive in the LK programme would easily equip them to make that transition. This is because, the basic functionality offered by an Office suite remains mostly the same, whether it is Microsoft Office, or LibreOffice. Just as we learn to drive a car, not a Hyundai Santro or a Maruti Swift and can drive one if we have learnt on the other, anyone who is conversant with LibreOffice can easily work on Microsoft Office. The focus on learning is therefore on the 'process' (such as text editing) and not a product.

Consumers to Creators

One student from Malappuram strikingly said, “Until now we were only playing games, now we are making games.” This is a recurring opinion the team came across while interacting with the students. The LK programme seems to have inculcated in the students a sense of being able to accomplish tasks that they did not consider taking up previously.

The world of FOSS is a world of creation, as teachers and students can work on the application and add extensions. Such creativity is not possible with proprietary software, as the vendor does not permit any modification or replication of the application.

At a macro level, FOSS has had many advantages for KITE.

1. The savings from using FOSS has enabled KITE to provide more hardware to the schools. Students have been able to copy the same software to their home computers.
2. KITE has been able to upgrade the software regularly, creating ‘custom distributions’ of the FOSS packages regularly and sharing these with the schools. Whereas in the case of programmes where proprietary software was used, the software is usually not upgraded as that has licensing cost implications. In such cases the programme software environment becomes obsolete over time.⁶
3. In the case of ‘freeware’ (proprietary software that is provided gratis or free of cost), the continued availability of the software cannot be ensured as the vendor may withdraw the software, or may close down.

A more detailed discussion on the choice of FOSS is provided in a subsequent section.

STEM for Girls

It has been observed that LK plays an important role in promoting STEM (Science, Technology, Engineering and Mathematics) disciplines among girls. The following table lists the numbers of boys and girls in the last three batches of LK: (note that programme was introduced in 2018 -19 and was implemented at scale post-covid)

YEAR	STRENGTH	BOYS	GIRLS	GIRLS (% of total)
2021-24	64,832	31,877	32,955	50.83
2022-25	65,261	32,259	33,001	50.57
2023-26	67,318	33,595	33,723	50.1

The above table (source:KITE) shows that girls are equally represented in LK as boys. KITE (specifically, LK) has been able to improve girls’ participation in STEM, thus making it contribute to gender inclusiveness.

⁶ Policy Brief on In-house v/s outsourced models, IT for Change 2009

Promoting STEM amongst girls

A striking social good of the LK programme is the way it promotes STEM among female students. A tenth-grade girl in Malappuram enthusiastically shared her learnings and details of her participation in the state-level camps with us. She said that she wanted to pursue a degree in computer science from one of the IITs. It is evident that the programme makes it possible for students from rural backgrounds to realistically aspire for a future they would have rarely imagined earlier.

In a Kollam government high school, one of the students had participated in the state-level camp for programming. Her case is a good example of how LK encourages greater participation of girls in STEM. In her words, “Teachers have encouraged me a lot. LK has given me an opportunity to explore many things. I never imagined making it to the sub-district camp, let alone reaching the state-level camp. I was the only girl from Kollam in programming, and in the state-level camp, five students were selected, of which, again, I was the sole girl. It made me feel very good.” Such events can have an enormous impact on the self-confidence of participants and make some students start considering richer futures.



5. Figure: Active participation of girls is a happy feature of the LK programme

Views of teachers

The team asked the teachers questions on the various aspects of the LK programme, such as the objectives and the effectiveness of LK, the training they received, positive changes in students’ learning skills and attitudes inculcated by the programme, the students’ socioeconomic backgrounds, the LK curriculum, the functioning of the program in the school, and ways to improve the programme. Key findings from these interactions are discussed in this section.

Teachers' views on training and support

One of the questions in the survey was whether the LK training helped them learn new skills. A large majority of the teachers answered positively. Another question was whether the training they received helped them overcome computer anxiety, which is experienced by some who have little or no computer experience. Nearly two fifths of the teachers who participated in the survey felt that the training helped them overcome computer anxiety. Their comfort bears testimony to the success of the LK training, which also included advanced technology topics.

At the same time, more than half of the teachers felt that they needed refresher training for new and advanced topics, to equip themselves to better teach these. Some teachers requested video lectures/resources for difficult topics they had to teach.

Teacher's views on student participation

Teachers noted that students' engagement and enthusiasm in studies improved as a result of their participation in LK. While one teacher highlighted students' improved mathematical ability, others underscored the students' enhanced problem-solving abilities, and greater sense of responsibility after joining the LK units. Others felt that the knowledge of IT is not just useful in itself, but also acts as a tool that helps students to learn all subjects. Perhaps partly this beneficial impact was due to the curricular content (IT literacy), but partly it could also be due to the participatory and progressive pedagogies used in the programme, where students were encouraged to take initiative, support the learning of peers etc. Many teachers noted that the LK students took care of the digital equipment in their smart classrooms and documented events in their schools. A teacher remarked that to even excel in the domain of art, in the present day, one needs to have a basic understanding of digital technologies.

In the survey teachers were asked how they tried to ensure the participation of students who found LK activities difficult. Many of the teachers felt that peer teaching (students who were comfortable with the activities would teach those who found them hard) was an effective way of dealing with this problem of different levels of understanding. The LK programme has thus supported desirable practices like peer learning, collaborative learning, and peer-teaching among students.

A few teachers noted that some students face difficulties with topics like robotics and computer programming, which require logical thinking. The teachers made sure that their interest in IT was kept alive by helping them focus on topics of interest to them, such as animation. The broad pattern that the teachers had observed was that there are two groups of students, one interested in programming and the other in animation. Teachers said that they would give extra time to students who had difficulties with robotics and programming and would occasionally let them take the laptops home so that they get enough time to practice.⁷ At times, they were also provided with videos that would help them understand the concepts more clearly at their own pace. Some teachers went a step further to lend

7 Since the programme is fully run by the department and school, the entire IT infrastructure belongs to the school system. This enables teachers to take decisions like allowing students to take laptops home. In an 'outsourced' model such as BOOT (Build, Own, Operate, Transfer), where the infrastructure is licensed by an external vendor, this would not be allowed.

individual support to such students, addressing their questions and helping them with their projects. Thus, the programme provided the scope for extending and enhancing the pedagogical practices of teachers, beyond the traditional chalk-and-talk method.

In the tenth grade, LK students do not have classes; they are only required to complete assignments and individual projects. The teachers take special classes for them, if needed, to keep these students engaged with the LK curriculum.

Some teachers thought that LK could be made more effective if students were given a textbook.⁸ In comparison, the LK programme provides ample scope for teachers to play the role of a facilitator who enables the student to learn by asking questions and finding solutions on their own.

Teachers' views on the functioning of the LK clubs

In general, teachers felt that the LK clubs in their schools were functioning effectively. According to them, the students participated in LK activities with great involvement and it led to a deeper understanding of IT-related concepts. Even in schools in rural areas, where the students had little access to IT-related resources, the teachers found the LK students' motivation levels to be high. LK gave the students the possibility of imagining learning which opened up job possibilities unknown to their parents' generation, such as the use of AI and virtual reality.

The teachers also noted that the exposure that students received because of LK positively impacted their personalities and their cognitive abilities. LK students began to take charge of the documentation of activities in their schools and also became self-motivated learners. While making students self-directed learners is the aim of all teaching, the traditional subjects in the curriculum tend to be approached with the attitude of 'syllabus completion and passing the examination' (this is part of the 'textbook culture'). Meanwhile, LK allows for, even encourages, self-directed and open learning.

The main challenges pointed out by teachers regarding the functioning of LK had to do with the shortage of time, given their many teaching and administrative responsibilities. Most teachers felt that they had insufficient teaching time: more than half of the teachers found managing LK classes along with their subject teaching quite challenging. Some teachers who had various additional responsibilities, such as being School IT Coordinators (SITC) and managing the School Management System, Sampoorna, found it difficult to devote sufficient time to LK. Some teachers felt that they needed more time with LK students.

Another suggestion from teachers was to provide further incentives to students to attend the LK programme through additional marks or 'grace marks'. Currently, additional marks are given to only tenth grade students. However, the programme needs to be seen by teachers and students as an important source and area of learning, where participation and learning are understood as the inherent reward. The practice of giving grace marks (as an incentive) is considered to be educationally

8 This may have to do with the teachers' preference for a standard and authoritative source to enhance their teaching, though it is not in the spirit of a programme that is essentially digital in nature. The reliance on textbooks is part of the 'textbook culture' discussed by Krishna Kumar in 1986 ("Textbooks and educational culture," *Economic and Political Weekly*. Vol. 21, No. 30. pp. 1309–1310). This culture disciplines teachers and instils a fear or a distrust in applying more participatory methods of teaching.

undesirable.⁹

Generally, the teachers are happy with the Head Master's/Mistress' (HM's) involvement in matters concerning LK. However, one concern that some teachers had, according to the results of the online survey, was that the HMs do not reduce the other teaching load of the teachers.

Few teachers raised equity related concerns in the programme. They saw a bias in favour of students from English-medium streams and better socioeconomic contexts for LK membership. In schools that have both Malayalam and English medium divisions, the English-medium students were more likely to be in the programme. However, some senior teachers expressed that this could merely be an effect of the increasing number of English medium divisions in government schools. Hence, it need not necessarily indicate that the students who enter the LK programme tend to be those who have greater social capital.

Teachers' views on social initiatives

The teachers had very positive reflections on social initiatives like 'Amma Ariyan' and 'Satyameva Jayate'. The teachers observed that cybersecurity is a matter of great concern and many parents, especially women, wanted more information. They felt that more initiatives of this nature need to be taken up under LK.

The teachers in a school recollected that their students had undertaken an 'Ubuntu installation fest' that displayed their interest in IT as well as their commitment to FOSS.

Regarding social initiatives that can be undertaken by the LK programme, teachers suggested that the LK units should help the public by providing some essential services like the ones offered by Akshaya centers in Kerala, but on a smaller scale (services related to Aadhar, bill payments, etc.). An interesting suggestion was that the students of Little KITES can help in the management of e-waste, which is becoming a major environmental concern. The other suggestions for social initiatives included conducting IT-related training sessions for students with disabilities, and organizing IT awareness programmes for members of the public, especially women and senior citizens. The teachers also suggested conducting sessions on the addictive and other negative aspects of mobile phones. The teachers recalled that the general public had responded positively to the social initiatives carried out under LK.

Parents' voices

Interactions with parents of the LK members showed that they are happy with the learning opportunities that the programme has provided, and added that their children are excited about being a

9 Eminent Educator and education psychologist, Kamala Mukunda has explained in her book 'What did you ask at school today?' the dangers of introducing extrinsic incentive-punishment in education. The joy of meaningful learning must be the primary and intrinsic incentive for the learner and this has to be developed over time. Extrinsic incentives distort the possibilities of developing intrinsic motivation (learning for its own sake). Incentives can be as harmful as punishments (disincentives). It is often believed that punishment is bad but incentive is good. However extrinsic incentives are also harmful. See Kamala V. Mukunda. 2009. HarperCollins. What Did You Ask At School Today: A Handbook Of Child Learning Book 1 .

part of it. Some parents thought that it would be good to have field visits and interactions with IT professionals so that students can get an understanding of the real world applications of the technologies that they are learning in the LK clubs.

One mother who attended ‘Amma Ariyan’ shared: “Awareness about the ways in which new technology changes our lives -- from simple things like setting an alarm on a smartphone to paying electricity bills and using bank accounts -- was new and valuable. The presentation on keeping our accounts secure without falling for online scams and phishing messages was extremely useful.”

KITE leadership and functionaries

In each district, the district KITE team consisting of MTs and the District Coordinator work to support the functioning of the LK units in schools across the district by conducting training for the LK masters, organizing student camps at sub-district and district levels and visiting the schools to support the implementation. The MTs also give inputs into the curriculum design and draw insights from their experiences, which include implementation challenges and the requirements of students, teachers, and schools.

The LK programme is seen by KITE as an important mechanism to build the capabilities of students in digital technologies, so that Kerala can be well equipped to take advantage of the digital revolution. The state has the ambition of becoming a knowledge economy.¹⁰ The government is devising various schemes to utilise robotics, internet of things and artificial intelligence for supporting advanced learning of students, for the development of relevant applications and platforms for the state, and for providing employment opportunities. Training camps would help students in understanding the design, operation and manufacturing of electronic devices.¹¹

Improvements are being made in the curriculum by KITE, to address recent developments in technology.

Universal programme v/s islands of excellence

The Atal Tinkering Lab (ATL) is an initiative from the Union Government to encourage technological innovation in high school students. Many of the features of ATL are similar to that of the LK programme. However, the ATL programme is expensive to set up (INR 20 lakhs) and is hence implemented in a limited number of schools.¹²

Though the ATL programme may be producing islands of excellence, given the prohibitive costs, the programme is not scalable nor sustainable. There is no clear programme to mainstream ATL in the government high schools across the country. Hence it would remain an exercise in inequity.

10 See for instance the article of the Chief Minister - <https://www.thehindu.com/news/national/kerala/towards-a-knowledge-economy-on-the-back-of-social-progress/article67470562.ece>

11 <https://www.eastcoastdaily.com/2023/05/15/students-will-be-introduced-to-robotics-and-artificial-intelligence-education-minister-inaugurates-little-kites-camp.html>

12 https://www.aim.gov.in/pdf/Grant-in-Aid_Fund_Utilization_Guideline.pdf

LK, on the other hand, functions in 2174 schools in Kerala, where the existing ICT infrastructure in each school is used and its maintenance supported on an ongoing basis by KITE. KITE is also keen to gradually expand the LK programme to cover all government and aided high schools in the state.

Digital Technologies can be used to bridge existing socio-economic and educational divides in society by ensuring its appropriate integration in all schools, which is something KITE is attempting to do. On the other hand digital technologies can add to existing divides through a digital divide.

A Note on Kerala Government's Commitment to FOSS

The Kerala government had taken a well-considered and deliberate decision to use FOSS in the public system two decades ago. As it uses FOSS in all government departments, the state saves about INR 300 crores every year in infrastructural costs, according to the State of FOSS Report, 2021.¹³ The promotion of FOSS is not driven merely by the goal of saving money, it also nurtures a philosophy of cooperation, and sharing of knowledge and concern for each other. This is best illustrated by the name of the open source operating system, 'Ubuntu,' a word borrowed from the Southern African language Zulu, which conveys the idea that an individual exists only because of a community). An important strength of LK is the sense of community and collaboration that the programme has instilled in students, this educational value of the programme is perhaps as important, as its technological learning aspects.

KITE ensures that all the computers in government schools run free software-based operating systems, open digital content, and open educational resources. Besides the fact that free software and educational resources incur no charges, they also help unrestricted sharing and editing/revising of educational content among teachers and students. Thus the expansion of the programme to more schools does not require any expenditure on software or content, and only the hardware and connectivity expenses are required to be incurred as needed. KITE has further facilitated the adoption of FOSS in the education sector through several robust initiatives interwoven with ICT, running with the active participation of students and teachers.

Kerala began its FOSS journey in school education in 2002 and the implementation has become quite mature by now. There used to be a strong belief amongst policy makers that 'open source is not user friendly' and 'not usable' and 'there is no support for open source'. Partly such apprehension is due to FUD (Fear, Uncertainty and Doubt) created by proprietary software vendors, who stand to lose if FOSS is chosen.

Not only is FOSS quite usable and user-friendly, there are several philosophical, pedagogical, economic and technological benefits from choosing FOSS over proprietary software. The most important reason is arguably that choosing FOSS allows the implementation of hundreds of useful educational applications, which creates a resource rich environment in schools.

FOSS is an important cause of the benefits from the LK programme, which are documented in the next section.

¹³ <https://state-of-foss.in/the-state-of-foss-report.pdf>

Benefits for Stakeholders

For Students

The programme introduces students to the numerous aspects of IT such as hardware, software, electronics, robotics, and animation and strengthens their technology literacy and skills.

1. LK promotes active learning and supplements classroom education with interactive digital experiences by providing students access to computers, internet, and rich/diverse educational resources.
2. LK offers students the potential to develop skills such as communication, creativity, problem-solving, perseverance, collaboration, critical thinking, information literacy, technology and digital literacy, media literacy, self-direction, social skills, literacy skills, civic literacy, social responsibility, innovation skills, and thinking skills.
3. Students receive specific training in state-of-the-art technologies such as Artificial Intelligence (AI), Robotics, Internet of Things (IOT) and 3D animation. The LK programme offers the students the possibility to perform hands-on experiments with these technologies.
4. Deep and effective participation in the LK programme builds self-esteem and confidence in students, especially those with an aptitude for technology by offering hands-on experiences, and equips them for careers in the digital age.

For Schools and teachers

1. The LK programme ensures schools have the necessary hardware, software, and internet connectivity, usually taking their technological infrastructure and capabilities to a higher level. KITE also provides ongoing support to maintain the technology infrastructure.
2. KITE's training programmes for teachers helps improve their technological skills and they can get better at integrating technology into their teaching methods. This is in addition to the support they get to effectively guide Little KITEs activities.
3. LK creates a lively, nurturing and stimulating learning context for students, which supports active involvement and reduces absenteeism. Learning for the intrinsic joy of it and learning by doing are valuable processes facilitated by the programme. The portfolio method of assessment of students adopted in LK also supports constructivist learning.
4. Schools can leverage the LK programme to engage with parents and the community, through programmes such as Amma Ariyan.
5. By participating in LK programme, teachers have an opportunity to integrate their Technological Knowledge, Pedagogical Knowledge and Content Knowledge (TPCK framework) and become better educators. LK provides them a space for engaging in teaching-learning without the legacy challenges of syllabus, textbook and written examinations.

It is no surprise that the Education Department of Finland is keen to set up student IT clubs, following the LK model.

For the larger public education system

Supporting the learning of youth on digital technologies, both as technological skills and critical understanding of the role of these technologies in society will aid the transformation of Kerala into a Knowledge Economy. The government is keenly aware of this aspect and the LK programme was given the “Best Innovative Project in Public Policy” award by the Chief Minister of Kerala in 2022.

For the community

Students of LK reach out to the immediate and larger local community and train parents in areas such as the role of the internet, distinguishing between the genuine and the fake in social media, and filtering out fake news. By initiating campaigns such as Satyameva Jayate, students support community’s awareness of Cyber Security and Digital Literacy.

LK reduces digital divide between urban and rural areas by providing equal access to technology and digital resources.

Recommendations

Although it is evident that the LK programme is providing significant benefits to schools, students and community, there is always scope for improvement, not only for the immediate component of strengthening student digital literacy capabilities but also for the larger strengthening of the entire education system itself. This second part (larger strengthening) is written keeping a higher ambition of meaningfully integrating digital technologies, through LK and other programmes of KITE, to support the achievement of larger educational aims.

Immediate suggestions for the programme

1. Based on the feedback received from teachers and students, there is a need for additional training, including refresher programmes for teachers to make them teachers more comfortable with advanced modules, such as robotics, AI, 3D animation, and higher-level programming.
2. It would make LK more inclusive if students studying in Malayalam-medium divisions get additional support to enhance their enrolment in the programme. As more and more schools and students get opportunities to participate in the LK programme, this issue will be mitigated.
3. Connecting education to the needs of the local community through community projects, including in partnership with local government, will ensure the high investment in public education can translate into local gains. Drawing from the general enthusiasm among the teachers and the students for socially relevant projects, one or two initiatives can be formally planned in every academic year. Ideas for such initiatives suggested by students and teachers include giving IT lessons for children with disabilities and awareness of cybersecurity, development of ‘safe cyberspace’ for all sections of society. More ideas could be collected in consultation with the students, teachers, parents, and the public.

Larger possibilities for strengthening public education

1. The programme should be extended to 11th and 12th grades, and provide both more advanced digital literacy learning, as well as strengthen life skills relevant to the needs of young people and Kerala society. It can combine critical awareness and thinking skills along with latest technologies,

to strengthen Kerala as a knowledge society and knowledge economy. Emerging ideas such as collaborative startups can provide pioneering socio-economic models for the world. The adoption of collaborative startups would encourage focus on real issues of society such as the environment, employment and social cohesion, while traditional commercial models will largely focus only on areas that are likely to yield profits and create monopolies.¹⁴

2. The potential for digital technologies to strengthen education should be seen as far more important than building digital skills, in teachers, students, local community as well as the school institutions.
3. The potential for digital technologies to rejuvenate teacher education lies in strengthening the 'Technological-Pedagogical-Content Knowledge' (TPACK) of teachers. Teachers' abilities to integrate digital technologies to strengthen their content and pedagogical practices can be developed through appropriate teacher education programmes. They should be able to create, customise curricular content that is multi-level and multi-modal to meet the diverse learning needs of heterogeneous classrooms. The National Curricular Framework for Teacher Education, 2009 lays out an ambitious agenda for teacher education and KITE's programmes should focus on leveraging digital technologies for this purpose.
4. The LK programme has good scope to improve life skills education for students in a manner that not only enhances their economic potential (employment and entrepreneurial possibilities) but also supports their abilities to negotiate and build societies of caring and compassion, the latter is becoming more and more essential to reduce social strife and build social cohesion.
5. Programmes like *Amma Ariyan* and *Satyameva Jayate* are critical in today's age of disinformation and misinformation. Adults who are not literate are very vulnerable and the best and efficient way to reach them is through their children. This activity can be formalised through 'Social Science' labs in schools, in which issues of contemporary nature can be discussed within the broader framework of core constitutional principles. Such formalization will build an important life skill of being able to understand and interpret society and this will be critical to building a cohesive society in the future.

14 The Kerala Knowledge and Digital Innovation Strategy Council (K-DISC) has initiated a programme for developing digital platforms on a co-operative mode and knowledge start-ups initiated on collaborative models will provide a fillip to this programme.

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8. UNICEF Comprehensive Life Skills Framework <https://www.unicef.org/india/media/2571/file/Comprehensive-lifeskills-framework.pdf>

Annexure – Tools used in the documentation and other useful links

1. LK Revised Syllabus: <https://drive.google.com/drive/folders/107MFwiFU858diz0vBWrN6lIMhU8n4rD>
2. Student FGD: https://docs.google.com/spreadsheets/d/1Wq4iAQgXklBtl6AL9uttXGh9vWZq_risSrtRkJ6NhHg/edit#gid=500931084
3. Student Interactions: https://docs.google.com/spreadsheets/d/1pv_iUxopUrBzUoeFEet9T18nJIjnU8QoBRGcF_ht900edit#gid=1326725062
4. Teacher Interactions: https://docs.google.com/spreadsheets/d/1h4BUTSeMlh3CvPwRuzCvFnBoWpWiwB--6Eew_DS30E/edit#gid=1542102921
5. Teacher Survey Questionnaire: <https://docs.google.com/spreadsheets/d/1x8l6oy3PhGJaZ7bzTDCpWfWEd3RVzKTYDdxlUPlq6s/edit#gid=1542102921>