# KERALA DEVELOPMENT AND INNOVATION STRATEGIC COUNCIL (K-DISC)

# ACTIVITY REPORT FOR THE PERIOD OF 2019 to 2022

# Contents

# KERALA DEVELOPMENT AND INNOVATION STRATEGIC COUNCIL (K-DISC)

## About K-DISC

The Kerala Development and Innovation Strategy Council, (K-DISC) is a strategic think- tank and advisory body constituted by the Government of Kerala. Confronted with second-generation issues in many key sectors, Kerala is facing challenges of providing holistic health care, employment-oriented skilling, enhancing quality of education, high quality social security, continued food and nutrition security with a pro-poor bias, gender justice and inclusion of outliers, all within severe fiscal constraints. The state also must address decades of infrastructure deficit and make rapid strides in cutting edge areas of knowledge revolution and tourism. In the above context, innovation emerges not only as an engine of prosperity, competitiveness and an ingenious mechanism of real-life problem solving but as the act of creating extraordinarily new values in unusually original ways. Launched on March 24, 2018, K-DISC was given the mandate of promoting innovation in the state. K-DISC aims at bringing out path-breaking strategic plans that reflect new directions in technology, product and process innovations, social shaping of technology and creating a healthy and conducive ecosystem for fostering innovations in the State. K-DISC had undertaken a few activities in promoting innovation in government, launching its flagship initiative for promoting young innovators and promoting social inclusion among marginalised.

K-DISC was originally constituted as a department guided by a six-member advisory council with Dr. K. M. Abraham, former Chief Secretary to Government of Kerala as the Chairperson. The Council consisted of six eminent persons of repute in Science, Innovation and Technology in order to equip K-DISC to carry out the newly assigned activities of the Knowledge Mission.

Given the radically enhanced role that K-DISC is envisaged to take up in the new Government's thrust to making Kerala an innovation hub, the structure of K-DISC has been totally revamped. K-DISC has been registered as a society on May 4, 2021, with the Chief Minister as the Chairperson, Finance Minister as Vice Chairperson and Ministers for Industries, Higher Education, Labour and Skills and Agriculture as members. The Governing body 0consists of Vice Chancellors of the major Universities in the state and experts from various walks of life.

### Vision

K-DISC was set up with a vision of "A competitive and inclusive Kerala through creation of a healthy, conducive ecosystem for transformative and bold innovations through new directions in technology, product and process innovations".

**Mission**

The mission of K-DISC can broadly be classified as holistic and quality human development in Kerala, a knowledge-centred, technology based local economy with global connect and enhanced inclusion, participation and self-reliance through cutting edge knowledge and technology.

**Program Framework & Activities**

In order to achieve its vision and mission, K-DISC has come up with a programme framework including competency development programmes based on design thinking, active learning, making Kerala ready for Industry 4.0, and enhancing inclusion, participation and self-reliance through livelihood strategies. K-DISC had undertaken a few activities in promoting innovation in government, launching its flagship initiative for promoting young innovators and promoting social inclusion among marginalized, innovations with ecological impacts, etc. It has been successful in making notable progress in many of these programmes so far. Taking these into account, the Government of Kerala had entrusted K-DISC to take Kerala on a journey to be a knowledge economy in its budget 2021-22, which included the following:

- Undertaking a massive skilling program to provide employment to the educated unemployed career-break women and returnees from abroad.
- Organising a program of innovation in educational institutions, Micro-Small and Medium Enterprises, local government institutions and the government departments.
- Undertaking radical transformation of the higher education sector by improving the infrastructure, quality of manpower and creating centres of excellence in cutting edge areas.
- Initiating the program of digital transformation of the Kerala economy in agriculture and allied sectors, logistics and infrastructure, service sector in a responsible, inclusive and environment friendly manner.

The Kerala Budget 2021-22 has set the initiative to mainstream innovations in the state. The main interventions proposed included developing a platform for individuals to upload solutions to problems in their locality, getting mentorship on how to take their solutions forward and being eligible for financial assistance. The budget speech also mentioned that a skill mission will be formed under K-DISC to impart training to educated youth. K-DISC has also been given the task of coordinating various government agencies for preparing a comprehensive plan for providing employment to the educated. As part of this, Digital University Kerala has set up the Kerala Digital Work Force Management System (DWMS) and more than 27,000 job aspirants have registered with it. Steps have been taken to consider it as a Sub Mission of Kudumbasree. Further, K-DISC will be undertaking skilling of Twenty Lakh educated and unemployed persons in five years and will also coordinate the transformation of the Higher Education sector in the state and Universities.

The outcome of the endeavour is the Kerala Knowledge Economy Mission (KKEM) which has the broad goal of developing 20 lakhs jobs over the next 5 years by augmenting the employability quotient of the State education system using a carefully built technological framework attached either to their educational/ academic institutions or to public institutions near their homes. Knowledge mobilisation and Skilling are directly responsible for providing the above said 20 lakhs jobs over the next 5 years. Taking up the task on behalf of the Government, K-DISC has been working over the past one year to build a framework of education, training, skilling and employment that would make every desirous and eligible person, regardless of whether they are job-seeking youth, homemakers, career break professionals or persons with vulnerabilities, entitled to get trained in technologies related to subject areas of their choice and use such knowledge to secure gainful employment.

**Organisation structure**

K-DISC was originally constituted as a department guided by a six-member advisory council with Dr, K. M. Abraham, former Chief Secretary to Government of Kerala as the Chairperson. The Council consisted of six eminent persons of repute in Science, Innovation and Technology. In order to equip K-DISC to carry out the newly assigned activities of the Knowledge Mission and the radically enhanced role that K-DISC is envisaged to take up in the new Government's thrust to making Kerala an innovation hub, the structure of K-DISC has been totally revamped. K-DISC has been registered as a society on May 4, 2021, with the Chief Minister as the Chairperson, Finance Minister as Vice Chairperson and Ministers for Industries, Higher Education, Labour and Skills and Agriculture as members. The Governing body consists of Vice Chancellors of the major Universities in the state and experts from various walks of life. Dr K.M. Abraham, is the Executive Vice Chairman (EVC) and Dr P.V. Unnikrishnan is the Member Secretary (MS). The organisational structure of K-DISC consists of five divisions headed by Executive Directors:

- Planning Competency Development and Innovation System (PCI)
- Innovation Technologies (ET)
- Social Enterprises and Inclusion (SI)
- Management Services (MS)
- Skills, Employment and Entrepreneurship (SEE)

# KERALA DEVELOPMENT AND INNOVATION STRATEGIC COUNCIL (K-DISC)

**ACTIVITY REPORT FOR THE PERIOD APRIL 2019 TO MARCH 2020**

The list of programmes/schemes under K-DISC during the period 2019-2020 is given below:

- Young Innovators Programme (YIP)
- Innovation for Differently Abled Children
- Accelerated Blockchain Competency Development (ABCD) Programme
- Manchadi – Teach Maths for Kerala
- Accelerating Adoption of Emerging Technology solutions in Government
- Kerala Innovation Fund (KIF)
- Kuttanad Hackathon
- Establishing a Consortium for Medical Devices Hub
- Community of Practices (CoP)
- Mazhavillu – Teach Science Kerala
- District Innovation Council (DInC)
- Program Management Office (PMO)
- Ganitha Sahavasa Camp (GSC)
- Conversion to Liquified Natural Gas(LNG) in the Marine Sector

## Young Innovators Programme

The objective of the program is to develop an ecosystem for identifying youth with bright minds for solving real life problems, mentoring them, attaching them to research institutions with scholarships for one year and help them build a career around the innovations, researching, re-discovering, incubating and accelerating the innovation. As a part of the proposal K-DISC shall put in place an ICT based support system for identifying promising ideas and processing through the funnel of innovation with appropriate linkages with academia, industry, investors and civil society for promoting innovations with sound business models and innovations with social relevance.

This is an ongoing program. During 2018-19, the first cohort of innovators – Silver group (170) and Gold group (34) have been selected through a process of pitching the innovations and screen at multiple levels. A team of 78 mentors have been positioned. A detailed plan of mentor training, mentor – mentee training and mentee capacity building has been planned. An ICT platform has been established for idea registration.

During **2019-20**, the Young Innovators Program has been restructured with a focus on building an innovation ecosystem in the state. Thousand and one hundred and forty-three educational institutions and research institutions have formally registered with the Young Innovators Program as partners nominating two facilitators each and mentors. The process of idea registration has been made more structured. Rather than providing an opportunity for coming up with an innovative idea in any theme the ideas have been limited to the following:

1. Problems of the children and the aged (Maestro challenge)

2. Technologies and systems for water conservation, renewable energy, energy conservation
3. Business model innovations in application and practice
4. Technology systems for value addition, productivity enhancement in agriculture and allied sectors
5. Assistive Technologies and systems
6. Technologies, applications and systems related to modern medicine, Biomedical and medical devices
7. Solid, liquid and hazardous waste management systems and technologies
8. Technologies and systems for value addition, productivity enhancement in traditional industries and systems
9. Technologies systems and applications related to complementary and alternative medicine including ethnic system.

The original IT platform has been improved by putting in place institutional registration, facilitator registration, mentor registration, idea registration and evaluator registration etc. The mechanism for recording evaluations and mentor-mentee matching has been initiated.

The status of YIP implementation so far is provided below.

**YIP – 2018 Mentees**

| Sl. No. | Row Labels | Above 18 | Below 18 | Grand Total |
|---|---|---|---|---|
| 1. | Agriculture | 3 | 3 | 6 |
| 2. | Air conditioner | | 1 | 1 |
| 3. | Assistive Technologies | 16 | 3 | 19 |
| 4. | Automobile Engineering | 2 | | 2 |
| 5. | Bio insecticides and Bio pesticides | | 1 | 1 |
| 6. | Biofuel | 1 | 4 | 5 |
| 7. | Child care | 1 | | 1 |
| 8. | Crafts | 1 | 1 | 2 |
| 9. | Crime prevention | 2 | | 2 |
| 10. | Drinking Water | 4 | 3 | 7 |
| 11. | Drone | 2 | 2 | 4 |
| 12. | Electric Engines | | 1 | 1 |
| 13. | Electric Vehicle | 1 | 1 | 2 |
| 14. | Electronics | 5 | 2 | 7 |
| 15. | Energy | 5 | 6 | 11 |
| 16. | Food processing | 1 | 2 | 3 |
| 17. | Forestry and Wild life protection | | 2 | 2 |
| 18. | Gaming, AR, VR and Teaching Aids | 2 | 1 | 3 |
| 19. | Healthcare and Sanitation | 10 | 4 | 14 |
| 20. | Housing and Building Materials | 3 | 2 | 5 |

| Sl. No. | Row Labels | Above 18 | Below 18 | Grand Total |
|---|---|---|---|---|
| 21. | Information Communication Technology | 1 | 1 | 2 |
| 22. | IoT | 7 | 4 | 11 |
| 23. | Machining and tools | 6 | 4 | 10 |
| 24. | Mathematics | 1 | 1 | 2 |
| 25. | Miscellaneous | 1 | | 1 |
| 26. | Organisation and process | 3 | | 3 |
| 27. | Pre School Education | 1 | | 1 |
| 28. | Robotics and Automation | 9 | 5 | 14 |
| 29. | Security and Safety Technologies | 9 | 4 | 13 |
| 30. | Software | 19 | 4 | 23 |
| 31. | Substitutes for plastic | 2 | 1 | 3 |
| 32. | Waste recycling and Environment | 14 | 8 | 22 |
| 33. | Water Conservation | 1 | | 1 |
| | **Grand Total** | **133** | **71** | **204** |

**YIP – 2019 Mentee Groups**

| Sl. No. | Themes | Junior | Researcher | Senior | Grand Total |
|---|---|---|---|---|---|
| 1 | Agriculture and Allied Sectors | 3 | 2 | 12 | 17 |
| 2 | Assistive Technologies | 1 | 0 | 8 | 9 |
| 3 | Business Model Innovation | 4 | 1 | 15 | 20 |
| 4 | Complementary and Alternative Medicine | 0 | 2 | 4 | 6 |
| 5 | Energy, E-Mobility and Renewables | 7 | 0 | 4 | 11 |
| 6 | Modern Medicine and Biomedical Technology | 0 | 2 | 4 | 6 |
| 7 | Problems of Aged | 3 | 0 | 6 | 9 |
| 8 | Problems of Children | 2 | 2 | 2 | 6 |
| 9 | Solid, Liquid and Hazardous Management | 3 | 0 | 6 | 9 |
| 10 | Traditional Industries | 0 | 0 | 2 | 2 |
| 11 | Water Conservation | 1 | 1 | 5 | 7 |
| | **Grand Total** | **24** | **10** | **68** | **102** |

## Major activities/achievements during the period

- Formulated a strategy paper for the Young Innovators Programme *(enclosed as Annexure-1)*

- Project cycle matured
- Transition from individual mentees to teams
- Linkage firmer with educational systems
- Selection process streamlined
- Mentee training outline finalised
- Started creating an Electronic platform
- Partnerships with Kerala Start up Mission, National Institute of Design, Ahmedabad
- Young Innovators Programme 2018-21 nurtures 204 innovators to develop ideas into products and processes with mentoring and resource support
- Young innovators programme 2019-22 has built an ecosystem of 1143 Institutions, 1393 facilitators and has completed a two stage evaluation process to identify 102 ideator groups with around 350 innovators

## Innovation for Differently Abled Children

K-DISC's YIP Program targets youth to empower future innovators to innovate new products, services or models to meet emerging requirements, unarticulated needs, or existing market needs of the society more effectively through a specially designed challenge. K-DISC recognizes that inclusion of all youth is essential for innovation. Equally, it recognizes that without special attention, much more time, and tailored and caring effort, youth with disabilities cannot be brought into the mainstream. KDISC, therefore, has initiated a Program for Innovation by Youth with Disability (PIYD), in partnership with Kerala Social Security Mission (KSSM).

The aim of this program is to generate innovation from youth with disability. The objectives of the special YIP (Phase I) would be two-fold. First, it will aim for the development of an innovative, scalable and replicable process in Kerala to identify and engage youth with disabilities under 40 who stand out as being motivated, creative, talented and passionate. A second objective of Phase I would be for the selected groups to be twinned with mentors and trainers, to gain new skills and ability to be able to think and act innovatively through a specially tailored program.

This, will then lead to Phase II, which is expected to result in the target group dreaming up innovative or different products, processes or services that they could support themselves, individual and community goals. Whether to pursue this second and longer-term goal would be dependent entirely on an understanding of the results of the first phase.

**Major activities completed during the period**

- Conducted an International workshop on Innovation by Youth with Disability to design the whole project. As a result, a detailed program has been designed
- A program Advisory Committee has been constituted
- Organized a Round Table Discussion with International experts to formulate the draft policy at K-DISC
- Developed the draft policy and submitted to the Department of Social Justice for the review
- 192 applications received through online and 79 candidates got selected for the program
- NISH with the support of K-DISC organised a 6-day leadership camp for 19 candidates who got selected under the innovation category
- KSSM with the support of K-DISC conducted a 3-day leadership camp for 47 candidates who got selected under the Talent Category
- Individual Talent Support Plan was created by compiling the comments from observers, catalysts and parents for the 47 candidates
- Organized a socio-economic survey for the 47 participants through home visits

- Developed the Action Plan for the phase 2
- The course curriculum has been developed for the certificate program in Assistive Technology

## Accelerated Blockchain Competency Development (ABCD) Programme

Accelerated Blockchain Competency Development is one of the flagship programmes for Blockchain competency development in the State. It is envisaged to develop a pool of 25,000 people with skills in the Blockchain technologies to convert the state into a key knowledge hub in Blockchain in the country.

This is an ongoing scheme during 2019-20. The details of trainings completed so far is provided below:

| Sl. No. | Category | Achievement |
|---|---|---|
| 1 | Full Stack Developer | 608 |
| 2 | Certified Blockchain Associates | 257 |
| 3 | Certified Blockchain Developer | 154 |
| 4 | Certified Blockchain Architect | 47 |

**Activities Completed**

- Partnership with IEEE to disseminate information on ABCD programme to the young professionals
- Kerala Blockchain Academy inaugurated KBA Women Connect initiative which will act as a platform to network woman Blockchain professionals.
- Train the Trainer program conducted for Hyperledger trainers by Intel.
- Train the Trainer program conducted for Ethereum trainers by MLG Blockchain, Canada
- Certified Ethereum Developer and Certified Hyperledger Developer programs contents developed in collaboration with MLG and Intel respectively.
- Fullstack training for graduated students and working professionals in progress
- Organized Corda Blockchain Bootcamp at Maker Village Kochi on May 12, 2019 in collaboration with R3 India.
- Launched KBA Innovation Club to help students from academic institutions to explore blockchain technology. Already 38 institutions expressed interest and 17 of them joined KBAIC.
- First Hyperledger Kochi Meetup conducted on June 6, 2019 at Maker Village Kochi

## Manchadi – Teach Maths for Kerala

Kerala has successfully tracked the first generation problems in education of literacy and low enrolment in schools. However, despite the progress achieved, the National Achievement Survey (NAS) consistently raises serious questions on the performance of students in Kerala. The programme aims at supporting children maths learning through parental and community support. Technology tools are also sought to be used for student benchmarking and for promoting adaptive learning by student. Experiences on teaching and learning of mathematics elsewhere in the country and globally has been also considered in building the campaign. A baseline study to benchmark the mathematics skills of children shall be undertaken. A control group and treatment group shall be drawn and the impact of child cantered, activity based maths learning focused on guided re-discovery and enquiry assessment. Community Maths Labs and LMS integrated adaptive learning environments shall be also be central to the campaign.

**Jodogyan Approach**

The pedagogic approach of Jodogyan is based on the recognition of the constitutively social character of human cognition. Small group work and large group dialogue play very important roles in the approach being taken. Vygotsky had shown the crucial role of mediation by the use of the sign/word during goal-oriented activities in the evolution of conceptual understanding. The role of activities in this case is different from the role of activities in an individual based approach where concept formation is seen to take place through a process of adaptation using concrete materials.

In the approach being taken, participation in joint problem-solving activities, where signs are used, play the crucial role in concept formation. Later the tools or the signs used for problem solving themselves become the focus of attention. The functional use of words/signs in meaningful activities thus plays the crucial role in this approach towards development of conceptual understanding. A corollary of this is that there are different stages through which an idea of a child develops. Even when the meaning is different for children and for adults, the functional use of the word in communication during problem-solving support the further development of the concept in children. What is thus indicated in this approach is the importance of `indirect teaching' rather than either direct teaching or just simple facilitation.

This Vygotskian perspective is being increasingly substantiated through research in the last few decades. Understanding about the process of concept development reflected in many recent strands of research in mathematics education are also supportive of this perspective. A very significant school of research that is consistent with the Vygotskian approach is that of Realistic Mathematics Education (RME) which has also brought forward `local instruction theories' for various concepts.

A key focus will be to restore/enhance children's confidence in their ability to think and solve context problems. Therefore, they would begin with context problems with which they can relate to. The numbers whether whole numbers or fractional

numbers would be chosen keeping the number sense levels of children, so that the comfort with the numbers would increase their ability to engage with the problems. Drawings, pictures and so on would be included in whole class dialogue to support problem solving. To support the process of engagement with the context and problem, not only standard context problems would be used but also problems where there is no straight forward solution. The goal would be to support the ability of children to create a situation model involving quantitative relationships and then choose appropriate solution methods.

Along with developing the abilities of children to model situations, activities would be also undertaken to strengthen the number sense of children both for whole numbers and for fractional numbers. This would be done through activities for quantification involving both counting and measurement. With a strong number sense as a base, children would also be given the opportunity to see patterns and logical relationships. Spatial sense would be strengthened in the context of mapping activities.

To Summarise

- Vygotskian approach for mathematics learning of children for primary and pre-primary years.
- Appreciating the key role of communication in the process of cognition.
- Supporting ability of children to create situation models and pursue problem solving methods.
- Quantification activities for strengthening number sense of integers and fractional numbers as well as patterns and logic relations and spatial sense

**Navnirmiti- Edugenie Approach**

The principles of RME are basic. Additional supporting criteria like universalization, exercising multiple intelligence with the many languages of math, sync with school curriculum, and engagement with community are also kept in mind while designing the modules.

The underlying design principle is that children attending the CML will experience play and enjoyment. The play elements and materials will be both physical and mental. Exploration and play will be seamlessly merged. It will be a mix of team/group, and individual activity, in which children will create, interact and solve problems in discussion with their peers and mentors.

Ascent by solving graded problems. Every child solves problems in a graded ascent, developing and discovering intervening relevant concepts. This gives a feeling of success and therefore confidence. Problem solving is often by peer group activity with interactions with each other in this process.

About Universalization – Prof W. W. Sawyer writes, 'We can go a stage beyond talking about things and drawing pictures of things by arranging for the actual handling of things. There is evidence that this greatly increases the proportion of the population capable of learning mathematics and this evidence is on a mass scale. About working with materials: "Children working with apparatus are doing precisely what good research workers do: They have a problem. They understand what the problem is. They really want to solve the problem. They guess and answer. They test the answer for themselves. If it does not work, they try something else."

To Summarise

- Design motivated by works of W.W. Sawyer
- Learning of maths by understanding, through actual handling of things leads of universalization of mathematics.
- Math has many languages: thing language, the language of actions, the language of shape and size, picture language, sound language and the language, of numerals and symbols. Exploring many languages promotes multiple intelligence.
- Ascent by graded problem solving in peer groups giving a feeling of success and confidence.

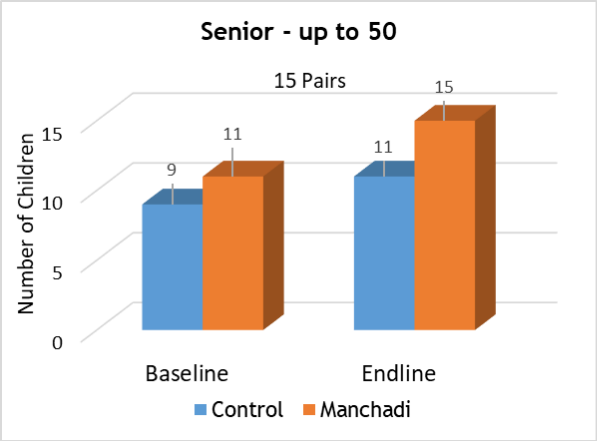
Using this approach CMLs were established in five locations

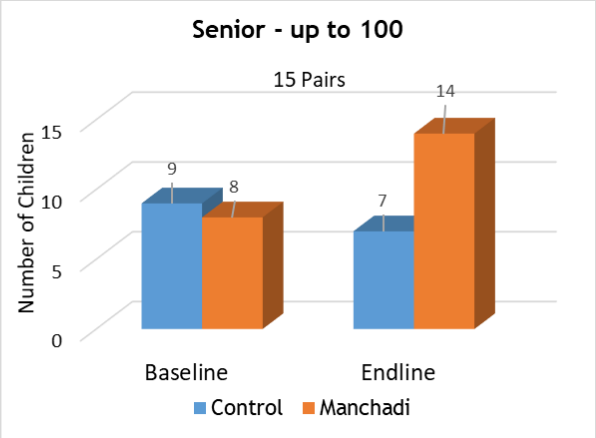
(i) Alappad (Navnirmiti, Edugenie)
(ii) Chalavara (Navnirmiti, Edugenie)
(iii) Feroke (Jodogyan)
(iv) Perinthalmanna (Jodogyan)
(v) Thirunelli (Jodogyan)

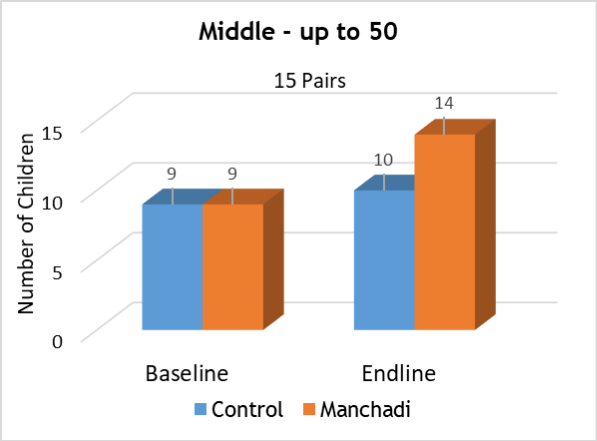
**The results from the assessments at Perunthalmanna, Feroke and Thirunelli**

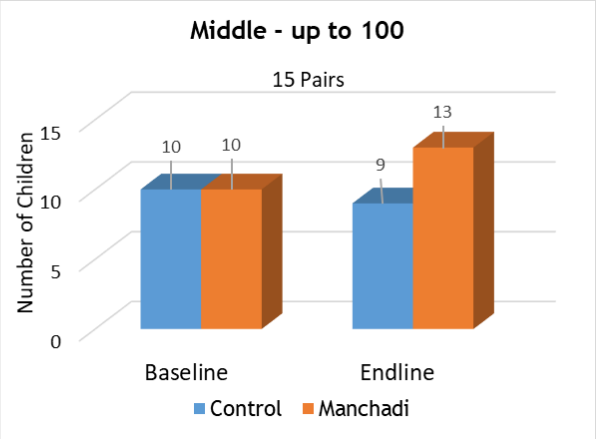
- Manchadi children have done better not just in terms of getting the correct answer, but significantly in terms of the methods they use to solve problems.

## Number sense

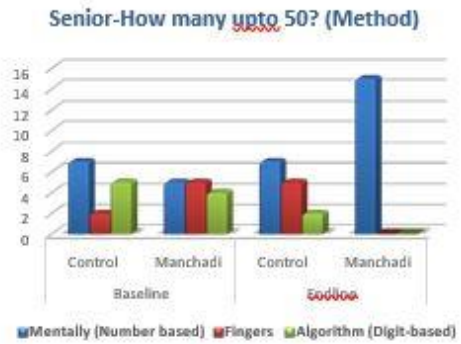


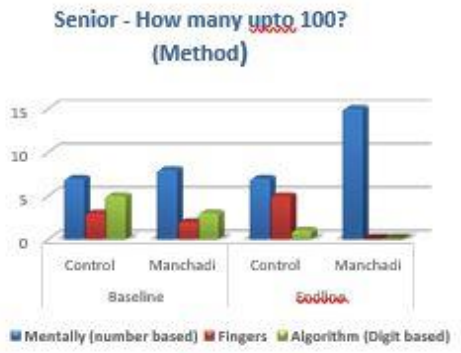



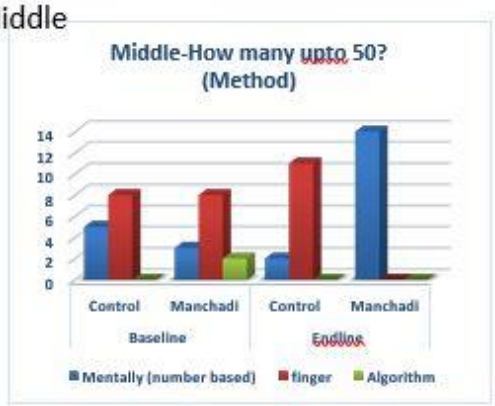



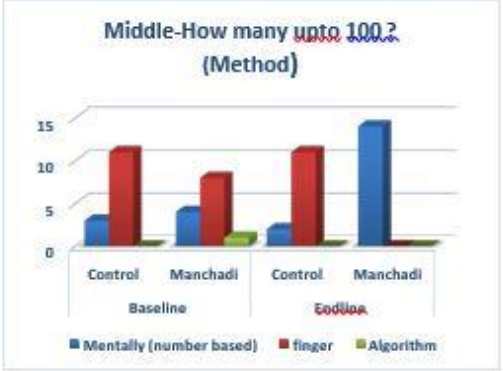

Senior



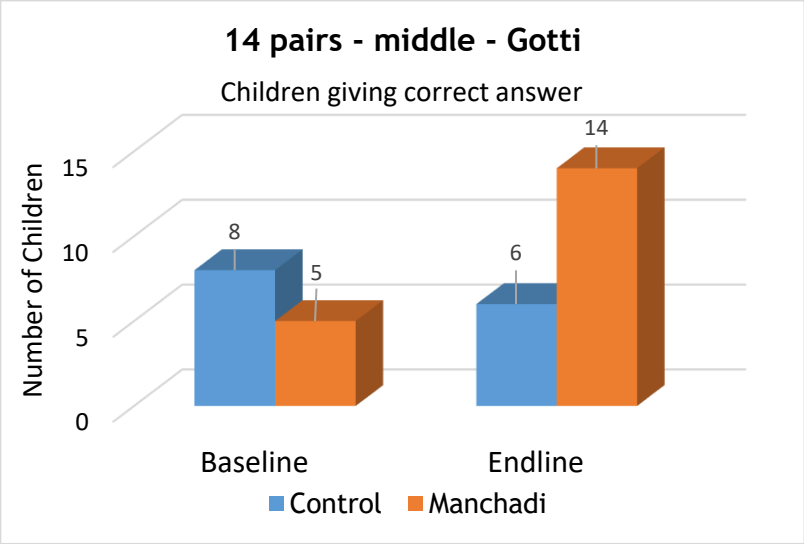

Middle



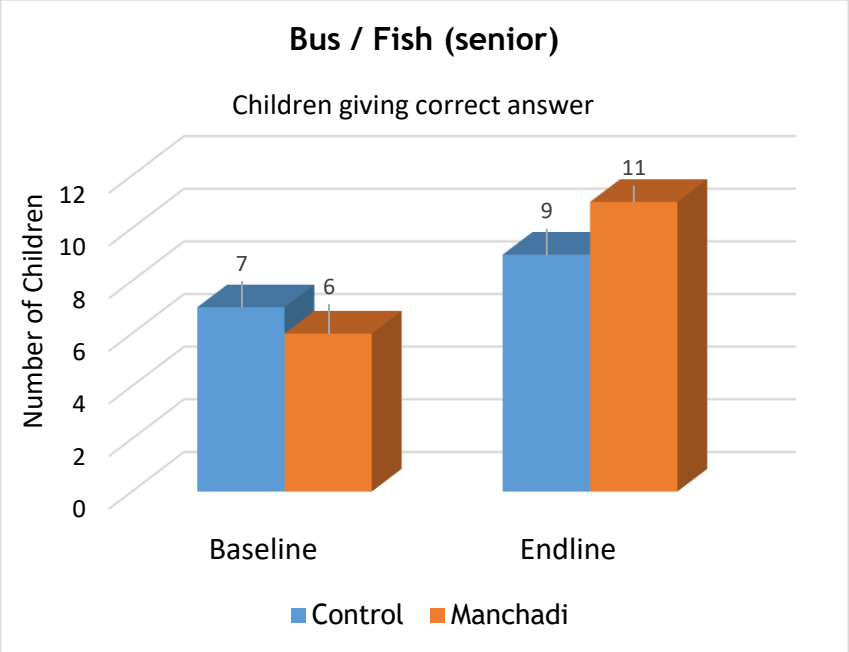



| How much will it be<br>**Considering all the Junior Children** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Does not understand** | **Counts all** | **Counting On** | **Mentally** | **Algorithm** | **No Data** | **Total children** |
| **Manchadi Continue** | 1 | 2 | 6 | 20 | 0 | 0 | 29 |
| **Manchadi Dropout** | 1 | 0 | 3 | 0 | 0 | 0 | 4 |
| **Control** | 2 | 6 | 9 | 11 | 1 | 1 | 30 |

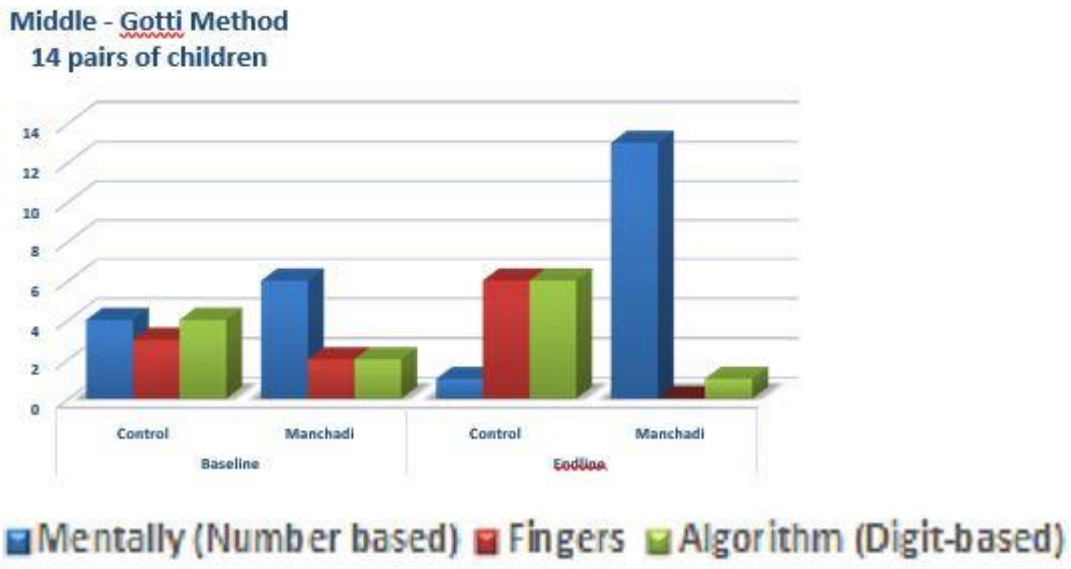
**Vazhikkanakku - Multistep Addition and Difference**




**Sum / Difference - multistep**

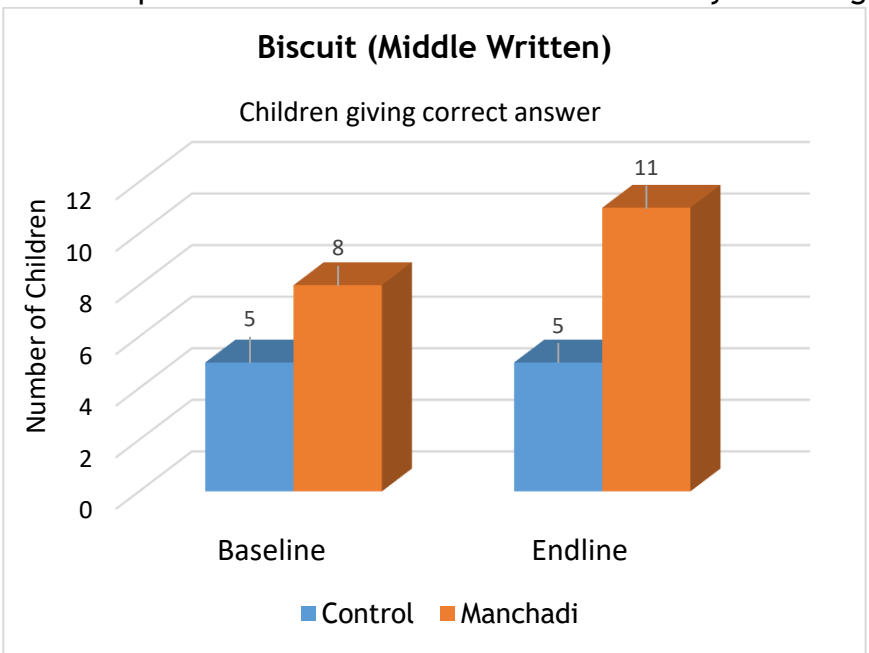


**Vazhikkanakku – multistep**
***Addition and difference***



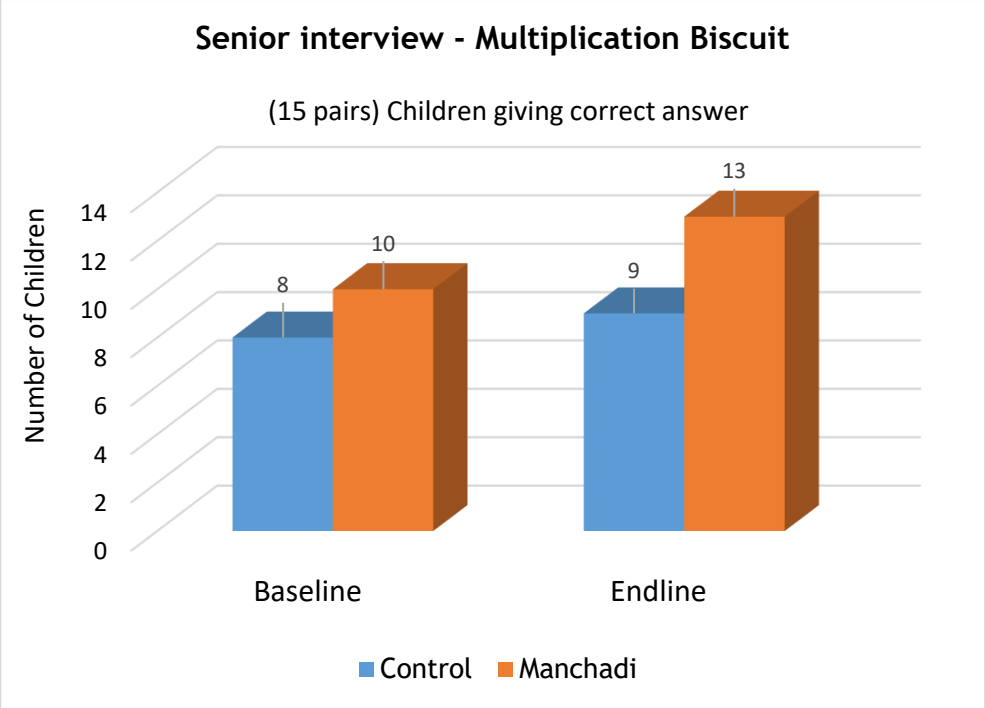

**Multiplication Context Problems**

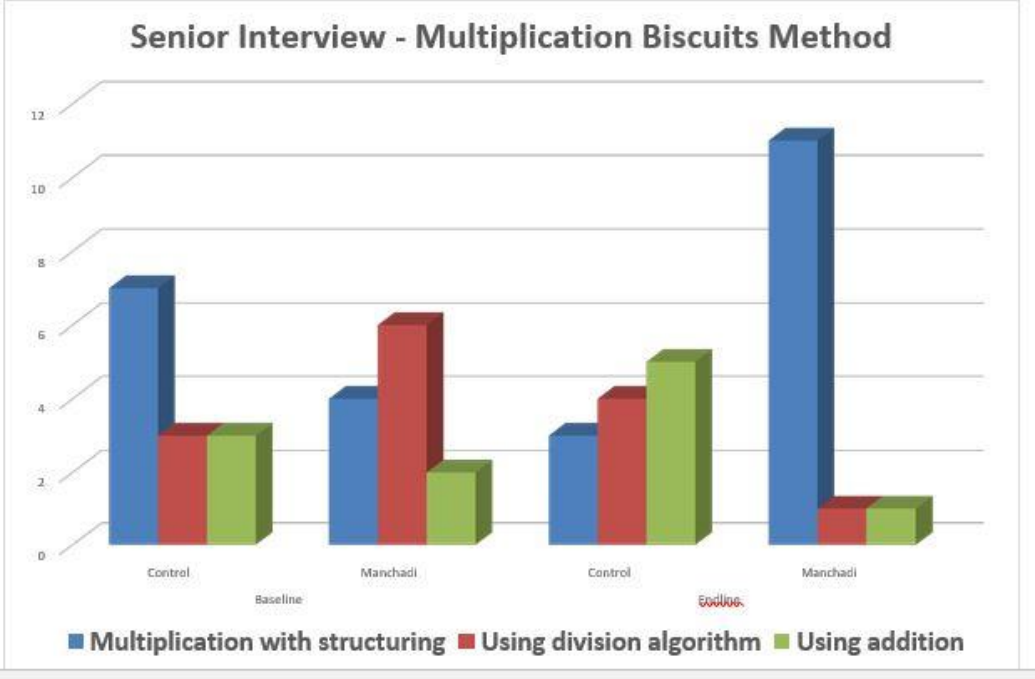
By the time of baseline children were just starting to do skip counting which is precursor to multiplication in the job Jodogyan trajectory. Yet we see a significant difference in the response of Manchadi children which is very encouraging.



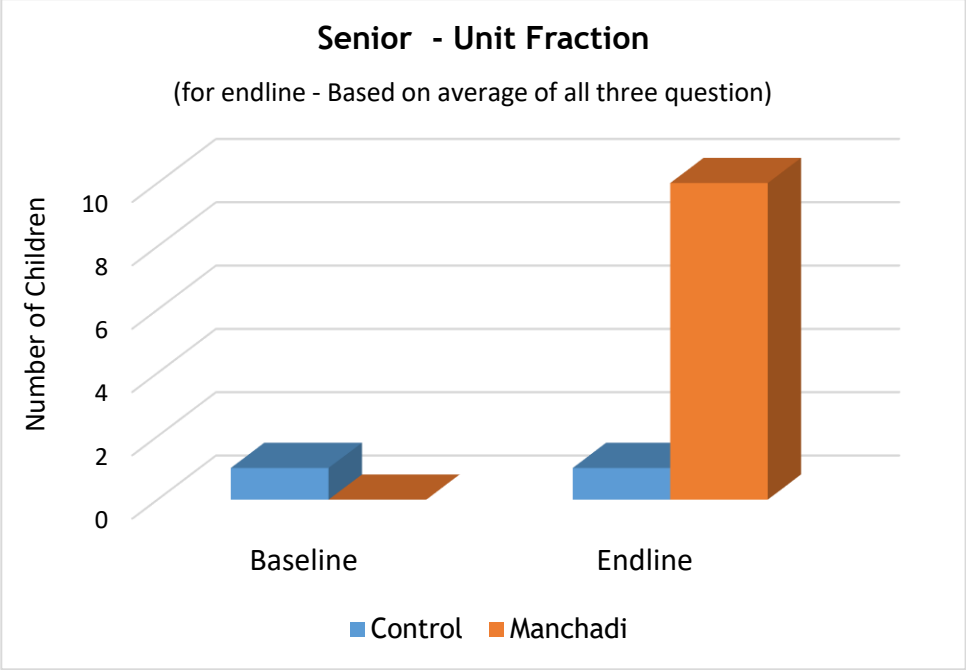

**Multiplication Vazhikkanakku**

In the case of seniors also we see a significant difference


Senior interview - Multiplication Biscuit
(15 pairs) Children giving correct answer
Number of Children
14
12
10
8
6
4
2
0
8
10
9
13
Baseline
Endline
Control
Manchadi


Senior Interview - Multiplication Biscuits Method
12
10
8
6
4
2
0
Control
Manchadi
Control
Manchadi
Baseline
Endline
Multiplication with structuring
Using division algorithm
Using addition

## Fraction




1/90 യെക്കാൾ ചെറിയ ഒരു ഭിന്നസംഖ്യ എഴുതാമോ താഴെ മൂന്നു ഭിന്നസംഖ്യകൾ തന്നിട്ടുണ്ട് ഈ ഓരോ . സംഖ്യകളുടെ അടുത്ത് അതിനെക്കാൾ ചെറിയ ഒരു ഭിന്നസംഖ്യ എഴുതാമോ

1/10, 1/24, 1/70

## Angle

Concept of angle is well known to have difficulties for children, with many children looking at the length of the arms to decide whether the angle is big or small. Manchadi programme seems to have made a significant difference to this.

85% of Manchadi children could make an angle smaller using longer straws as against 21% of Control group

**Q7 Making Smaller Angle (Senior)**

| Koodaram | Category | Immediately said can and did | Taking time to make | Said cannot be done |
|---|---|---|---|---|
| Perinthalmanna | Manchadi Continuing | 11/12 | 1/12 | 0/12 |
| | Manchadi Dropout | 6/6 | 0/6 | 0/6 |
| | Control | 1/14 | 1/14 | 12/14 |
| Feroke | Manchadi Continuing | 12/12 | 0/12 | 0/12 |
| | Manchadi Dropout | 10/11 | 1/11 | 0/11 |
| | Control | 5/17 | 9/17 | 3/17 |
| Thirunelli | Manchadi Continuing | 6/10 | 4/10 | 0/10 |
| | Manchadi Dropout | 6/8 | 1/8 | 1/8 |
| | Control | 2/7 | 2/7 | 3/7 |
| Total | Manchadi Continuing | **29/34 (85%)** | 5/34 (15%) | 0/34 (0%) |
| | Manchadi Dropout | **22/25 (88%)** | 2/25 (8%) | 1/25 (4%) |
| | Control | **8/38 (21%)** | 12/38 (32%) | 18/38 (47%) |

**The results from the assessments at Navnirmiti and Edugenie**

| | CHALAVARA | | | | ALAPPAD | | | |
|---|---|---|---|---|---|---|---|---|
| | CML | | Control | | CML | | Control | |
| | Baseline | Endline | Baseline | Endline | Baseline | Endline | Baseline | Endline |
| Class 1 | 85% | 86% | 62% | 66% | 74% | 97% | 60% | 69% |
| Class 2 | 83% | 90% | 67% | 72% | 69% | 100%* | 53% | 61% |
| Class 3 | 54% | 88% | 27% | 37% | 69% | 85% | 67% | 57% |
| Class 4 | 63% | 93% | 64% | 73% | 74% | 88% | 73% | 68% |
| Class 5 | 62% | 83% | 56% | 62% | 86% | 96% | 75% | 71% |
| Class 6 | 57% | 88% | 50% | 68% | 67% | 96% | 66% | 67% |
| Class 7 | 43% | 78% | 40% | 47% | No Children | | | |

Based on the methodology of Manchadi tried out it is proposed to extend the program to 300 – 400 locations in the state.

**Key Achievements of Manchadi program**

1. Formulated a Strategy Paper for Manchadi Teach Maths for Kerala programme *(enclosed as Annexure 2)*
2. Established 5 Community Math Labs in Thirunelli (Wayanad District), Feroke (Kozhikode), Perinthalmanna (Malappuram), Chalavara (Palakkad) and Alappad (Kollam).
3. 10 volunteers selected from the localities and 3 Animators were deputed to the selected locations.
4. 355 students were enrolled to the program and 114 students were dropped out. 241 students remain with Community Math Labs.
5. 1496 hours of classes conducted in the community math labs in total till August 31.
6. Cameras and other devises for monitoring and documenting live activities of Community Math Labs, installed in all location and it is utilizing by animators and volunteers.
7. Web based platform for academic planning, documentation and reporting commissioned for all Community Math Labs, K-DISC and National resource groups.
8. Baseline assessment conducted with the students of Community Math Labs along with other 50 students from out of Manchadi Labs as Control group. End line Assessment completed in 2 locations with the same children and end line process in rest three are in process and the analysis is on process.
9. 13 workshops, 4 State Mission Team meetings, 2 High level meetings and 4 Immersion programs conducted during the project duration.
10. Teachers from the all districts in where Manchadi to be extended, representatives from SSA and SCERT, participated in State workshop on Manchadi Expansion, and observed academic activities of Feroke CML and opined that the model is eligible for expansion.
11. 2nd High level meeting conducted, and all panchayat presidents participated in the meeting and agreed to take up the project.
12. A visit of the team includes program executive, animator and national resource group to the new CML location for further discussion in on process.
13. The Proof of Concept was reviewed by General Education Department on May 25th & 26th

## Accelerating Adoption of Emerging Technology solutions in Government

One of the stated objectives of K-DISC is to encourage/facilitate the adoption of Emerging Technology Solutions (ETS) in Government and public agencies to enhance efficiency and effectiveness of office systems and processes. ETS typically include Blockchain, Machine Language, Artificial Intelligence, Internet of Things, Gaming & Virtual reality, Augmented Reality, Big Data etc.

K-DISC proposes to achieve its objective through holding a series of Application Development Clinics (ADCs) with concerned Departments/Agencies. Expert K-DISC teams led by one or two domain experts would, depending on the Department/Agency's familiarity with Emerging Technology, explain the potential of ETS and support the Departments/Agencies to identify and articulate their problem areas.

The ideation process to clarify issues and define the problem would entail a few sessions, depending on the complexity of the problem, and the familiarity of the Department/Agency in tackling the problems. At the end of these ADC sessions, a first draft of a Proof of Concept (POC) document would be drawn up outlining the identified problem and possible solutions through use of ETS. KDISC Expert teams would also provide support for bringing start-ups with the appropriate and relevant experience and resources to the platform.

K-DISC plans to propose around 60 technology solutions in next financial year and work with various government departments to implement it.

**Major achievements during the period**

Under the Accelerating Adoption of Emerging Technology Solutions in Government Programme, Application Development Clinics have been organised in 7 departments and 16 use cases have been identified. Artificial Intelligence based system for automatic screening of diabetic retinopathy, AI base facial recognition of CCTV video and Collision Warning System for KSRTC buses are in an advanced stage of implementation.

K-DISC is currently working on a few active and ongoing ADCs as below

| Sl. No. | Name of Project | Departments | Technology | Current Phase |
|---|---|---|---|---|
| 1 | Artificial Intelligence based system for | Health | ML/AI | Project Implementation |
| 2 | Blood Bag Traceability | Health | IoT, Blockchain | Project Implementation |

| Sl. No. | Name of Project | Departments | Technology | Current Phase |
|---|---|---|---|---|
| 3 | Pilot Implementation of tank level monitoring | Water Resources | IoT | Project Implementation |
| 4 | Collision Warning System | KSRTC | Mobil eye and Telematics | Project Implementation |
| 5 | Antibiotic policy App | Health | Chat bot, ML/AI | Technology Partner (start- |
| 6 | Electronic Health Record Management using | Health | Blockchain | Technology Partner (start- |
| 7 | AI based facial recognition on CCTV video | Police | ML/AI | Technology Partner (start- |
| 8 | AR/VR based training for Kerala Police | Police | AR/VR | Technology Partner (start- |
| 9 | Bill Discounting using Blockchain (for KFC) | Finance | Blockchain | Technology Partner (start- |
| 10 | Kerala Land record management using | Revenue | Blockchain | Technology Partner (start- |
| 11 | Advanced Technology-driven continuous Drinking | Water resources | IoT devices | Technology Partner (start- |
| 12 | Traceability in Tissue Culture | Agriculture | Blockchain and IoT, QR code | Technology Partner (start- |
| 13 | Block chain based Smart Crop Insurance | Agriculture | Blockchain | Project proposal |
| 14 | e-Wallet based Collection System | Water Resources | Payment App | Project proposal |
| 15 | Immunochain | Health | Blockchain | Project proposal |
| 16 | Cervical Cancer detection using AI | Health | AI | Project proposal |

## Kerala Innovation Fund

To develop the model for a crowd sourcing platform-and internet based market place linking practitioners, policy makers, bureaucrats technocrats, policy and the common man to engage with and air their pain areas and problem statements and to arrive at innovative solutions through a virtual forum with ideators, researchers, technologists, practitioners, educational institutions, consultants, accelerators, incubators and start-ups and undertake Proof of Concepts (POCs), develop prototypes and attempt scaling of pilots if needed.

The crowd sourcing platform shall cover three main service

1. Idea posting:
   Posting ideas, suggestions via unsolicited manner
2. Challenge posting:
   A crowdsourcing challenge functionality to crowdsource specific questions and problems
3. Co-ordination & social media sharing
   The functionality to share all the content from the platform and to connect citizen to the crowdsourcing challenges.

**Major Activities during the period**

The concept of the initiative was finalised during this period. However, the any of the activities under the initiative could not be pursued due to lack of manpower.

## Kuttanad Hackathon

The main objectives of the Kuttanad Hackathon initiative are:

- Integrated River Water management (RKDP- priority 4.1) in Kuttanad as part of the Vembanad lake basin management
- Contextualising Kuttanad problem in broader perspectives (Linking to sustainable development of Kuttanad region and climate change scenario as proposed under RKDP programme)
- Land use reorganisation (RKDP Disaster Risk Management)
- To create rooms for rivers
    - To redesign/ densification of settlements
    - To consider redesigning of levees/ polders (drawing lessons from international experiences specially from Japan and Netherlands)
- Deliberations on risk assessment and nature based risk management (RKDP Disaster Risk Management)

The major activities undertaken as part of the initiative is as given below:

1. In continuation with the preliminary discussion held on February 7$^{th}$, 2019, an internal consultation with the stakeholders was held on April 8$^{th}$, 2019
2. As part of the initiative a meeting was held with Ashoka Trust for Research in Ecology & the Environment (ATREE) on May 25$^{th}$

3. Second internal consultation with the stakeholders on June 6th 2019
4. Discussion held with Professor Bhaskaran, Kerala Agricultural University on June 14th 2019
5. A one-day field visit to Kuttanad, the rice bowl of Kerala was conducted on July 13th, 2019. Kuttanad which has witnessed the worst flood in two decades, has been isolated from the rest of the state. Purpose of this field visit was to get acquainted with the problems of Kuttanad and to understand people's response/coping mechanism following 2018 devastating flood. Kuttanad is most flood prone area in the state. Home visits were made on R block in which 22 families reside. Some of the major findings are given below:
    - Most of the families are planning to build new houses in the same place using panchayat flood relief fund.
    - From embankment to the building's backside it is completely under the water level. All the houses are sitting above sand ground. If we go below the sand layer we can find grass land and above the sand layer there is improvised clay layer. There is a possibility to do a matte foundation after taking out the sand part.
    - The people here are not willing to relocate to any other place although the government is ready to relocate them. They won't go anywhere else as they have some land here.
    - Other major problems include drainage congestion, non-availability of drinking water, water quality etc.

Major Issues to be addressed:

- Drinking water: As the people are isolated, availability of drinking water should be ensured. Now they buy drinking water for Rs 60/- per litre.
- Strengthen the stability of embankments
- Provisioning of services
- Scope of settlement redesigning

## Establishing a Consortium for Medical Devices Hub

Kerala has the unique set of circumstances for becoming one of the leading global hubs for an advanced and capable medical device and technology industry. It has some institutions doing world class research, relatively good higher education sector with the potential to supply necessary manpower, tertiary level hospitals doing advanced clinical procedures, patients demanding cutting edge clinical procedures because of their exposure to advanced countries, growing medical tourism sector, good climate and standard of living which can attract best of the world experts, good international connectivity and emerging industrial infrastructure like, electronics hardware park, polymer park, and manufacturing support structures. A consortium to establish Kerala as one of the medical technology development and manufacturing leaders over the next decade shall be established bringing the various leading technology research and clinical institutions in the state in a common platform.

**Aim and Objectives**

- Development and manufacturing of cutting edge medical technologies and healthcare solutions that are competitive in international markets.
- Identification of special clinical needs relevant to Indian society and address them with innovative and cost-effective solutions.
- Multidisciplinary R & D efforts to address clinical needs that have minimal or low commercial potential, with significant support from the government.
- Development of appropriate environment and skilled workforce to attract global industry leaders to Kerala to support its economic growth and development.
- Creation of high paying and sustainable jobs.
- Establishment of Kerala as a destination for medical and business tourism by utilizing it.

**Major Activity undertaken during the period**

The programme launched on January 26th, 2020. A core team was positioned to support the programme. A Detailed Project Report (DPR) is prepared and finalised. The same is approved by the Council of Ministers, Govt. of Kerala. Dr Ramachandran Thekkedath, former Vice Chancellor, CUSAT was appointed as Advisor & Special Officer for Implementation of the programme. The core functionaries positioned will undertake initial activities.

## Community of Practices (CoP)

The CoP programme rolled out by KDISC enables creation of breakthrough ideas, new knowledge and practices through a confluence of knowledge exchange between research institutions, practitioner's/industry professionals and domain experts. Through CoP, KDISC envisages a quicker realisation of research problems of CoP members into products/services, research programmes and social enterprise.

As part of the initiative a Core Group is identified mainly from the institutional hub in each of the 5 identified areas:

1. Energy, E-Mobility & Renewables
2. Agriculture
3. Ayurveda
4. Geriatrics
5. Traditional Industries - Coir

The Core Group consists of Academicians, Researchers, Practitioners and Veteran experts. After identifying the core group, broad focus areas are identified in each domain. More members are added to the community eventually. Later, problem statements are devised in these focus areas. Several brainstorming and other sessions will be conducted wherein each member of the community can contribute problem statements in their area of expertise. The result of the process is a shelf of problem statements aimed at addressing user-centered issues. The shelf of problem

statements will be thrown open to the student community for open innovation.

**A concept note containing detailed description of the idea and its objectives was prepared during the period.**

## Mazhavillu – Teach Science Kerala

Mazhavillu – Teach Science for Kerala is a sequel to Manchadi. Mazhavillu Programme aims at preserving and strengthening the public education system of Kerala and has unequivocal focus on improving the quality of education. The program aims at improving the quality of teaching / learning in HEIs, by bridging the gap between theory and practice through community engagement; Promoting deeper interaction between higher educational institutions and local communities for identification and solution of real life problem faced by the communities in a spirit of mutual benefits; Facilitating partnerships between local communities and institutions of higher education so that student and teachers can learn from local knowledge and wisdom; Engaging higher education with local communities in order to make curriculum, course, and pedagogies more appropriate to achieve the goals of national development; Catalysing acquisition of values public service and active citizenship amongst students, and youth alike, which would also encourage, nurture and harness the natural idealism of youth; Undertaking research projects in partnership with local community through community based research methods.

**Major activities during the period**

- Resource groups have been constituted
- Institutions linked
    - ✓ Brennen College Kannur,
    - ✓ Integrated Rural Technology Centre Palakkad,
    - ✓ Kerala Forest Research Institute Trissur,
    - ✓ Maharajas College Ernakulam,
    - ✓ Govt. Arts College Thiruvananthapuram

## District Innovation Council (DInc)

The Kerala Development and Innovation Strategy Council (K-DISC) has been established by the Government of Kerala with the following objectives in Innovation promotion.

1. Support Government to promote innovation in the State.
2. Encourage young talent and local universities, Colleges, Medium and Small Scale Industries, R&D institutes.
3. Map opportunities for Innovation in the State.
4. Identify and reward talent in innovation and disseminate successful innovation examples for adoption.
5. Help create innovation eco systems.
6. Administer the Innovation Challenge Fund.

7. Advice Departments and Government institutions in utilising funds allocated for innovation and R & D and help mobilise additional resources both human and financial for them.
8. Promote research and development activities to support innovation in the form of partnership research programmes with Academic and R&D Institutions and National and International Bodies.
9. Prepare a ten-year Innovation Roadmap.
10. Organise risk capital for financing innovation ventures in Government, Academic and R&D Institutions and Start-ups.
11. Collaborate with national and international academic and R&D organisations, companies promoting/practicing adaptable innovation practices.
12. Organise seminars, lectures, workshops to promote and further innovation.
13. Create necessary IT support systems and web-based portals for promoting the development of an innovation ecosystem in the State.

The District Innovation Council shall be the district arm of K-DISC

**Aims and Objectives**

(i) Help K-DISC build up an innovation ecosystem from the schools, training institutes, Polytechnics, engineering colleges, research centres and centres of excellence at the district level.
(ii) Link young talent in the various educational institutions in the district with Young Innovation Programme (YIP) and other challenges.
(iii) Create a pool of mentors at the district level and to link the mentor pool with the young innovators through the mentor-mentee platform of K-DISC.
(iv) Identify local innovations and disseminate successful innovation examples for adoption.
(v) Integrate local governments in the district and institutions, functionaries and departments Kerala at the district level with the Kerala Innovation Fund.
(vi) Stimulate innovation by supporting partnerships among colleges, local governments, Departments, the Centres of Excellences and Research Centres in the district for learning and innovation proactively with K-DISC.
(vii) Encourage small and medium enterprises to submit proposals for technological and social innovation that will lead to significant commercial and public benefit proactively with K–DISC.

The District Innovation Council shall be the district arm of K-DISC

The distribution of the major stakeholders in the ecosystem is as follows

| Sl. No | District | Schools | | | Senior Institutions | | | Reg. Total | Facilitator 2019 | Mentor 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Premium | Non-Premium | Total | Premium | Non-Premium | Total | | | Official Location | Residence Location |
| 1 | Thiruvananthapuram | 29 | 41 | 70 | 47 | 24 | 71 | 141 | 177 | 20 | 24 |
| 2 | Kollam | 10 | 31 | 41 | 14 | 13 | 27 | 68 | 90 | 6 | 5 |
| 3 | Pathanamthitta | 6 | 15 | 21 | 3 | 11 | 14 | 35 | 42 | 2 | 2 |
| 4 | Alappuzha | 19 | 22 | 41 | 13 | 10 | 23 | 64 | 68 | 3 | 3 |
| 5 | Kottayam | 11 | 31 | 42 | 21 | 20 | 41 | 83 | 103 | 3 | 3 |
| 6 | Idukki | 14 | 30 | 44 | 5 | 11 | 16 | 60 | 58 | 0 | 0 |
| 7 | Ernakulam | 32 | 46 | 78 | 31 | 24 | 55 | 133 | 203 | 22 | 18 |
| 8 | Thrissur | 34 | 33 | 67 | 26 | 9 | 35 | 102 | 133 | 3 | 3 |
| 9 | Palakkad | 19 | 29 | 48 | 14 | 13 | 27 | 75 | 71 | 2 | 2 |
| 10 | Malappuram | 41 | 34 | 75 | 8 | 18 | 26 | 101 | 111 | 2 | 2 |
| 11 | Kozhikode | 32 | 36 | 68 | 19 | 17 | 36 | 104 | 119 | 5 | 4 |
| 12 | Wayanad | 7 | 14 | 21 | 4 | 5 | 9 | 30 | 30 | 2 | 2 |
| 13 | Kannur | 17 | 24 | 41 | 17 | 37 | 54 | 95 | 101 | 4 | 5 |
| 14 | Kasaragod | 14 | 19 | 33 | 9 | 7 | 16 | 49 | 40 | 1 | 1 |
| 15 | Outside Kerala | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 3 | 4 |
| | **Total** | **285** | **407** | **692** | **231** | **219** | **450** | **1142** | **1346** | **78** | **78** |

It is proposed to organise the following activities in districts as a part of the ecosystem building

1) Registration of educational institutions in the district as a part of the Innovation Ecosystem in the district
2) Registration of research institutions in the district as a part of the Innovation Ecosystem in the district
3) Registration of National institutions as centres of Excellences in the district
4) Registration of nodal officers in educational institutions as a part of the innovation eco system
5) Registration of facilitators in educational institutions research institutions and national institutions as a part of the innovation ecosystem
6) Registration of mentors in educational institutions, research institutions and national institutions as a part of the innovation ecosystem
7) Registration of ideas as a part of the annual Young Innovators Programme challenges by students in the schools and researchers in the research institutions which are part of the innovation ecosystem
8) Facilitate mentee, mentor and facilitator boot camps in districts strengthening the ecosystem further
9) Organise road shows for innovation promotion linking academic institutions, research centres and centres of excellence with K-DISC.

**Major Activities during the period**

- District Innovation Councils formed in 6 Districts
- 14 District Innovation Councils Co-ordinators in position
- Innovation Ecosystem Building in position

## Program Management Office (PMO)

Program Management Office is set up to manage various programs initiated by K-DISC. Functionaries of the PMO are positioned through this and also as a part of various projects included in the annual plan.

The program management office shall consist of a program manager with 6 functionaries at the headquarters and 14 functionaries at the district level. The distribution of program executives across projects shall be as provided below.

| Sl. No. | Programme | Count |
|---|---|---|
| 1 | Manchadi rollout and CML running | 2 |
| 2 | Mazhavillu, Kuttanad Hackathon | 2 |
| 3 | Young Innovators, Multi Stakeholder Platform, Community of practice | 2 |
| 4 | District Innovation Council, Young Innovation Ecosystem | 14 |
| | **Total** | **20** |

Apart from this the following functionaries have been positioned in different project teams reporting to project heads. These functionaries shall also get integrated with the PMO team. The details are provided below.

| Sl. No | Program | Functionaries | Count |
|---|---|---|---|
| 1 | Manchadi | Animators | 84 |
| | | Volunteers | 84 |
| | | Faculty/ Co-ordinators | 15 |
| 2 | Mazhavillu | Animators | 15 |
| | | Volunteers | 50 |
| | | Faculty | 15 |
| 3 | Accelerating adoption of emerging technologies in government | Programme Executives | 5 |
| | | Co-ordinators | 5 |

**Methodology of Implementation**

1. **Programme Manager**
   The programme managers are the heads of units for program management in K-DISC. The provision is for meeting the salary of programme management

2. **Programme Executives**
   Twenty programme executives are part of the K-DISC program management. The provision is for meeting the salary of these project functionaries

3. **Travel accommodation and overheads**
   The provision is for meeting the travel and accommodation of the project functionaries.

## Ganitha Sahavasa Camp

As a follow up of the Manchadi Community Lab pilots, it is proposed to spread the message of joy of maths learning to children in the age group of 6-12 through maths dwelling together camps. 1040 camps one each in Grama Panchayats and Municipalities and two each in Corporations are envisaged. The workshop shall be organised for four days and shall cover joy of learning maths activities, interaction with old persons in the locality on old measurement systems, local knowledge, field visits, rapid surveys in the locality, sky watching sessions, estimation and measurement practice sessions, and maths nights discussing maths concepts etc.

**Aims and Objectives**

1. Ganitha Sahavasa Camp workshops in 1040 locations
2. Training of teachers as resource persons in the methodology of activity based maths programmes

The workshop shall be organised by a local reading room / library or by a youth club or other public forum and hosted by them in a local institution preferably in a school. 75 children in the immediate vicinity of the camp site will be hosts for 75 children from the remaining portions of the local government. The breakfast and the supper for the guest children and accommodation shall be provided by the host families. The project shall involve creation of a State Resource Group, District Resource Groups, orientation of master trainers, pre-camp activities including registration, communication and follow up.

The expenses sought to be covered includes workshop expenses for 1040 limited to lunch and tea, nominal honorarium for resource persons, bare minimum cost of material (rest of the material being created locally out of local material), costs of planning, orienting faculty, coordinators handling communications etc.

**Major activities during the period**

- Recommendation submitted to Government. Some of the recommendations are given below:

- ☛ Primary mathematical learning should be linked to the life experiences. It would be advisable to give special training to the teachers for this. Consider the possibility of a handbook on "Mathematics Life".
- ☛ A state level mathematical festival can be considered to share the inquiries made by the teachers in the study of mathematics in the state and to develop the possibility of life-affirming mathematical learning.
- ☛ For primary math teachers a special cluster can be considered on the subject of Mathematics Life.
- ☛ Local skills should be utilized to the maximum in the classroom. Eligible mothers can be specially trained and turn in to study aids.
- ☛ Mathematics tours from schools can be encouraged to facilitate math learning.
- ☛ Steps need to be considered for setting up and expanding school math labs.
- ☛ Utilize the potential to transform biodiversity parks in to a mathematical learning tool.

- Details of the camps conducted as part of the initiative is given below:

| Sl. No. | District | Total No. of Camps conducted | Total No. of Students participated |
|---|---|---|---|
| 1 | Thiruvananthapuram | 12 | 6861 |
| 2 | Kollam | 12 | 5139 |
| 3 | Pathanamthitta | 11 | 4309 |
| 4 | Alappuzha | 11 | 7155 |
| 5 | Kottayam | 13 | 5781 |
| 6 | Idukki | 8 | 4561 |
| 7 | Ernakulam | 15 | 6529 |
| 8 | Thrissur | 18 | 8548 |
| 9 | Malappuram | 15 | 10290 |
| 10 | Palakkad | 13 | 9806 |
| 11 | Kozhikode | 15 | 8289 |
| 12 | Wayanad | 3 | 1427 |
| 13 | Kannur | 15 | 8760 |
| 14 | Kasaragod | 7 | 3808 |
| | **Total** | **168** | **91263** |

## Conversion to Liquified Natural Gas(LNG) in the Marine Sector

The potential of using Liquefied Natural Gas (LNG) as an alternate fuel for fishing and a source of energy for sea food industry provides immense scope for socioeconomic development of the sector in Kerala. It will help to lower the costs of fishing, enhance the income of poor households entirely dependent on the fishing sector, and increase the value of seafood exports. In addition to increasing the competitiveness of the sector, LNG is also seen as the cleanest fossil fuel, paving the way for significant environmental benefits

**1. Building A Seafood Park in Kochi**

The frozen food industry is highly based on modern science and technology. LNG is made by liquefying natural gas at -150 to-155 degree centigrade so that it shrinks it by around 600 times and make it easy for transportation. This is the technology used for the transportation of LNG and it is being stored in LNG terminals. The gas is then converted into room temperature by increasing the temperature using water and as such it is distributed at the normal room temperature. The availability of LNG (negative temperature) at LNG terminals can be utilised for the different purposes in sea food industry. As Government has enough land available near the LNG terminal a seafood park with huge capacities of freezing as well as Ice production can be created by tapping the low temperature available with the LNG terminal.

**2. Utilization of LNG as fuel in larger marine engines 275bhp and above**

There is a 30% reduction in operating cost to the fisherman if the fishing boats use LNG as fuel. Retrofitting an existing marine diesel engine system to enable it operate on Dual fuel (LNG + Diesel) will be done as a pilot.

**Major activities completed during the period**

- An Advisory Committee has been formed for the program headed by Dr. KM Abraham (Chairman K-DSIC), including Shri. KR Jyothilal (Principal Secretary, Department of Fisheries and Ports), Shri. S Venkatesapathy (Director of Fisheries), and other experts from Matsyafed, Central Institute of Fisheries Technology(CIFT), Central Institute of Fisheries Nautical and Engineering Training (CIFNET), Petronet and GAIL Limited. It has been constituted to oversee feasibility, design and conceptualisation of innovations for use of LNG on OBM boats and establish a seafood park in Kochi.
- A Procurement Committee headed by Dr. K.M Abraham has also been established to identify the Supplier through single source contracting for retrofit of existing diesel engines for fishing.
- The high capital cost and the reduction in the engine life of OBMs in connection with converting to LNG restrict OEMs like Yamaha to pursue the program. Thus it was decided to discontinue this attempt.
- For the conversion of large marine vessels, the procurement committee has decided to move forward with the procurement process
- A technical specification document has been developed by Petronet for the procurement process
- The programme on Feasibility of Cold Energy (Coupled with LNG) Applications in Kochi to develop Seafood Park is in the conceptualization phase.

## Multi Stake Holder Platform

As Kerala moves ahead into a self-sufficient, technology driven food production platform, Multi Stake Holder Platform (MSP) is one of the essential tools and component, that would also allow the farmer for higher specialisation and resultant income from the homesteads, while ensuring Safe to Eat Food for the household too.

The traceability of Agriculture food supply chain management is important to ensure the food safety. It also increases the customer satisfaction and peer-to-peer productivity. The centralised data storage makes it more difficult to assure quality, rate, and origin of the products. So, we need a decentralised system where transparency is available which makes people from the producers to consumer's satisfaction. Blockchain technology, which is a digital technology that allows us to acquire traceability and transparency in the supply chain.

Making use of this technology improves the community between different stakeholders and farmers. The blockchain may essentially provide increased capacity, better security, immutability, minting, faster settlement, and full traceability of stored transactions records. While the government should implement a full traceability system, the system should encourage the private producers and distributors to establish their own traceability system. The entire system should be fully integrated with the Local Self Governments and decentralised governance.

As part of the initiative various consultations and meetings were held in connection with the conceptualisation and Proof of Concept.

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# KERALA DEVELOPMENT AND INNOVATION STRATEGIC COUNCIL (K-DISC)

## ACTIVITY REPORT FOR THE PERIOD APRIL 2020 TO MARCH 2021

The list of programmes/schemes under K-DISC during the period 2020-2021 is given below:

- Young Innovators Programme (YIP)
- Accelerated Blockchain Competency Development (ABCD) Programme
- Manchadi – Teach Maths for Kerala
- Mazhavillu – Teach Science Kerala
- Accelerating Adoption of Emerging Technology solutions in Government
- One District One Idea (ODOI)
- Preparation of DPR for Kerala Mineral Hub
- Establishing a Consortium for Medical Devices Hub
- Miyawaki Afforestation Project
- Multi Stakeholder Project
- District Innovation Council (DInC)
- Innovation for Differently Abled Children
- Program Management Office (PMO)
- Conversion to Liquified Natural Gas(LNG) in the Marine Sector
- Disability Program with Academy of Magical Sciences
- Talent Search for Youth with Disabilities
- Innovation by Youth with Disabilities
- Tribal Education Methodology

## Young Innovators Programme (YIP)

The objective of the program is to develop an ecosystem for identifying youth with bright minds for solving real life problems, mentoring them, attaching them to research institutions/ partner institutions with scholarships for one year and help them build a career around the innovations, researching, re-discovering, incubating and accelerating the innovation. K-DISC shall put in place an ICT based support system for identifying promising ideas and processing through the funnel of innovation with appropriate linkages with academia, industry, investors and civil society for promoting innovations with sound business models and innovations with social relevance

State evaluation for 2019-20 done with participation of 11 Research and Development departments/ NGOs/ Agencies

1. Kerala Agricultural University, KAU Main Campus, Vellanikkara, Thrissur
2. Cochin School of Business, SCMS Group of Institutions, Cochin
3. National Institute of Speech and Hearing (NISH) Thiruvananthapuram
4. Chief Minister’s Mission Team and Ecoloop
5. Centre for Water Resources Development and Management (CWRDM), Kunnamangalam, Kozhikode
6. National Institute of Technology, Kozhikode
7. Government Medical College, Kannur

8. Child Development Centre (CDC), Medical College Campus, Thiruvananthapuram
9. VPSV Ayurveda College Kottakkal, P.O EDARIKODE, Malappuram
10. National Coir Research and Management Institute (NCRMI), Thiruvananthapuram
11. ALIVE, Pandits Colony, Kowdiar, Thiruvananthapuram

**Major activities during the period**

- The institutional linkage is being broadened to 30 agencies in North South and Central Kerala in 2020-21.
- Around 4500 institutions registered as part of the YIP programme
- An ICT platform for transactions of various stakeholders in final shape
- YIP 2018 - NIT evaluation completed on 30th June 2020 and 18 candidates participated. Experts from KSUM recommended funding for 11 candidates and 7 candidates were selected as runner ups.
- YIP 2019 Maker session completed in Trivandrum. 11 teams attended
- First Design Thinking Workshop conducted successfully in Kochi in coordination with KSUM and NID's Prof Gayatri - 23 Mentees of YIP 2018 attended.
- YIP 2020 – A total of 2826 ideas have been submitted as part of the YIP 2020 challenge. 689 new institutions have registered. A preliminary evaluation was conducted and the preliminary evaluation stage concluded with 800 ideas.

## Accelerated Blockchain Competency Development (ABCD) Programme

Launched the model for Accelerated Blockchain Competency Programme with Indian Institute of Information Technology and Management Kerala (IIITMK) and ICT Academy of Kerala (ICTAK) covering mean stack training, Blockchain Associate and Blockchain Architect training aiming at making Kerala a hub for Blockchain application. The progress is given below:

| Sl. No. | Activity | Remarks |
|---|---|---|
| 1 | Certified Blockchain Associate (CBA) Batches 1 to 26 completed | 385 candidates |
| 2 | Certified Hyper Ledger Developer (CHD) Batches 1 to 4 completed | 141 Candidates |
| 3 | Certified Ethereum Developer (CED) Batches 1 to 4 completed | 134 Candidates |
| 4 | Certified Blockchain Architect (CBR) | 79 Candidates |
| | **Total** | **739 Candidates** |

**Major achievements during the period**

In the full stack programme 1439 candidates have cleared test, 766 candidates have been trained, 279 candidates are undergoing training, and the full stack developer programme for regular students is ongoing. 385 candidates have cleared Certified Blockchain Associate programme, 141 Candidates certified as Hyper Ledger Developer, 134 candidates certified as Ethereum Developer and 79 candidates certified as Blockchain Architect. Those who completed the course have obtained promising positions already.

## Manchadi – Teach Maths for Kerala

Kerala has successfully tracked the first-generation problems in education of literacy and low enrolment in schools. However, despite the progress achieved, the National Achievement Survey (NAS) consistently raised serious questions on the performance of students in Kerala. The programme aims at supporting children in maths learning through parental and community support. Technology tools are also sought to be used for student benchmarking and for promoting adaptive learning by student. Experiences on teaching and learning of mathematics elsewhere in the country and globally has been also considered in building the campaign. A baseline study to benchmark the mathematics skills of children shall be undertaken. A control group and treatment group shall be drawn and the impact of child centered, activity based maths learning focused on guided re-discovery and enquiry assessment. Community Maths Labs and Learning Management System (LMS) integrated adaptive learning environments shall be also be central to the campaign.

**Major activities during the period**

- The progress of 5 CMLs was evaluated by the education department and it has been decided to extend the experiment to 14 CMLs. The nine new local governments identified are listed below
    - Pazhayakunnummel (Thiruvananthapuram)
    - Koduman (Pathanamthitta)
    - Vazhur (Kottayam)
    - Velliyamattam (Idukki)
    - Kumarapuram (Alappuzha)
    - Payippara (Ernakulam)
    - Vadanappalli (Thrissur)
    - Kurumathur (Kannur)
    - Madikkai (Kasaragod)

- Online training was given for mother animators and volunteers of all the 14 CMLs by Animators and the National Resource Team on Module and Pedagogy.

- Meeting with parents of Manchadi Students, local coordinators and Panchayath members associated with community labs was conducted in different phases, via online
- Online classes were conducted for students in all CMLs. Direct classes were simultaneously conducted for those who didn't have smartphones/online access.
- To facilitate online classes, Study materials from the National Resource Group were distributed to all the students across CMLs. This is done in different phases under the guidance of K-DISC, the National Resource Group and Panchayath Personnel.

## Mazhavillu– Teach Science for Kerala

Mazhavillu – Teach Science for Kerala is a sequel to Manchadi. Mazhavillu Programme aims at preserving and strengthening the public education system of Kerala and has unequivocal focus on improving the quality of education. The program aims at improving the quality of teaching / learning in HEIs, by bridging the gap between theory and practice through community engagement; Promoting deeper interaction between higher educational institutions and local communities for identification and solution of real life problem faced by the communities in a spirit of mutual benefits; Facilitating partnerships between local communities and institutions of higher education so that student and teachers can learn from local knowledge and wisdom; Engaging higher education with local communities in order to make curriculum, course, and pedagogies more appropriate to achieve the goals of national development; Catalysing acquisition of values public service and active citizenship amongst students, and youth alike, which would also encourage, nurture and harness the natural idealism of youth; Undertaking research projects in partnership with local community through community based research methods.

**Launched a pilot for integrated Science teaching of children in the age group of 8-12 in schools jointly with Higher education in situations and research centres.**

## Accelerating Adoption of Emerging Technology solutions in Government

One of the stated objectives of K-DISC is to encourage/facilitate the adoption of Emerging Technology Solutions (ETS) in Government and public agencies to enhance efficiency and effectiveness of office systems and processes. ETS typically include Blockchain, Machine Language, Artificial Intelligence, Internet of Things, Gaming & Virtual reality, Augmented Reality, Big Data etc.

Model for innovation in government established with initial success in transport, health, agriculture and law enforcement with models for Collision Avoidance System, Blood bag traceability, Immuno chain traceability, Diabetic retinopathy

Phase I, Smart Crop Insurance, AI based facial recognition and AR/VR based training through Start-ups established.

The details of completed projects of Emerging Technologies and their outcomes is given below:

| Sl. No. | Name of Project | Department | Outcomes |
|---|---|---|---|
| 1 | Kerala Land Record Management - Project Study | Registrations Department | Led to the project Kerala Land record management using Blockchain. |
| 2 | Pilot Implémentation at Athiramala Pandalam | Kerala Water Authority | The outcome of this project leads to the launch of Emerging Technology driven Continuous Drinking Water Supply Monitoring System for Pandalam Municipality Town under the Department of Water Resources. |
| 3 | Artificial Intelligence based system for automatic screening of Diabetic Retinopathy Phase 1 | Health Department | This is leading to second phase of online image quality analysis and screening of Diabetic Retinopathy. |
| 4 | Collision Avoidance system | Motor Vehicles Department | The successful outcome of the project has resulted in KSRTC deciding to install Driver assist systems with telematics and collision avoidance systems in 700 more buses. |
| 5 | Blood Bag Traceability | Health Department | Completed and discussions are in progress regarding scale-up. |
| 6 | Immunochain | Health Department | Completed and submitted to consider for scale –up |

The details of the ongoing Projects under Emerging Technologies and their status is given below:

| Sl. No. | Name of Project | Department | Project Status |
|---|---|---|---|
| 1. | Electronic Health Record Management using Blockchain | Health Department | API developed and has been handed over to eHealth for testing. |
| 2. | E wallet based collection system | Kerala Water Authority | Mobile app development is in progress. |

| Sl. No. | Name of Project | Department | Project Status |
|---|---|---|---|
| 3. | Smart Crop Insurance | Agriculture Department | Installed Weather IoT stations at 14 locations. Dashboard development with the term sheet computations is in progress. |
| 4. | AI based facial recognition on CCTV video | Police Department | Purchases of hardware is in progress. The reworked strategy to suit the pandemic situation approved by department. BRD is in progress. |
| 5. | AR/VR based training for Kerala Police | Police Department | Implementation started. |
| 6. | Advanced Technology-driven continuous Drinking Water Supply System | Kerala Water Authority | Implementation to begin, with the revised strategy on flow meter distribution. Phase2 with Automation of Pump and Water Treatment plant are being discussed in parallel. |
| 7. | Antibiotic policy App | Health Department | Project to begin as soon as the start-up registers in Kerala. |
| 8. | Tissue Culture Traceability | Agriculture Department | Project to begin as soon as the start-up registers in Kerala. |
| 9. | Kerala Land record management using Blockchain | Registrations Department | Project kick off to begin as soon as the agreement is signed. |
| 10. | Cervical cancer Screening | Health Department | Department's review of the diagnosis of slides, from the start-up is in progress. |
| 11. | Land Slide Prediction | Disaster Management | Internal Committee meeting |
| 12. | Diabetic Retinopathy Phase 2 | Health Department | Preparations for the HEC Committee and discussions regarding integration with eHealth in progress. |
| 13. | Climate Connect | Local Self Government | Concept Note for the project has been drafted. The Detailed Project Report to be developed. |

## One District One Idea (ODOI)

K-DISC proposes to launch a challenge for Promising Innovations in MSME Clusters in Kerala under "One District-One Idea"-MSME development challenge. The Challenge will be open under two categories viz. Manufacturing Clusters which shall include a minimum number of twenty registered MSME units and Micro-Enterprise Clusters including Handicraft Clusters, Handloom/ Power-loom Clusters, Other Traditional Industries and Service Clusters which are aggregations of household enterprises. Handloom/Power loom Clusters shall have a minimum of 200 looms and handicraft, traditional industries and service clusters shall have at-least 20 units in each cluster.

The MSME clusters participating in the challenge shall come up with an action plan that details the strategic innovation plans and the required appropriate interventions. Such Cluster proposals will have the collaboration of academic centre/business school partners. Evaluation of the proposals will follow based on the decided framework, with emphasis on Innovation and Technology along with other weightage considering factors.

The challenge response submission and follow up activities are to be implemented through a centralised ICT platform of K-DISC. The District-wise Innovation cluster short listing and Academic Institution short listings are done, the next set of major activities would be to connect the clusters with Institutions, offer strategic linkages, preparation of the Innovation plan, carry out Innovation Challenges and start to implement the Challenges. The Digital University will be the key knowledge partner in the programme and in its implementation.

- A Core group to support the ODOI programme is formed including the functionaries of EMC, Industries and Commerce Department, KILA, Kudumbashree.
- During the period various consultations were held as part of the programme. The list of such consultations are given below:

| Consultations | Attendees |
|---|---|
| District level consultations - Direct Target Group | • District General Manager (I&C) and Taluk, Block functionaries of Departments of Industries and Commerce<br>• Representatives of Identified Cluster Groups in the District Industrial<br>• Potential Survey Report and Brief District Industrial Profiles<br>• Implementing Officers of Important Local Government Projects- industrial activities<br>• Representatives of important Kudumbasree led micro-enterprises including ADPM (Micro Enterprise Promotion), DPM (ME) and DPM (SVEP)<br>• Representatives of Handloom, Handicraft and Powerloom Co-operatives, Joint Registrar (Co-operatives) |

| | |
|---|---|
| | • Representatives of Kerala Artisanal Development Corporation and representatives of Artisanal Clusters |
| District level consultations - Synergies | • Commodity Boards<br>• Export Development /Promotion Agencies<br>• Technopark, Industrial Parks, Kinfra Park,<br>• KSIDC, SIDCO, Inkel<br>• District Bankers Committee<br>• Small Industry Promotion Banks<br>• KFC<br>• SC&ST Dept<br>• Industry Associations, MSME Associations<br>• Representatives of Ancilliary industries |
| District level consultations – Research and Academics | • RSETI, Industries Dept MSME training incubation centres<br>• K-DISC Mentors<br>• Govt & Pvt College teachers in Commerce, Economics<br>• Business Schools - Entrepreneurship Innovation Promotion<br>• Interested startups<br>• Incubators<br>• IEDCs in the District<br>• ECS Societies, Energy Auditors |
| District level consultations – Linkage Groups | • Forestry, Agriculture, AH- Veterinary, Dairy, Fisheries,<br>• Tourism, Mining and Geology<br>• LNG, Power and Infrastructure providers like minor<br>• ports, ports, airports, railway, Metro, Water Metro,<br>• Water Transport Dept<br>• Supply Side Linkages Health, Education, Social justice<br>• Representatives of PSUs |

- As part of the initiative K-DISC invited EOI from leading academic institutions as part of mobilising the academic partners. 101 EoIs was received. An expert committee was constituted to shortlist the institutions. Subsequently out of 101 EoIs 63 institutions has been identified.

## Preparation of DPR for Kerala Mineral Hub

Kerala, with a long coastline, is endowed with many occurrences/deposits of Beach Sand based minerals (Ilmenite, Rutile, Zircon, Monazite, Sillimanite). Many industries based on these minerals are already under operational. Though there is substantial growth in annual revenue generation, underutilization of mineral resources remains a key issue and the State is yet to achieve its optimum potential

in mineral development. In this context, Board of Governors, K-DISC in their first meeting held on 02nd March 2018 identified and approved Development of Beach Sand Based Mineral Industries and Beach Sand Based Mineral Hub as one of its strategic initiatives.

The main focus is to intervene in value addition of the huge mineral reserve that the state is enjoying which is as of now been given away without meaningful conversion into value added products, a process which could bring back a substantive addition to the state's GDP. The Strategic Development Plan (SDP)covers five integral parts of the value chain from mining, mineral separation, to manufacture of basic products, manufacture of value added products and their marketing. The SDP for mining involve various departments such as Kerala Minerals and Metals Limited (KMML) and Indian Rare Earths Limited (IREL), Kerala State Mineral Development Limited (KEMDEL). To produce value added products an Industrial Complex company should function in associated with Kerala Infrastructure Investment Fund Board (KIIFB)

***Completed the DPR for Mineral hub for Kerala using the mineral resources in Chavara region and handed over to Industries Department, GoK for implementation.***

## Establishing a Consortium for Medical Devices Hub

Consortium for making Kerala a Medical Devices Hub and established basics systems for the Consortium functioning. Kerala Medical Technology Consortium (KMTC) is a futuristic and highly ambitious program envisioning to create an appropriate ecosystem in the state to foster medical innovation, R&D, technology development and manufacturing over the next decade. KMTC, through its advanced educational and research programmes, state-of-the-art incubation facilities, comprehensive sets of services and a wide institutional network, intends to create a vibrant start-up ecosystem to complement Kerala's giant strides in the healthcare sector. It is conceived as a new "Beyond Cluster" model where the entities will interact and iterate between themselves and organically evolve.

**Major activities undertaken during the period**

As part of the programme, discussion was initiated with Makers Village Super Fab Lab, SCTIMST, CCRC, KUHS, KVASU. Studied and compiled all available schemes that can benefit MSMEs &; Entrepreneurs in KMTC, with the support by Central Govt. (DST, MEITy, Start-Up India, DBT. DIPP), and State Govt. (KSUM). The office at Cochin has been functioning since March 2020, due to Covid-19 pandemic there was no substantial progress in the project. Thus, the project has been deferred from October 2020 to March 2021.

## Miyawaki Afforestation Project

Miyawaki Afforestation project was launched on 29th January 2020, following which twelve 10 to 20 cents plots were identified across Kerala for piloting the afforestation. The project is being implemented as a partnership effort of various Governmental and non-Governmental agencies with Nature's Green Guardian Foundation (NGGFn) as the technical partner. Planting of saplings have already been completed in all of the selected plots. Three locations with total area of 20 cents each and 9 locations with total area of 10 cents each has been selected for the project in various districts.

A baseline has developed up for all the plots to scientifically analyze the Environmental Impact of the Miyawaki model. Quality variation in the constituents of the Soil, Air, Water and Sound will be analyzed using modern scientific equipments and periodic assessment charts will be prepared in each of the plots. On verification of these chart and ascertaining the average mean value for a specific period will provide the quantitative measure of the influence of Miyawaki model of afforestation at each destination.

## Multi Stakeholder Programme

Developed a model for traceability of fruits, vegetables, fish and meat and a model for Kerala Food Platform in a primary co-operative bank region with Self-help groups and a green army based technical; support system.

K-DISC is working with M/s SunTec business solutions to adapt the Micro, Small and Medium Enterprises (MSME) food platform developed by them for Dubai Government for the food sector in Kerala. The use cases of Palliyakal Service Co-operative Bank in Ezhikkara Grama Panchayat in Vypin Taluk of Ernakulam District has set a model by mobilising 88 self-help groups with 1400 farmers producing 40 MT Pokkali Rice, 70 MT fruits and vegetables 3,19,920 litres of milk, 4,69,200 chicken eggs and 1,03,044 duck eggs as a part of the campaign for pesticide free vegetables in the state and have established a local procurement system retail sales outlets etc. The UAE food platform has been adapted based on the Palliyakal Service Co-operative Bank model. The service co-operative banks in Ernakulam district have shown interest in on boarding the platform. The business model for ecosystem building and partnering with producers, aggregators and other stakeholders in the food value chain is underway.

## District Innovation Councils (DInc)

The main objective of setting District innovation councils is to help K-DISC build up an innovation ecosystem from the schools, training institutes, Polytechnics, engineering colleges, research centres and centres of excellence at the district level; Link young talent in the various educational institutions in the district with

Young Innovation Program(YIP) and other challenges; Create a pool of mentors at the district level and to link the mentor pool with the young innovators through the mentor-mentee platform of K-DISC; Identify local innovations and disseminate successful innovation examples for adoption; Integrate local governments in the district and institutions, functionaries and departments Kerala at the district level with the Kerala Innovation Fund; Stimulate innovation by supporting partnerships among colleges, local governments, Departments, the Centres of Excellences and Research Centres in the district for learning and innovation proactively with K-DISC; Encourage small and medium enterprises to submit proposals for technological and social innovation that will lead to significant commercial and public benefit proactively with K–DISC.

***District Innovation Councils (DInC) were reconstituted with District Panchayat Presidents as Chairman and District Collectors as Convenors in all districts.***

## Innovation for differently abled children

Established a pioneering model for innovation for differently abled children for the first time across the globe and initiated a pilot program for the same. The programme is implemented jointly by K-DISC with the Kerala Social Security Mission (KSSM) and the National Institute of Speech and Hearing (NISH). Two streams of programme have been developed

- **Talent support program**

In the talent support program 47 candidates were identified through a screening process. An individual talent support programme has been developed and five students have been attached with Magic Academy for talent development Institutional attachment for other children is under progress.

- **Innovation by Youth with Disability**

Motivated and creative children were screened from a total of thirty. Five children remain with us currently. A detailed plan of care, capacity building and mentoring has been drawn out.

## Programme Management Office

The Program Management Office (PMO) of K-DISC has been set up to manage various programs initiated by K-DISC and to co-ordinate with various institutional partners, experts and other agencies as necessitated by the functions of the organisation. Functionaries of the PMO are positioned through this and also as a part of various projects included in the annual plan.

The program management office shall consist of 4 program managers with 17 functionaries at the headquarters and 14 functionaries at the district level. The distribution of program executives across projects shall be as provided below.

| Sl. No. | Programme | Count |
|---|---|---|
| 1 | Senior Programme Executives | 1 |
| 2 | Manchadi rollout and CML running | 3 |
| 3 | Mazhavillu | 3 |
| 4 | Young Innovators, Multi Stakeholder Platform, | 4 |
| 5 | District Innovation Council, Young Innovation Ecosystem | 14 |
| | **Total** | **25** |

Apart from this the following functionaries have been positioned in different project teams reporting to project heads. These functionaries shall also get integrated with the PMO team. The details are provided below.

| Sl. No. | Programme | Functionaries | Count |
|---|---|---|---|
| 1 | Manchadi | Animators | 14 |
| | | Volunteers* | 85 |
| | | Mother Animator* | 71 |
| 2 | Mazhavillu | Junior Animator | 18 |
| 3 | Accelerating adoption of emerging technologies in government | Programme Executives | 2 |

*To be relieved after programme completion of Manchadi

## Conversion to LNG fuel in larger marine vessels (mechanized)

The project has been piloted to retrofit an existing 325 bhp marine diesel engine system operating on diesel fuel to enable it to operate on Dual fuel (LNG + Diesel). With necessary approvals from K-DISC, Advisory Committee and Procurement Committee, Petronet LNG Ltd had floated an Expression of Interest (EoI) for selecting a vendor for this installation. Based on the observations of the Commercial Bids opened on 27 January 2020, M/s Jio Lat Auto Gas Industries, New Delhi has quoted the least amount (L1). Thus KDISC has accorded the sanction for M/s Jio Lat Auto Gas Industries, New Delhi to pilot the Project to Install a Dual Fuel Kit to convert an existing marine diesel engine of to enable it to operate on dual fuel (LNG + Diesel). Central Institute of Fisheries Technology (CIFT) has given the fishing boat for modifications.

CIFT has modified the boat to accommodate the retrofitting and M/s Jio Lat Auto Gas Industries under the super vision of Petronet LNG Ltd has completed the installation of LNG fuel storage tank and other associated equipment's and pipelines in the existing 325 bhp fishing boat by 28 February 2021. CIFT has drafted a testing protocol for the modified boat retrofitted with Dual Fuel Kit with steps to be taken by the user department, Department of Fisheries. Ongoing adequate field testing with the ultimate end user.

## Disability Program with Academy of Magical Sciences

K-DISC in collaboration with Academy of Magical Sciences has piloted a year-long training and internship program for selected Specially Abled Children (SAC) between the ages of 14 and 25. As part of this project, they are being trained in performing arts and magic so as to offer them the opportunity to strengthen their skills, stage presence, and overall personality. The program is organized in the Different Arts Centre of Academy of Magical Sciences. Periodical Monitoring and Evaluation of the participants, with the help of Institute for Communicative and Cognitive Neuro Sciences (ICCONS) and Child Development Centre (CDC) have found the pilot to be a success.

ICCONS has conducted scientific based evaluations of a sample of 32 participants, and for whom baselines had been established as per Vineland Adaptive Behaviour Scales. The ability to retain participants was considered a high risk, but the risks did not materialise as expected - the retention rate was high - 75% from Phase1 –Phase2 and 82% from Phase2-Phase 3, despite on-line classes during COVID. Using a before and after methodology, the evaluations found very satisfactory progress - a reduction of the undesirable behaviours exhibited by all the participants and notable improvement in their daily living skills. Gross & fine motor skills also improved following the yearlong training program. Since the pilot is a success, KDISC has approached the Hon'ble Minister, Department of Health and Social Justice and submitted the Monitoring and Evaluation Report along with the suggestions for strengthening the project as well scaling up the initiative to reach out to more youth. The minister has announced that the project will be scaled up to at least on a regional basis in 4 districts and thereafter extended to 14 districts of Kerala.

## Talent Search for Youth with Disabilities

This program attempts for a talent search among Youth with Disability and in guiding them to nurture their talents and equip them to take leadership roles in their life. Based on the collected information from Catalysts and Resources persons during the three-day leadership camp and from the Socio-Economic study conducted by home visits, Individual Talent Support Plan (ITSP) for each participant has been prepared. The information in the ITSP is validated and confirmed by contacting each participant. Necessary approvals from the Advisory Committee have also been taken before it was implemented.

Due to the Covid pandemic related situation, only online training sessions for Music, Dance, Videography, Drawing and Mimicry are conducted, which is mainly focused on strengthening the talent of all the participants within the limited resources. A need assessment to understand how many participants can participate in on-line mentoring sessions was also conducted prior to the kick-off. Motivation sessions were given in two months to motivate and inspire the participants. Two sessions/month for each talent (Music, Dance, Videography, Drawing and Mimicry) are organized. The systemic approach taken for the online sessions include preparing and circulating the monthly lesson plans as per the Intellectual level of participants, along with circulating weekly reference videos to the participants. A monthly progress report with the inputs from parents and catalyst based on the performance and overall improvement was also prepared. A total of 60 online talent training sessions and three motivational sessions were conducted till March 2021.

## Innovation by Youth with Disabilities (I-YwD)

Innovation by Youth with Disabilities has completed two years of its journey thus far. In these two years, the programme has crossed a number of significant milestones. The second year of I-YwD took an unexpected turn due to the circumstances caused by the Corona pandemic; the decision was made for the programme to go virtual, a combination of synchronous and asynchronous components leading to the birth of a self-paced accessible online programme on innovation. A detailed curriculum on innovation was developed by the core team in close collaboration with both subject matter experts and accessibility experts. The three key modules are as follows:

The Problem – tools and techniques for effective research and framing of a problem statement and design brief.

The Big Idea – creative brainstorming strategies followed by idea filtration and detailing of one most innovative and feasible solution.

Prototype – prototype development/service blueprint giving the idea a form.

The online curriculum developed by I-YwD is an all-inclusive programme wherein participants regardless of their abilities and disabilities may come together to expand their knowledge base on innovation, to brainstorm, collaborate, learn and grow. On the premise of feedback from previous batch of participants, suggestions from accessibility experts, advise from external advisors, and research the team made tremendous efforts to include all possible accessibility features to ensure that the videos and the programme as a whole is inclusive and meaningfully accessible to all participants. This is considered the biggest achievement so far; an innovation in its own standing.

## Tribal Education Methodology

Tribal Education Methodology Project in partnership with University of Lincoln, Scheduled Tribes Development Department, Education Department and Kerala

Social Security Mission is a year-long project funded by the Arts and Humanities Research Council (AHRC) in the United Kingdom in partnership with the University of Leeds under the umbrella of a larger project - GCRF Program Changing the Story. The project aims to develop a sustainable curriculum for young people (10-16 years of age) from the indigenous tribes (Adivasis) of Wayanad District, Kerala, India. The tribal youth are out-of-school, and a proper integration of tribal language and culture into the State syllabus of Kerala has a long way to go. This results the Adivasi education, a complex phenomenon in the State causing lack of education, unemployment, and poverty among the tribal youth. To address these issues of the tribal communities in Wayanad and their post-conflict identities, the project will undertake a youth-led Participatory Action Research (PAR) to design a tribal art-based curriculum for empowering transformative learning for advancing education as a way of reducing poverty.

The project commenced on 4th January 2020. Due to COVID-19 crisis, the initial project proposal had to be modified to evolve a mitigation plan, however, in line with the project objectives. The following activities have been completed so far as part of the project:

Theatre workshops were held in the targeted 5 Model Residential Schools (MRS) in Wayanad. A team of teachers was constituted from these MRSs for the development of the TEM toolkit. The work is in progress and the team meets up constantly via online media. A survey to evaluate online teaching-learning process was undertaken. A sample of 1000 students was taken from Mananthavady Block, Wayanad. The survey also included a sample of 100 parents and information was also sought from teachers from these 5 MRSs. The survey was done in collaboration with Kerala Mahila Samakhya Society (KMSS).

Another activity in partnership with KMSS was Safeguarding of Children Activity titled ‘Ontu Nilluva’ (Meaning – Stay Together in Adiya language). As part of Ontu Nilluva a set of 16 volunteers were selected from Mananthavady Block who belonged to Adiya, Paniya, Kattunayaka, Kurichya, Kuruma and Kadar communities. They were imparted training. A theatre workshop was also held in conjunction with this wherein they developed a drama which was staged in 15 hamlets. The drama performance is in connection with spreading awareness on Coronavirus, Child Rights and safeguarding in 45 hamlets (15 each from Thondarnadu, Thavinjal and Thirunelli panchayats in Mananthavady Block). The TEM Volunteers spread awareness through oral sessions, drama, songs and distributing pamphlets. To evolve a grass root level system, these volunteers were put in charge of creating safeguarding groups in each hamlet. Panchayat level meetings of these groups are currently ongoing in Wayanad.

# KERALA DEVELOPMENT AND INNOVATION STRATEGIC COUNCIL (K-DISC)

## ACTIVITY REPORT FOR THE PERIOD APRIL 2021 TO MARCH 2022

Major activities undertaken during the period 2021-22 under K-DISC is given below:

| Sl. No. | Division | Programmes/Schemes |
|---|---|---|
| 1. | Planning, Competency Development and Innovation Systems | • Young Innovators Programme<br>• One District One Idea<br>• District Innovation Council<br>• One Local Government One Idea<br>• Multi Stake Holder Platform<br>• Manchadi Teach Maths for Kerala<br>• Mazhavillu – Teach Science for Kerala<br>• Accelerated Blockchain Competency Development programme<br>• Electric Vehicle Programme |
| 2. | Knowledge Mission | • Kerala Knowledge Economy Mission |
| 3. | Innovation Technologies | • The Blood Bag Traceability<br>• Diabetic Retinopathy Phase 2 for automated image analysis and detection<br>• Kerala Land Records Management using Blockchain<br>• Collision Avoidance System<br>• E-Wallet based collection system for KWA<br>• Artificial Intelligence based Facial Recognition<br>• Blockchain based smart crop insurance<br>• AR/VR Training for Crime Scene Forensics investigation<br>• Antibiotic Policy Application<br>• INNOVATION for GOVERNMENT (i4G) 2021<br>• CITIZEN SERVICE – ONE DEPARTMENT ONE IDEA 2021 |
| 4. | Social Enterprises and Inclusion | • Innovation by Youth with Disability<br>• Talent Search for Youth with Disability<br>• Disability program with Academy of Magical Sciences<br>• Virtual Tribal Employment Exchange<br>• Conversion to Liquified Natural Gas Fuel in Out Board Motors<br>• Tribal Education Methodology |

## Planning Competency Development and Innovation System Division

## Young Innovators Programme (YIP)

YIP is a flagship programme of K-DISC. It is an ongoing programme. During the period Micro planners were created and Functional Re-organisation was completed.

*YIP 2018*

Closure of YIP 2018 process initiated for 20 teams. 5 teams in Accelerated Innovation Track completed at the Exit workshop held on 16 June 2021. Documentation of success stories has been initiated. Documentation of the achievements of Normal Innovation Track (NIT) winners (10 nos.) and Accelerated Innovation Track (AIT) winners (7 nos.) is in progress. Sri. Manu Joseph (AIT winner) who developed a Marijuana Detector got selected for the Entrepreneur in Residence (EIR) programme of the Kerala Startup Mission (KSUM). Sri. Rohit. K and Sri. Manas Manohar (AIT winners) who developed the Aero Water Maker and G file: Next Generation e-Governance got selected for the Start-up Innovation Service Initiative of K-DISC. Sri. Justin George and Sri. Joseph John (AIT winners) who developed Electro Dynamic Chair and Modified Walker respectively are being connected with APJ Abdul Kalam Technological University (APJAKTU) and National institute of Speech and Hearing (NISH) for further possible engagements. The first and second exit workshop was completed during the period. YIP 2018 concluded with 7 winners under Accelerated Innovation Track (AIT) and 10 winners in NIT.

*YIP 2019*

Institutional framework for YIP has been re-structured for better accountability. Mentor mentee application improvement has been initiated. Review sessions of 72 teams under YIP 2019 has completed. Mentor orientation plan (New Product Development with Fuzzy Front End) for domain mentors was initiated during this period. Second stage of the multi-gated innovation evaluation process was completed. 234 teams were short listed. Immersion boot camps on design thinking, research methodology and social impact product development have been launched. State level Institution Hub programme piloted in 5 institutions. Community of Practices and Shelves of Projects were finalised. IT Solution revamp to incorporate project shelf-based ideas initiated. Innovation Ecosystem strengthening plans have been finalised.

Proposals for State Innovation Hubs challenge, District Innovation Hubs Challenge, Crowd sourcing for innovation funding programme and innovation fellowship program were finalised. AIT progress evaluation shall be scheduled along with NIT evaluation. The target date for completion YIP 2019 is 31st March 2023. 102 teams were selected as winners. 7 teams completed under AIT. Normal Innovation Track (NIT) will be announced by the end of March 2022.

*YIP 2020*

Immersion bootcamps on design thinking, business model development, intellectual property rights, research methodology and social impact product development for YIP 2020 are completed. State level evaluation got completed. The winners will attend the maker camps, research showcase events and the business for good camps. The winners will be attending the AIT and NIT challenges which will happen subsequently. As per 3 stage gated exit strategy 345 winners and 96 winner teams have been identified. The identified participants will be connected to partner institutions to enable their mentorship process. AIT and NIT to be announced soon.

*YIP 2021*

YIP 2021 institutional registration process commenced on 18th August, 2021. The ideator pre-registration process was launched by the Hon. Chief Minister. A partnership with Mulearn, an affinity space created by G Tech (a collaborative of IT companies in Kerala) is launched. Fox Lab Makerspace has been brought in as an institutional support mechanism for hardware related work of innovation. Over 1 lakh pre-registrations and more than 13,000 teams have registered. Around 40,500 ideators have completed the Voice of Customer (VoC) training and 8330 ideas were submitted. Preliminary evaluations are commencing by end of April 2022. More than 5,780 institutions are now part of the YIP ecosystem.

## One District One Idea Programme (ODOI)

The core aim of the programme is to establish innovation clusters in the state. Empanelling of 115 clusters was completed including the sixty-six clusters identified earlier. Sixty- three institutions including 33 Engineering Colleges, 12 Arts and Science Colleges, 9 Business/ Management Schools, and 9 Polytechnics have been shortlisted as academic partners for the program through an EoI. The training of these institutions by the Digital University was completed in December. Sixty-six Innovation Cluster proposals by District MSME Core groups were reviewed by Digital University. The State-level MSME Core Group reviewed ODOI progress and revisited cluster guidelines. Revised guidelines prepared. Process for mobilizing Farmer Producer Organisations (FPO) and modern engineering clusters are initiated. The process for mobilizing Farmer Producer Organisations (FPO) and modern engineering clusters was initiated based on the revised cluster guidelines finalized by the State core group. 52 cluster organizations have been shortlisted and 55 mentor institutions have been brought into the program. The institutions are developing innovation plans for cluster development. Challenge is scheduled to be announced shortly.

## District Innovation Councils (DInC)

Various meetings of District Innovation Councils at different instances were organised. YIP 2021 institutional registration revamp was completed with the help of the DInC mechanism. The Core Group meetings of DInC were held regarding

cluster identification for ODOI. District Innovation Council also played an enabling role in mobilizing institutions for YIP during the period.

## One Local Government One Idea (OLOI)

The OLOI programme is intended to develop a sustained mechanism for promoting innovation in local governments. The overall objective of the programme is to foster sustainable Local Economic Development and bring about social transformation in LSGIs of the state. In the process, it is aimed at developing a system for identifying best practices and translating them into innovations at the local government level, working jointly with LSGIs. It will also strive to put in place a support system for structuring the innovation process as a challenge with involvement of academic and research institutions to take up the better idea for implementation. It is expected that this in turn, will strengthen the support system for problem solving at the local level and create linkages with Academic and Research Institutions and entrepreneurs/start-ups. The programme will also support organizing innovations locally and integrate the local innovation system of rural innovators with the overall innovation eco-system of the state. The Programme is expected to encourage development of ideas at local government level, identify the best idea and take it forward for implementation. The programme will be operationalized through partnerships between LSGIs, academic/research institutions, Government Agencies, private enterprises and experts.

**Major Activities during the period**

The detailed framework for the programme is finalised. Consultations were initiated with Kerala Institute of Local Administration (KILA), Integrated Rural Technology Centre (IRTC), Kudumbashree, Local Self Government Department and Minister Local Self Government. A write-shop to finalize the OLOI strategy was organized at KILA based on which a process outline and protocol were worked out. Centre for Management Development (CMD) has submitted a framework and implementation plan for the program. Following this, a tripartite MoU has been signed between K-DISC, KILA, and CMD for the programme implementation. A detailed preliminary meeting between KILA, CMD, K-DISC and LSG Commission was held on 18th March 2022. Funds have been released for preliminary activities to CMD and KILA.

## Muti Stake Holder Platform-Kerala Food Platform for safe to eat organic food

Detailed discussions with Director, Agriculture on extending traceability, e-commerce and micro agricultural services platform at the State level. Proposal for integration with Co-operative Initiative for Agriculture Infrastructure Kerala (CAIK) to leverage market connect, value addition, and productivity enhancement in agriculture, animal husbandry and fisheries developed with State Planning Board, Kerala Bank, Kerala Agricultural University, Kerala Block Chain Academy and International Co-operative Alliance under process.

## Manchadi-Teach Maths for Kerala

Community Maths Labs (Manchadi Koodarams) functioning online because of covid were moved to a blended mode before the exit of the pilot phase. Also completed migration of Six CMLs to Realistic Maths Education around contextualisation, mathematisation, peer learning, community scaffolding and dynamic assessment approaches during the period. A detailed discussion on Extended pilot with Minister for General Education was held. Exit strategy for current Manchadi pilot finalised. Joint proposal for new phase of Manchadi developed jointly with Sarva Shiksha Abhiyan-Kerala. Capturing dynamic assessment in Bitrix application has been initiated.

Preparations for the extended pilot in Model Residential Schools governed by the Scheduled Caste Department and Scheduled Tribe Departments, Multi Graded Learning Centres and the Community learning centres for children belonging to the fisherman community have been completed. The Sarva Shiksha Abhiyan-Kerala and the SCERT are integrated through the Block Resource Centres and DIETs. The TLM mechanism on Bitrix is completely being revamped to suit the requirements of the new MGLCs and also for integrating the teacher user groups. 20 centres have been identified after discussion with the SC, ST Department. A children's home in Alappuzha was also added to the programme as a Manchadi Koodaram. Offline classes which were suspended due to covid restrictions have restarted during this period.

## Mazhavillu-Teach Science for Kerala

TLM content around a methodology of problem-based learning around integrated thematic teaching initiated. A methodology of enquiry-based science teaching and dynamic assessment was also launched. TLM content being updated in ICT application Bitrix. Workshop for thematic Integration and developing learning trajectories completed at IRTC. The intense session was a good exercise in firming up strategies after the induction programmes of the animator's content consolidation around the methodology of problem-based learning around integrated thematic teaching in progress. A methodology of enquiry-based science teaching and dynamic assessment is also sought to be attempted in the field avoiding direct teaching fully. Immersion completed for volunteers. Mechanisms for baselining of students being attempted. Teaching -Learning process is sought to be done in a blended mode and will address learning loss due to the pandemic. The content of Mazhavillu has been revised. Classes have started in 5 centres following the revised content.

## Accelerated Blockchain Competency Development Programme

Mobilisation for mean-stack training was affected by Covid. Virtual classroom programmes launched for Meanstack, Blockchain Associate and Blockchain Developer. MOOC based Blockchain Foundation course covering Foundation, Ethereum and Certified Blockchain Associate launched by KBA. The program is

getting good attraction and has covered 6667 students already. Three blended learning programmes launched for Mean- stack by ICTAK during the period. Instructor led virtual trainings for certified Blockchain start-ups and Certified Blockchain Associate launched by KBA.

## Electric Vehicle Programme

A project report for an EV programme involving Travancore Titanium Products Limited (TTPL), Vikram Sarabhai Space Centre (VSSC), Centre for Development of Advanced Computing (CDAC-T), Trivandrum Engineering Science and Technology Research Park (TresT Park) has been prepared. Two proposals for Development of Battery Management System for Lithium Titanate Oxide Cell based batteries for EV application and Development of a 43-kW fast charger for Heavy Electric Vehicles have been submitted to Ministry of Electronics and Information Technology (Meity) under the Development of Electric Vehicle Subsystems. The signing of the MoU was held at 11.15 AM on 24th November. Following the MoU signing between the consortium partners, regular monthly review meeting is being conducted under the overview of the Executive Vice Chairperson (EVC). Funds were released for C-DAC for their proposed activity in the first quarter of BMS development for LTO based cells (INR 93.59 Lakhs). Funds were released for TTPL for purchasing necessary machinery for the program. TTPL has proposed to provide LTO based material for characterisation of the batteries. TrEST Research Park has also submitted proposal for Low Voltage (LV) and High Voltage (HV) Drive Train Testing Lab which shall be a component in the envisioned EV Park and the proposal has been evaluated and approved for funding.

## Kerala Knowledge Economy Mission

EVC constituted a core group for Kerala Knowledge Economy Mission (KKEM) in February 2021. The KKEM core group after the preliminary activities including the launch of the mission, initial consultations with industry leaders and positioning of the platform Digital Workforce Management System (DWMS), initiated consultations with vendors who responded to the EoI for platform integration with DWMS. M/s Monster, M/s Freelancer, M/s Sentient Scripts, M/s Transnueron, M/s Text Kernel. M/s Tseek, M/s Awign and M/s Cactus responded to EoI. The Council of Ministers at its meeting on 20-05-2021 had authorised K-DISC to prepare a strategy paper on the programme for skilling twenty lakh educated unemployed. Based on this stakeholder consultation were done by the core group with various departments, agencies, universities, industry bodies, training providers, social security and infrastructure providers etc. Based on this the core group has prepared the strategy paper which has been forwarded to the Chairman for further examination at the government level. The consultations on the Strategy Paper initiated by K-DISC were completed substantively before the 1st meeting of the Governing Body itself. The process of consultations with the State Planning Board was the major one remaining. This has ever since been completed on 29th and 30th September. The revised strategy paper consolidating all the inputs has been subsequently submitted

to the Government. The Government approved the Strategy paper of KKEM. Meanwhile as a proof of the concepts mooted, K-DISC has taken up a programme for providing 10,000 jobs for the educated unemployed of the state. A comprehensive action plan has been charted out jointly by K-DISC with the partner organisations viz. ASAP, KASE, Kudumbasree, ICT Academy and Digital University. Agreements with M/s Monster.com, India private limited and the Confederation of Indian Industries (CII) have been also been leveraged for the PoC. The CII has promised to provide 10,000 vacancies and support for providing employment for 6000 jobseekers. Monster is providing data feeds of employments on to DWMS daily. The Digital Workforce Management System (DWMS) has been quickly improved adding an employer registration module apart from the Jobseeker module. ICT Academy has put in place a mechanism for mobilising employers and job opportunities through them jointly with GTech, Technoparks and Kerala Small Scale Industries Associations. A temporary process of validation of the job providers is put in place by ICT Academy through the professional bodies. The opportunities consolidated by the employers registered on the portal are being used to organise a seriesof job fairs in districts in a blended mode ie. partly physicaland partly virtual. A process for onboarding jobseekers registered with the partner agencies, Centre for Management Development (CMD), Placement Officers in various Educational Institutions were integrated through a process of data- cleansing and data standardisation. The jobseeker profilesare also being enriched through e-mail and SMS blasts voicecalls and WhatsApp messages. An agency has been identified for communication support through ICT Academy and the process of data handling initiated.

**Major activities undertaken as part of KKEM is given below:**

**DWMS:** Digital University has established the electronic platform – Digital Workforce Management System (DWMS) for jobseeker registration and job provider registration. The first version of the platform is complete. The platform already has 3,11,857 candidates registered on the portal (as on 31st March 2022). New features and functionalities are being added to the platform by Digital University to provide various services to job seekers and job providers including curation and counselling, skill cataloguing and routing to skill partners and job matching. Features of profile updation for job seeker and due process for updation of job provider will be incorporated in the next version. A feature to schedule and conduct continuous virtual job fairs is also sought to be incorporated.

**Job Fair:** Only a limited-on ground effort was undertaken initially to mobilise candidates for the program. It was necessary to validate the program's capability to mobilise candidates and jobs. To demonstrate the feasibility of the KKEM strategy the honourable Chief Minister suggested a 10k pilot project. The pilot project was launched through ICT Academy (ICTAK) in October 2021. 17 physical job fairs, a virtual job fair, and 3 job fairs for Back to Career (B2C) candidates were conducted across Kerala. We were able to mobilise 580 employers, 2104 job roles, and 33,047 total vacancies. A total of 10,693 candidates were shortlisted and selected during

the pilot. Based on the feedback from employers 2801 job seekers were selected through the campaign. Through the pilot we gained valuable insights that will guide future activities of the program. We were unable to provide job seekers for high end jobs. Many of the candidates who were selected for the lower end jobs did not join. It shows that skilling and grooming is necessary to achieve the vision of transforming Kerala into a knowledge economy. It also revealed that candidates are selective in lower end jobs.

**Mobilisation:** Two plans regarding mobilisation were finalised. A mobilisation plan proposed by Kudumbashree for an amount of Rs. 14.62 crores were evaluated and approved. Kudumbashree is being positioned for mobilisation of job seekers at the grass root level via My Job My Pride campaign. A detailed bottom-up mobilisation through local government was created and discussed with the Honourable Minister for Local Self Government, the Additional Chief Secretary, and the Kudumbashree Executive Director. The plan has been put in motion. A second plan was put in place via discussion with Vice Chancellors and ASAP to mobilise candidates from Higher Education Institutes. A campaign called Connect Career to Campus is being initiated with education institutions through ASAP.

**Curation and Counselling:** EOI was invited for Personality Development Professionals for providing basic communication skills as part of enhancing the opportunities of job seekers. A career clinic was proposed to catalyze the job matching for registered candidates in DWMS. As part of the career clinic, a training program for the KKEM Programme Managers was held on 17th and 18th March 2022 to equip them to connect the job seekers with the Knowledge Economy. For improving the job descriptions in DWMS it was proposed to on-board Case Workers who can work with job providers. An EOI for on boarding Case Workers will be invited at the earliest. A proposal to groom candidates going for job fairs and interviews has been obtained through ASAP and is being evaluated.

**Skilling:** The skilling ecosystem will consist of training partners - ASAP, ICTAK, Kudumbashree, KASE; major higher education Institutions, and other training institutes in the state. For training purposes, it is sought to route job seekers through the training partners. Cataloguing of courses has been initiated. The training network will be extended to cover universities and other training institutions/ agencies in the state. Discussions with State Level Bankers' Committee (SLBC) aim to improve access of skill loans to job seekers looking for training. Discussions are ongoing with the Chairman of Kerala Bank and KSFE. A programme for setting up of an AR/VR lab in a community skill park of ASAP has been processed. A program for providing scholarship for students for skill courses has been agreed with ASAP for Rs. 3,00,00,000. Skill cataloguing and identification of new age skill courses is underway. A sector classification and programme template are shared with 10 agencies to collect course details. Skill infrastructure enhancement proposals submitted by different agencies are being evaluated.

**Demand Mobilisation:** ICTAK is the nodal agency for demand side mobilisation. Partnerships have been entered into with national and international leaders in demand side aggregation. An agreement has been signed with CII whereby CII will facilitate employment of 7 lakh candidates in the next 5 years. CII has set up their PMU and started activities for the same. We have also tied up with M/s Awign as a gig job provider, and with M/s Freelancer and M/s tseek as aggregators for international opportunities. Partnership with M/s Monster has resulted in 5000 job seekers being identified and 40 job seekers attending interviews and receiving exposure through Monster. An NDA with Freelancer approved by the law department is currently under the evaluation of the Chief Secretary's Office for final approval. The program will partner with more aggregators in the coming year.

**Platform Co-operatives:** Knowledge Economy activities have often led to exploitation of gig workers. To address this the mission has envisaged creation of 4000 platform co-operatives as a techno-economic model that will provide a social security system for the gig workers and prevent their exploitation. A joint programme to establish platform co-operatives is being initiated with ICA-AP and The New School, New York City. An expert committee consisting of Dr. A. V. Jose (CDS), Smt. Sarada G. Muraleedharan IAS, Smt. Mini Antony IAS, Dr. S. Chithra IAS, Smt. P.I Sreevidya IAS, Dr. K. J. Joseph (GIFT), Representative from International Cooperative Alliance - Asia and Pacific (ICA-AP), and Dr. Sonia George (SEWA) has been proposed to provide overall guidance to the program.

## Innovation Technologies

## Completed Projects

The Blood Bag Traceability in Trivandrum General Hospital and its associated blood storage centres, Retinal Image Quality Assessment and Feedback Generation Methodologies using Artificial Intelligence Phase 1, Blockchain enabled Vaccine Coverage Analysis System, Tank level Monitoring system at Athiramala for Pandalam Water Supply System Pilot implementation, Kerala Land Records Management - Project Study and Collision warning system for KSRTC have been completed with demonstrable benefits. Blood Bag Traceability Phase 2 for scale up across the status has been initiated by the Health Department.

Diabetic Retinopathy Phase 2 for automated image analysis and detection has been initiated along with Health Department.

Phase 2 of Kerala Land Records Management using Blockchain has been initiated with the Registrations, Land Survey and Revenue Department.

KSRTC has agreed to implement the Collision Avoidance System in new buses being procured through Kerala Infrastructure Investment Fund Board (KIIFB).

## Projects under Implementation:

In E-Wallet based collection system for KWA, UPI payment interface using QR code for collection agents has been completed and functionality of the mobile integration with KWA billing application is under progress. In Aadhaar Data Vault Compliant Blockchain based Electronic Health Record System deployment completed. Completed successful bulk upload of 45,46,875 records to the Aadhaar Data Vault at the State Data Centre.

In Artificial Intelligence based Facial Recognition based real time video for Law Enforcement, procurement of hardware has been completed and the locations for camera installations are being finalized with the Department.

In Blockchain based smart crop insurance for Department of Agriculture the User Acceptance Testing of web application for Agri Department and mobile app for farmers in progress. The department has agreed to scale up the project to two more districts – Thrissur and Idukki.

In AR/VR Training for Crime Scene Forensics investigation for Kerala Police Academy, out of the 15 Virtual Reality Crime Scenes to be developed, 5 Crimes scenes are developed and delivered. Development of configuration module is under progress.

In Antibiotic Policy Application for building a handy, easy to use conversational tool for medical professionals, the initial version of the application with 7 modules have been completed and UAT approval is also obtained from user department. The final version's development with remaining 6 modules has been completed and internal testing is in progress.

**INNOVATION for GOVERNMENT (i4G) 2021**

Under INNOVATION FOR GOVERNMENT (i4G) 190 applications were received during the current cycle. From the solutions submitted by the start-ups, 13 promising ones relevant for the Health Department were presented to the Domain experts suggested by the Health Secretary.

The Emerging Technology team also had driven the Hackathon event for Health Department and selected 5 start-ups as winners of the Hackathon event.

**CITIZEN SERVICE – ONE DEPARTMENT ONE IDEA 2021- CS-ODOI 2021**

K-DISC received a total of 105 applications from various departments across Kerala. After preliminary verification of 105 applications received, 84 applications were presented during the CS ODOI workshop in front of the panel members from the Departments.

## Social Enterprises and Inclusion

### Innovation by Youth with Disability

Nineteen participants are identified and being mentored by NISH. Blended learning programme being developed and implemented. First tranche in progress. New cycle being initiated. Application process for the current tranche initiated. Selection process is completed. LMS under development. KTU has expressed interest in joining as an academic partner along with NISH. Organized selection camp and selected 21 participants. LMS has been developed. An MoU has been initiated for partnering with KTU. The first Learning milestone has been reached and participants finalized their problem statement

### Talent Search for Youth with Disability

The program aims at talent search among people with disability and guiding them to nurture their talents and equip them to take leadership roles in their life. First tranche is completed. New cycle initiated. The online training for the participants of first cycle are being organized. Application process for the current tranche initiated and shortlisted 75 participants.

### Disability Program with Academy of Magical Sciences

A yearlong internship for Specially Abled Children between the ages of 14 and 25 has been completed. A new initiative Universal Magical centre is being developed.

### Virtual Tribal Employment Exchange

The tribal population comprises 1.45% of the total Kerala population or about 5 lakhs consisting of 1.46 lakhs of families residing in about 7000 settlements. The Scheduled Tribes Development Department (STDD) has been implementing a large number of training and livelihood programs for them. Government of Kerala spends about Rs. 10-15 crores annually for skilling and employment generation during the last few years. Typically, such livelihood and training were supply driven. There is, however, no systematic matching between available skills of tribal youth and potential employers in the market. STDD has, therefore, proposed a Virtual Tribal Employment Exchange(VTEE) Model to mediate between the supply of educated tribal youth and the demand for their services in the markets. The innovative part comes from the mixing of the 'matching' process with the 'skilling process,' which distinguishes VTEE from a standard Employment Exchange Program. Project core team has been positioned. Proposal for sustainability of Virtual Tribal Employment Exchange being developed for UNICEF. Discussions initiated with Polish Chamber of Commerce, MEITY, Jobs Warehouse, Amazon Fulfilment Centres etc.

**Major activities during the period**

VTEE App has been developed. Linkages with KKEM has been developed through ICT Academy. Arrangements for availing the job postings of HUNTR an aggregator for placement of trained ST youth is under progress. The candidates are being mobilized

to register in the app. The app has also been updated with courses imparted by the Tribal Department.

## Conversion to Liquified Natural Gas (LNG) Fuel in Out Board Motors

Approval for LNG in OBM project has been obtained from fisheries department. Based on the protocol for testing modified boat retrofitted with Dual Fuel Kit, Central Institute of Fisheries Technology (CIFT) has organised field trials using dual fuel (High Speed Diesel (HSD) and LNG. The trials indicate, no reduction in the power when LNG is mixed with HSD.A discussion was initiated with Department of Fisheries, CIFT, Matsyafed and Petronet LNG Ltd. to extend the pilot to three more fishing boats.

## Tribal Education Methodology

The project is being implemented by Lincoln University for Tribal Department to develop a tool kit for Tribal Education Methodology in the Kerala context was extended till September 30, 2021 because of the prevailing COVID situation. A closure of the project has commenced.

# ANNEXURE 1- Strategy Paper of Young Innovators Programme

# Young Innovators Programme (YIP)

## Kerala Development and Innovation Strategic Council (K-DISC)

**Version 11.0**

**23.05.2019**

# Young Innovators Programme

# K-DISC

## I. Objectives of the Programme:

The Young Innovators Programme (YIP), a flagship programme of K-DISC in its innovation segment, aims to empower future innovators to innovate new products, services or models to meet emerging requirements, unarticulated needs, or existing market needs of the society more effectively through specially designed challenges.

## II. Sponsor of the Program

Government have formed the Kerala Development and Strategic Council (K-DISC) with a mandate of promoting innovation in the State. The overall focus of K-DISC is to identify and nurture a critical mass of innovations in the State and to provide appropriate institutional linkages to the selected innovations. K-DISC will facilitate creation of an integrated ecosystem for innovation in government and work towards complementing the roles of other agencies in the state promoting innovation and entrepreneurship. YIP shall be part of an open innovation strategy[1] that is being adopted by K-DISC towards this objective. Through the open innovation strategy K-DISC will establish an Idea Exchange[2] which will integrate challenges like YIP to the K-DISC innovation ecosystem. A broad spectrum of problem areas and solution domains that are of interest to K-DISC is provided in Annexure 1. The problem areas identified by K-DISC broadly converge with the focus of Navakeralam the mission programme launched by the government of Kerala in 2016. However, the ideas, prototypes or processes proposed in YIP challenges need not necessarily be limited to these. A sample of the type of innovations is provided in Annexure 2. YIP will be sponsored and managed under the auspices of K-DISC. Resources for the programme are primarily provided under plan grants for K-DISC, which are sought to be augmented by funds from foundations and Corporate Social Responsibility Funds.

[1] Open innovation is a distributed innovation process based on purposively managed knowledge flows across organisational boundaries, and values sharing of knowledge without contradicting intellectual property.

[2] Idea Exchange is an online collaborative community networking with peers and mentors and work together to solve problems of common interest.

## III. Thrust of the Program

The YIP 2018-21 tranche has been modelled on the lines of the programmes of the National Science Foundation (NSF) of United States. Emulating the rigorous and thorough merit review process of the NSF, YIP was expected to achieve its objectives through the following activities:

1. Enhancing identified youth with design thinking[3], collaborative, creative problem solving and leadership skills
2. Empowering and building youth through immersive programmes to Learn, Empathise, Accelerate and Disrupt. (LEAD)
3. Mentoring them and intensifying networking to build a product or develop a process for showcasing in the Young Innovators' Challenge.
4. Certifying promising innovations and attaching the young innovators to research institutions in related areas with scholarships for 1 year.
5. Tracking these young innovators and linking them to institutions, industries, enterprises and prospective funding agencies.
6. Build a strong pool of mentors to identify, assess and track innovations as well as provide young innovators the necessary academic, domain specific as well as psycho-social support necessary through the process.

Build up on the overall focus outlined in 2018, the YIP 2019 has firmed itself around a philosophy of situated cognition[4] and design-based learning, and is envisioned to be a massive, open, inclusive, collaborative, institution-based program aimed at identifying and nurturing young innovators. The overall design and structure of the YIP 2019 has evolved from the following underlying **strategies.**

1. To prepare the next generation of youth in Kerala for the 4th Industrial Revolution[5] and helping them apply Industry 4.0 related skills in addressing Kerala's developmental issues.

[3] **Design thinking** is a creative problem solving method. It makes use of elements like empathy and experimentation from the designer's toolkit to arrive at innovative solutions.

[4] **Situated cognition** is a theory that argues that knowing is inseparable from doing, by arguing that all knowledge is situated in activity bound to social, cultural and physical contexts. Knowledge and learning according to this model requires thinking on the fly rather than the storage and retrieval of conceptual knowledge. Cognition cannot be separated from the context. Knowing exists, *in situ*, inseparable from context, activity, people, culture, and language. Therefore, learning is seen in terms of an individual's increasingly effective performance across situations rather than in terms of an accumulation of knowledge, since what is known is co-determined by the agent and the context.

[5] The phrase **Fourth Industrial Revolution** was popularly introduced by , the executive chairman of the World Economic Forum, Klaus Schwab. Emphasizing on advances in communication and connectivity, Schwab refers to cyber-physical systems (technologies that combine hardware, software, and biology) as the basis of this fourth era.

To imbibe the next Industrial Revolution skills and apply them within an overarching framework of design thinking for applying acquired Sciences, Technology, Engineering, Arts and Mathematic (STEAM) skills in order to solve open questions, and hard "wicked" problems[6], complex challenges, overcome local and hyperlocal developmental issues. The future of Kerala is bright and exciting, replete with formidable challenges and opportunities. YIP 2019 is designed to equip, nurture and develop, in these young innovators, the requisite skills and tools that will be imperative to secure a vibrant future for Kerala.

2. To innovate embodying the hopes and aspirations for a brave new Kerala.
   Confronted with second-generation issues in many key sectors, Kerala is facing challenges of providing holistic health care, employment-oriented skilling, enhancing quality of education, high quality social security, continued food and nutrition security with a pro-poor bias, gender justice and inclusion of outliers, all within severe fiscal constraints. The state also must address decades of infrastructure deficit and make rapid strides in cutting edge areas of knowledge revolution and tourism without infringing upon its fragile environment and impacting adversely upon its biodiversity. In the above context Innovation emerges not only as an engine of prosperity, competitiveness and an ingenious mechanism of real-life problem solving but as the act of creating extraordinarily new values in unusually original ways.

3. To build a conducive **Innovation Ecosystem**.
   Innovation is the resulting interplay of industry, research, academia and civil society and needs a conducive environment for ideation, design and application. An institution-based approach shall be followed, where Industry, Research Practitioners, Teachers and Professionals are actively involved end-to-end in adopting and inculcating the process of innovation systemically. The emphasis on mentorship and interactions with domain experts and professionals through Communities of Practices (CoPs)[7] are also meant to establish exciting spaces for innovators with sustained support for problem solving.

4. To promote **diversity, inclusion** and **collaboration**.

[6] A **wicked problem** is a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. It refers to an idea or problem that cannot be fixed, where there is no single solution to the problem. The use of the term "wicked" here has come to denote resistance to resolution, rather than evil.

[7] A Community of Practice (CoP) is a group of people who share a craft or a profession. A CoP can evolve naturally because of the members' common interest in a particular domain or area, or it can be created deliberately with the goal of gaining knowledge related to a specific field. It is through the process of sharing information and experiences with the group that members learn from each other, and have an opportunity to develop personally and professionally.

Diversity and Inclusion are proven drivers of Innovation – enabling out-of-the-box thinking and bringing together multiple perspectives and skills. Collaboration is also key to driving Innovation, and YIP Challenge 2019 will try and encourage collaboration amongst the innovators through team or group-based participation. Nevertheless, individual entries shall also be screened for consideration based on the ingenuity and exceptional quality of submitted ideas. Every individual who is passionate about an idea will be given the opportunity to explore them. Grit and passion, the spirit of enquiry and inquisitiveness of the individuals as well as the teams will be critical attributes for assessment.

## IV. The strategy adopted

The overall strategy for the 2018 – 21 Tranche comprised of the following.

1. K-DISC has used scouting agents, agencies and institutions with excellent credentials and track record and who are engaged in the process of identifying ideas in innovation. These agencies will be relied on to undertake the first level of screening of potential talent.
2. K-DISC has undertaken a process of selection from among the student identified under the various streams.
3. Agencies and institutions organising state level knowledge fests, science fairs, work exhibitions, and innovation talent hunts for high school and higher secondary levels in Kerala for at least five years continuously with multi-level merit-based and transparent selection processes were involved.
4. Such agencies were certified by any one of the following government departments involved in human resources development of children and youth.
    a) Kerala State Council for Science Technology and Environment.
    b) Directorate of Technical Education
    c) Directorate of Higher Secondary Education
    d) Directorate of Vocational Higher Secondary Education
    e) Directorate of Industrial Training
    f) Directorate of Collegiate Education

    based on the following broad conditions:
        i. There should be a multi-level screening process involving two or more levels.
        ii. The focus should be on real life problem solving using Science Technology Engineering, Arts and Mathematics (STEAM), the term science encompassing social sciences as well.
        iii. There shall be focus on assessing overall creativity of students preferably using through Multiple Intelligence Assessment Metrics.

Based on the experience of the 2018-21 for the 2019 -22 Tranche the programme has been broadened to cover the higher education institutions more thoroughly by reaching out through the various Universities in Kerala including Kerala University, Mahatma Gandhi University, Cochin University of Science and Technology, Calicut University, Kannur University, Kerala Technological University, Kerala Agricultural University, Kerala Veterinary and Animal Husbandry University, Kerala University of Fisheries an Ocean Sciences , Kerala Health University, Thunchath Ezhuthachan Malayalam University, National University of Advanced Legal Studies and the Sree Shankaracharya University of Sanskrit, Kalady and the various deemed universities in the State. An effort shall be made to rope in students from CBSE Schools, ICSE Schools, Technical Schools and also students learning nursing, para medical sciences etc. There shall be an extended focus on law, arts, humanities, social sciences, management, life sciences, agriculture and medical sciences, applied sciences etc. beyond engineering and technology. The strategy of selecting innovators based on pre-qualification criteria of selection in science talent tests and similar competitions run by departments and agencies was dropped. Instead a multistage selection process extending up to the district shall be put in place. The emphasis on individuals would be dropped and teams would be motivated into collaborative problem solving. During 2018-21 students had been submitting ideas and solutions directly through the K-DISC portal. This system was dispensed with and teams of students were motivated to submit their proposals through the institutions so that there would be continuity.

## V. Who will participate:

The norms for participation in 2018 -21 is as follows[8]

1. Stream One (Students -Age below 16)
   Students[9] of age less than 16 from government, aided and private schools including technical schools in the state who have reached the penultimate level in a multi-level merit track during the last three years and shortlisted by the District innovation council can submit an innovative idea through the K-DISC idea exchange.

2. Stream Two (Students -Age above 16)
   Students of age more than 16 from Government, Aided and Private Higher Secondary Schools, Vocational Higher Secondary Schools, Technical Schools, Industrial Training Schools and Polytechnics who have reached the penultimate level in a multi-level merit track during the last five years and shortlisted by the District Innovation Council shall be included.

3. Under each of these streams, there shall be two themes
   i. STEAM innovation for Business.
   ii. STEAM Innovation for Societal Advancement.

[8] Students in special schools included in the 2018-19 has been dropped because there is a special programme developed by K-DISC jointly with National Institute of Speech and Hearing.
[9]Students include past students who have successfully completed the terminal examination also.

**For the** 2019 – 22 Tranche it was decided that the Stream Three (Students of Special Schools) need not be included in the programme since K-DISC is running a special programme viz. Innovation for Differently Abled Children. Further the streams have been re-organised as Stream One (Age from 12 to 18) Stream two (Age from 18 to 28). The first stream would be predominantly for Schools and Polytechnics and the second stream for Students from Colleges, Universities and Professional Colleges. One of the major achievements of the YIP 2018 was the good participation of the children from schools, technical schools, vocational higher secondary, industrial training schools and polytechnics, The 2019 –22 tranche wanted to retain this while expanding further into the higher education streams.

## VI. Programme Design[10]:

For 2018 – 21 tranche the programme design was as follows.

- The overall programme design is as shown below in Figure 1.
- The first cycle for submission of the YIP applications was from 3rd May 2018 to 30thJune 2018. The applications for this cycle were collected through the K-DISC YIP portal from the student innovators with recommendation from the talent scouting agents, agencies and institutions.
- The applications were evaluated by the K-DISC selection team and participants list finalised on 19 July 2018 based on criteria stated below.
  The selected mentees went through motivational workshops on 29 September 2018 and 10th October 2018 at various locations. The participants attend pitching workshops on 20, 21 October 2018 and 11 November 2018. Following these further screening was done by a state level jury and a national jury. A total of 204 young innovators have been identified and 35 among them identified as those with better individual attributes to pursue the idea further.
- The selected participants went through two intense immersive boot camps- a fundamentals workshop in February/ March 2019 and an Innovators boot camp in April 2019.
- There was a face to face interaction of the K-DISC core team with the mentors during March 2019.
- The innovators come back mid- way during their mentoring engagement and intense networking facilitated by K-DISC for a design camp during September 2019. The innovators challenge closes with a final design camp and announcement of the best performers in December 2019, eighteen months after the Challenge opening. There shall be a fast track component for those mentees who have already completing their product or process designs.
- The selected best performers in the four thematic groups in the two streams for main schools shall be awarded one-year Young Innovators Program scholarships and attached to research institutes centers of excellence, incubators, academic

[10] The initial schedule had to be reworked following the Kerala Floods 2018.

institutions to work on K-DISC certified innovations under qualified institutional mentors. The District Innovation Councils will facilitate linking of the innovators in the District with the incubators and help K-DISC in monitoring incubation process effectively. The District Innovation Councils would be interacting with the mentors periodically.

- The innovators shall complete the idea to a prototype during the engagement with the incubators. An evaluation of the innovators shall be done and successful innovators shall be provided a productionisation or scale up grant after an evaluation process jointly with the Kerala Startup Mission.
- If the innovation is of relevance to a government department or a civil society group a process of incubating the innovation in their context would be enabled through an innovation bazaar and a Community of Practice.

The conversion of the idea to innovation will follow the innovation funnel shown in figure 2.

The design and structure of YIP 2019-2022 tranche has been changed substantively.

## VII. Two Tracks of YIP 2019.

The YIP 2019 shall be structured around 2 tracks:

a. THE MAESTRO CHALLENGE

This track would deal with inter-disciplinary issues or problems which require a multi-faceted approach to find solutions. This track would also include socially relevant issues which may require intervention in the form of a social enterprise. This would target students/teams from higher education institutions – senior category institutions.

Universities, Arts & Science Colleges, Engineering Colleges, Agricultural Colleges and Institutions from the field of Translational, Environmental, Biotechnology, Biomedical streams would be targeted to form groups and teams across disciplines to participate in this track of the Challenge.

However, there won't be any restrictions for students from schools to participate in this track of the challenge. Institutions/Agencies like IRTC, COSTFORD, Inspiration India, ATREE, and NISH will also be involved in the social enterprise methodology.

Individual participation would be permitted in exceptional cases based on the merit of the problem statement and ingenuity in approach to problem-solving.

For the Maestro challenge the theme for 2019-20 shall be **"Problems of Children and the Aged in Kerala"**

b. THE STAR CHALLENGE

This track is designed with a rigor suited for solving less "wicked", focused problems and issues, which may not require much interdisciplinary interaction. Students from

Schools and Colleges would be encouraged to apply their acquired skills and exposure to enquire into problems of relevance to Kerala as well as critical concerns of the global community. These issues may not cut across multiple domains and candidates working on these would require domain-specific inputs or support. Individual participation is permitted in this track as well, based on the uniqueness of the problem and novelty of the solution attempted.

c. THEMES FOR THE STAR CHALLENGE

The themes for the star challenge 2019-20 shall be limited to the following:

a) Technologies and systems for value addition, productivity enhancement and drudgery reduction in traditional industries and systems
b) Technologies and systems for value addition, productivity enhancement and drudgery reduction in agriculture and allied sectors[11]
c) Biomedical and Medical devices technology applications and systems
d) Technologies and systems for water conservation, renewable energy, energy conservation, e-mobility etc.
e) Solid, liquid and hazardous waste management systems and technologies
f) Assistive technologies an systems
g) Complimentary an alternative medicine technologies systems and applications
h) Business model innovations in application and practice

APPLICATION PROCESS

The YIP 2019 Challenge will be open to all students, from every institution, across Kerala. Applicants can apply to be part of the YIP 2019 Challenge in one of the following two ways:

1) INSTITUTION-BASED APPLICATIONS

With notifications and direct communications, K-DISC will invite institutions from all over Kerala to apply to be part of the YIP 2019 Challenge. There will be a minimum requirement these institutions have to meet before they can register for the Challenge.

With the consent of their Heads, interested Institutions will have to register for the YIP 2019 Challenge with at least 2 Teachers or Faculty Members who would be the "FACILITATORS" of the Institution for YIP, if the institution is shortlisted. The institutions could also recommend mentors for the YIP Programme. Further, these

[11] Covers agriculture, animal husbandry, poultry development, diary and fisheries

institutes should identify and support groups of students to participate in the Challenge.

2) INDIVIDUAL APPLICATIONS

In cases where the individual is interested in being a part of the YIP 2019 Challenge, but is part of an institution which is not part of the Institutions screened and shortlisted for the Challenge, they may be allowed to register provided they submit the consent of their Head/Principal and the Institute to meet the eligibility criteria for the program.

3) INSTITUTIONS & THEIR ROLE

In pursuit of creating an Innovation Ecosystem in the state, K-DISC will notify and invite institutions from all over the state, across categories and streams, to register for participation. In order to apply, institutions must meet certain criteria set out by K-DISC. Due to constraints in resources for the program, institutions will be shortlisted based on clearly laid out indicators.

- Institutions identified to be part of the program have been classified into two broad categories:
    i. Group 1: This would cover the following institutions,
        - Universities
        - Engineering Colleges
        - Medical Colleges
        - Ayurveda Colleges
        - Law Colleges
        - Other Professional Colleges
        - Business Schools
        - Media & Fine Arts Schools
        - Arts & Science Colleges
    ii. Group 2: This would cover the following institutions
        - Polytechnics
        - Higher Secondary Schools
        - High Schools
        - Industrial Training Institutes
        - Junior Technical Schools
        - Vocational Higher Secondary Schools
        - Sports Schools

4) ELIGIBILITY CRITERIA

Since the Institutions are envisioned to play a crucial facilitating role in the YIP, K-DISC has stipulated a minimum Eligibility Criteria for Institutions:

a. Institute must be a registered Institution recognized by the Govt of India or Govt of Kerala or affiliated to the Universities in the State.
b. The Heads/Directors/Principals of these Institutions must consent to register for the program.
c. Institution must nominate at least 2 (TWO) Teachers or Faculty members to be the FACILITATORS for the entire duration of YIP 2019.
d. Institution may nominate mentors for the YIP programme
e. Institution must be able to identify, support and ensure the participation of a a few students,

5) SCREENING & SELECTION PROCESS fOR INSTITUTIONS

K-DISC will use the following Screening & Selection Criteria for prioritizing the final selected list of YIP 2019 Institutions:

a. NIRF Ranking during the last year – for Institutions of Higher Education
b. NAAC Grade during the last year – for Institutions of Higher Education
c. ARIIA Ranking of institutions on Innovation Achievements during the last year
d. Number of Students enrolled in regular programmes during the last year– for all kinds of Institutions
e. Previous Years' Results – for different regular courses
f. No of requests originated for Mentor Registration till the time of application

6) FACILITATORS

In the envisioned design of the YIP program, facilitators are expected to be agents for continuity of the YIP program within their institutions. They shall identify and support suitable applicants/candidates, coordinate with K-DISC etc. and would serve as torch bearers for pursuing institutional goals in solving inspiring problems.

a. NOMINATION PROCESS

At least 2 (TWO) facilitators must be nominated by each registering Institution – this is to ensure continuity in problem solving at the institutional level. While the Government Departments and Institution Heads have the flexibility to nominate facilitators of their choice, for the success of the YIP, these Facilitators must be approachable by students, experienced and passionate about the program.

7) YIP APPLICANTS

K-DISC has designed the YIP 2019 Challenge to be open, any student of any registered, recognized educational Institution in Kerala can apply/register for the program to have a chance to be part of YIP 2019.

- **SCREENING & SELECTION PROCESS**

K-DISC will find the most suitable candidates for the program through a rigorous Screening & Selection process. The selection process is designed with enough rigor to look at the quality and merit of ideas submitted by the applicants. The programme shall be built to check for inquisitiveness, spirit of enquiry, grit and passion which are important pre-requisites for the applicant's progress and success through the program.

After final submission of their ideas on the digital platform, applicants will be individually and collectively contacted, and even observed closely during interactions, to understand the rationale for their choice of the problem, their rough approach for solving the problem and their passion for the cause.

- **GROUPS**

K-DISC, and the participating Institutions, will encourage Team-Based/Group-based participation. YIP Applicants would be encouraged to form small groups or teams, of at least 2 (TWO) members and up to 5 (FIVE) members, with peers from the same Institution to enter the program.

Multiple groups/teams would be permitted to enter the program, provided the Institutions they are registering from has also registered, and has not exceeded the maximum number of permitted groups. For Group 1 Institutions, a maximum of 10 (TEN) groups/teams are permitted while for the Group 2 Institutions the permissible limit is 5(FIVE) groups/teams.

K-DISC will also, in exceptional cases, allow individual participation based on the merit of the idea proposed by the applicant.

8) MENTORS

Mentorship is a key process in the YIP ecosystem, YIP candidates receive much of their support and guidance from mentors. To grow the Mentor network, YIP 2019 will allow institutions to nominate Mentors, during their registration process.

- **NOMINATION PROCESS**

Mentors can also be nominated by each registering Institution. To encourage the process of mentorship and the involvement of the institutions thereof, K-DISC will also screen and shortlist Institutions based on the number and experience of mentors nominated by them.

9) REGISTRATION

Registrations will be invited from institutions via a digital platform which will have the provision for handling the following:

- **REGISTRATION OF INSTITUTIONS**

Details of the Institutions shall be gathered during this registration process, and along with the details of the Institution Head, their consent for participation in the program will also be captured. At least 2 (TWO) Facilitators will have to be nominated for the program, without which the registration process would be considered incomplete.

- **REGISTRATION OF FACILITATORS**

Details of the nominated Facilitators will be gathered during this part of registration process. At least 2 (TWO) Facilitators will have to complete registration for the program, without which the application of the Institution would be considered incomplete.

- **REGISTRATION OF MENTORS**

Details of the Institutions-nominated Mentors shall be gathered during this registration process.

- **REGISTRATION OF PROBLEM BEING SOLVED**

In order to, to check for spirit of enquiry, inquisitiveness, genuine interest and passion for the idea, the registration process for the idea has been made more rigorous. YIP 2019 Applicants will have to fill in the details of that idea into a specifically created Idea Template on the web portal.

The Problem Statement template has been designed to gather the following details as a minimum, about the problem being registered:

- Background of the problem being solved
- The Problem in just ONE Line, typically around 25-35 words.
- What is the problem being solved?
- Who is affected by the problem?
- What is the root cause of the problem?
- Motivation/Rationale for solving the problem?
- What are the limitations of the existing solutions?
- How is this Idea/solution an improvement over existing products/solution?
- Approach to the solution for the problem
- Outcome of the solution
- Time frame for coming up with the solution
- Estimated cost of the solution
- Reference material

10) PROPOSED SCHEDULE

| No. | EVENT | DATE / WINDOW |
|---|---|---|
| 1 | Notification / Announcement for YIP Challenge 2019 | May 10, 2019 |
| 2 | Registration Window for Institutions to Register for YIP Challenge 2019<br>Registration of Facilitators<br>Registration of Mentors | May 10 to May 31, 2019 |
| 3 | Prioritisation & Screening of Registered Institutions | May 31 to June 10, 2019 |
| 4. | Facilitator Training Workshops [Block 1]<br>for Facilitators nominated by screened and selected Institutes – District-wise | June 10 to July 8, 2019 |
| 5 | Registration of Ideas from Innovators by Institution-based Applications | July 1 to July 29, 2019 |
| 6 | Open Registration of Ideas from innovators | July 1 to July 29, 2019 |
| 7 | Facilitator Training Workshops [Block 2]<br>for Facilitators nominated by Institutes coming in via Open Idea Challenge | July 8 to July 31, 2019 |
| 8 | Window for changing, modifying or refining of Ideas | August 5 to August 19, 2019 |
| 9 | District level events for screening of applications | |
| | Kasaragod<br>Thiruvananthapuram<br>Palakkad | 2019 September 16, 17, 18 |
| | Kannur<br>Kollam<br>Trissur | 2019 September 19, 20, 21 |
| | Wayanad<br>Pathanamthitta<br>Ernakulam | 2019 September 23, 24, 25 |

| No. | EVENT | DATE / WINDOW |
|---|---|---|
| | Kozhikode<br>Kottayam<br>Idukki | 2019 September 26, 27, 28 |
| | Malappuram<br>Alappuzha | 2019 September 30, and October 1, 2 |
| 10 | Zonal workshops | |
| | South<br>(Thiruvananthapuram, Kollam, Kottayam, Pathanamthitta, Alappuzha) | 2019 October 11, 12, 13, 14 |
| | Central<br>(Idukki, Ernakulam, Trissur, Palakkad) | 2019 October 16, 17, 18, 19 |
| | North<br>(Malappuram, Wayanad, Kozhikode, Kannur, Kasaragod) | 2019 October 23, 24, 25, 26 |
| 11 | State Jury | 2019 November 9, 10, 11, 12 |
| 12 | National Jury | 2019 December 13, 14, 15, 16 |
| 13 | Notification of the winners of the Challenge | 2019 December 31 |

## VIII. Criteria for Selecting Young Innovators

An idea in innovation for business or innovation for societal change shall be evaluated based on the following, the relative weightage of which could be suitably decided by DISC

i. Usefulness
ii. Value of the solution
iii. Market potential or social worth

The indicators for each evaluation criteria shall be as indicated below

1. Usefulness, novelty and non-obviousness
   a) Assess whether the idea is useful.
      **Indicators**

      How useful is the idea based on its characteristics?

      Extent to which the utility is specific substantial and credible.
   b) Assess the novelty of the idea
      **Indicators**

- Idea must be new, not previously known or used by others, based on literature survey, product information and IPR?

c) Assess Non-obviousness of the idea

**Indicators**

- Idea is different from the usual practice, that a person having normal skill in the related area, would not find it obvious to make the change otherwise

2. Value of the solution

**Indicators**

- Real measurable consequence of inaction on the problem
  - Is the problem unworkable?
- Implication of non-fixing the problem- the mandate not addressed
  - Is fixing the problem unavoidable?
- Consequence of a delay in addressing the problem
  - Is solving the problem urgent?
- Conspicuous absence of other valid solutions to the problem
  - Is solving the problem underserved?

3. Market potential

**Indicators**

- Will the product or service satisfy as market need?
  - Who are the customers and where can they be found?
  - What completion is there?
    Direct/Indirect/International
  - How distinct is the product from what is offered by the competitors?
- Can the product stand test of changing trends or take advantage before it dies out?
- Does the law of land allow the business to be established?
- At what prices are customers prepared to by the product?
- Can the innovator make a profit?

4. Additional indicators for evaluating ideas for societal advancement
   - An idea shall be included in the category of STEM Innovation for Societal Advancement if
     - it targets a social process.
     - it creates positive value of being good or better than what it replaces.
     - it promotes a bottom up or civic centered solution where bureaucratic planning or market process fails.
     - it promotes a solution addressing a global challenge humanity is facing.

- it pertains to public service delivery of a common social good
- it addresses a need of the marginalized, downtrodden or deprived.
- it helps resolve a conflict or strife

5. Social worth of the idea can be estimated by the following indicators

**Indicators**

- Does it result in one or more of the following?
  - An organizational change
  - Create a social support system accompanying a material innovation
  - Political interventions triggered by a large-scale reform
  - Create novel patterns of need fulfillment
  - Create novel lifestyles often adaptation of material and societal challenges.
- What is the extent of impact?

## IX. Organization of the YIP Camps: 2018 – 21 Tranche

1. The immersion boot camps and the design boot camps midway through the challenge and at the close of the challenge are at the core of the programme.
2. Many a time the idea presented by the innovator while intrinsically meritorious would be inadequately or poorly defined. The success of the immersion boot camps and design camps depends on the extent of knowledge integration that can be achieved to reshape such problems addressed. In general, inadequately or poorly defined problems solutions are more likely to advance when knowledge is integrated across different disciplines, experiences and perspectives. The immersion programmes, the mentoring process and the design camps should prepare the participants to receive a collage of different perspectives on their problems and take them through a process of sharing, highlighting and combining the knowledge in arriving at an innovative solution.
3. The broad frame work of skills to be imparted to the talent joining the program shall cover systems thinking, design thinking, collaboration, creative thinking and gaming. It shall also aim to strengthen competitive mind-sets and systematic ways of looking for opportunities outside traditional boundaries.
4. It is proposed to develop a local team who can handle workshops in English and Malayalam to spearhead the innovation knowledge integration process. The team should be equipped to think out of the box working in a disciplined manner sharing, highlighting and combining knowledge to develop tangible disruptive results.
5. K-DISC will shortlist quality institutions with which the local team might have to work closely for designing these camps. Some nationally and internationally accepted agencies are the following:
   - IDEO an international design and consulting firm in Palo Alto, California.

- Hasso Plattner Institute of Design at Stanford based in Stanford University, Stanford.
- Design Thinkers Academy, Amsterdam a network of design thinkers world over.
- Dutch School of Design Thinking, Eindhoven.
- Seriously Creative, Porto Rico.

6. Selected consultants who are equipped in tools of design thinking shall be also identified to assist in the process.

## X. **Linking Special Schools:** 2018 – 21 Tranche

In addressing children from special schools, the support of international agencies and agencies working in the field of disability shall be enlisted. The programme shall be organised jointly with United Nations Educational, Scientific and Cultural Organization (UNESCO), Score Foundation, Disability Arts International and National Institute of Speech and Hearing (NISH). This component was later converted into an independent program.

## XI. **The Grand Jury:**

A grand jury comprising of Indian and International experts will decide the award-winning innovators in each of the awards category. The decision making process will include one or more rounds of interactions and presentations that will evaluated to decide the award winners.

## XII. **Monitoring and Evaluation Framework**

**2018 – 21 Tranche**

A monitoring system will be established for YIP, before initiation of the programme, which will systematically collect and deliver information on individual outputs and early outcomes for each K-DISC certified innovation in a manner will allow aggregation of the results to a program level. During the implementation period, the focus will be on outputs and intermediate outcomes at best, given the short duration of YIP. Figure 2 indicates a set of **illustrative** indicators that could be used to assess the results of the

*One of the great mistakes is to judge policies and programs by their intentions rather than their results."*
Milton Friedman

program, which will be finalised in consultation with experts in the field.

An impact assessment of the Program will be undertaken only after the Program is completed (3 years). This assessment will focus on a three dimensional results framework, namely usefulness, value, market (or social impact as appropriate) of the K-DISC certified innovations. SMART[12] indicators will be developed to assess the results in each dimension. Each K-DISC certified innovation will be assessed by the same indicators, so as to facilitate aggregation of the results to the Program levels. The evaluation framework (that is indicators and scoring scales) will be developed in consultation with the K-DISC board, and jointly with the Kerala Startup Mission after three years from the initiation of the program.

The monitoring framework for 2019-22 shall be same as the one created for 2018-21. A mobile applications has been established for facilitating the interaction between mentees and mentors. A Facebook workspace based virtual mechanism has been also established for mentors and mentee interaction.

[12] Specific, Monitorable, Attributable, Relevant & Time bound

**Figure 1**

**The overall program outline (2018 – 19 tranche)**

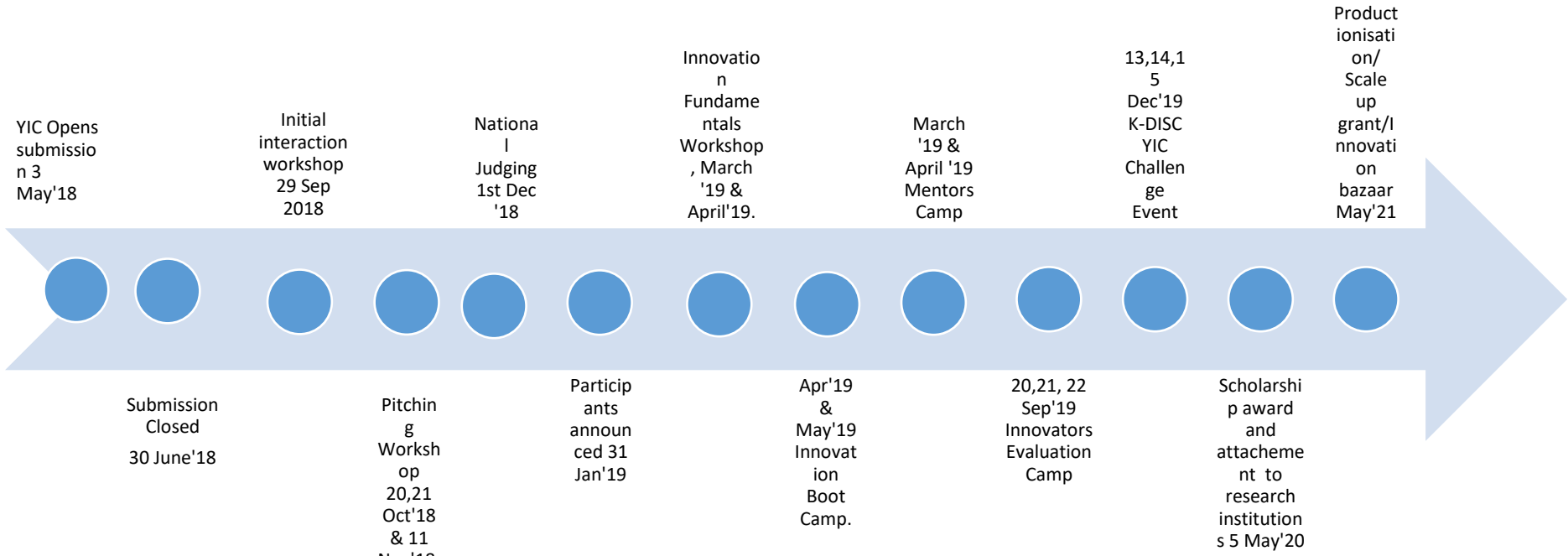


**Figure 2**

**Innovation Funnel**

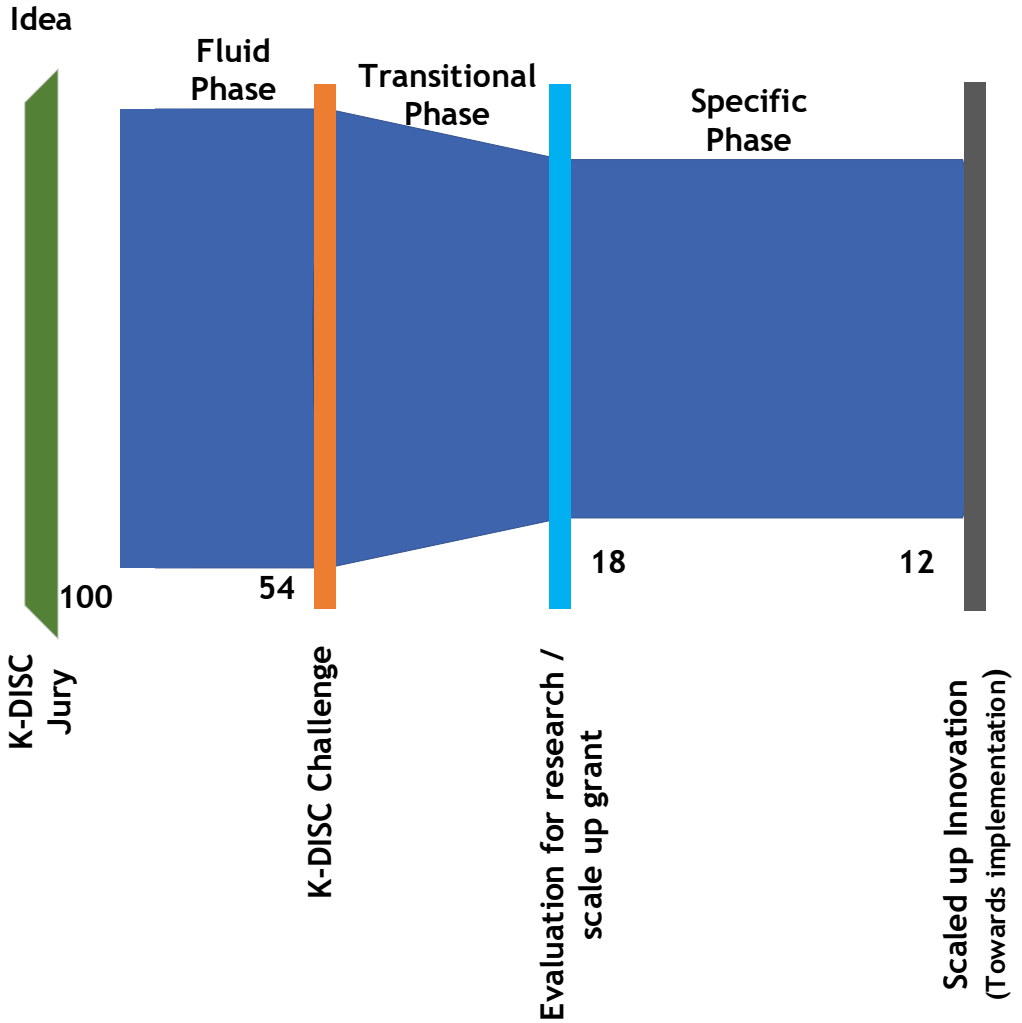
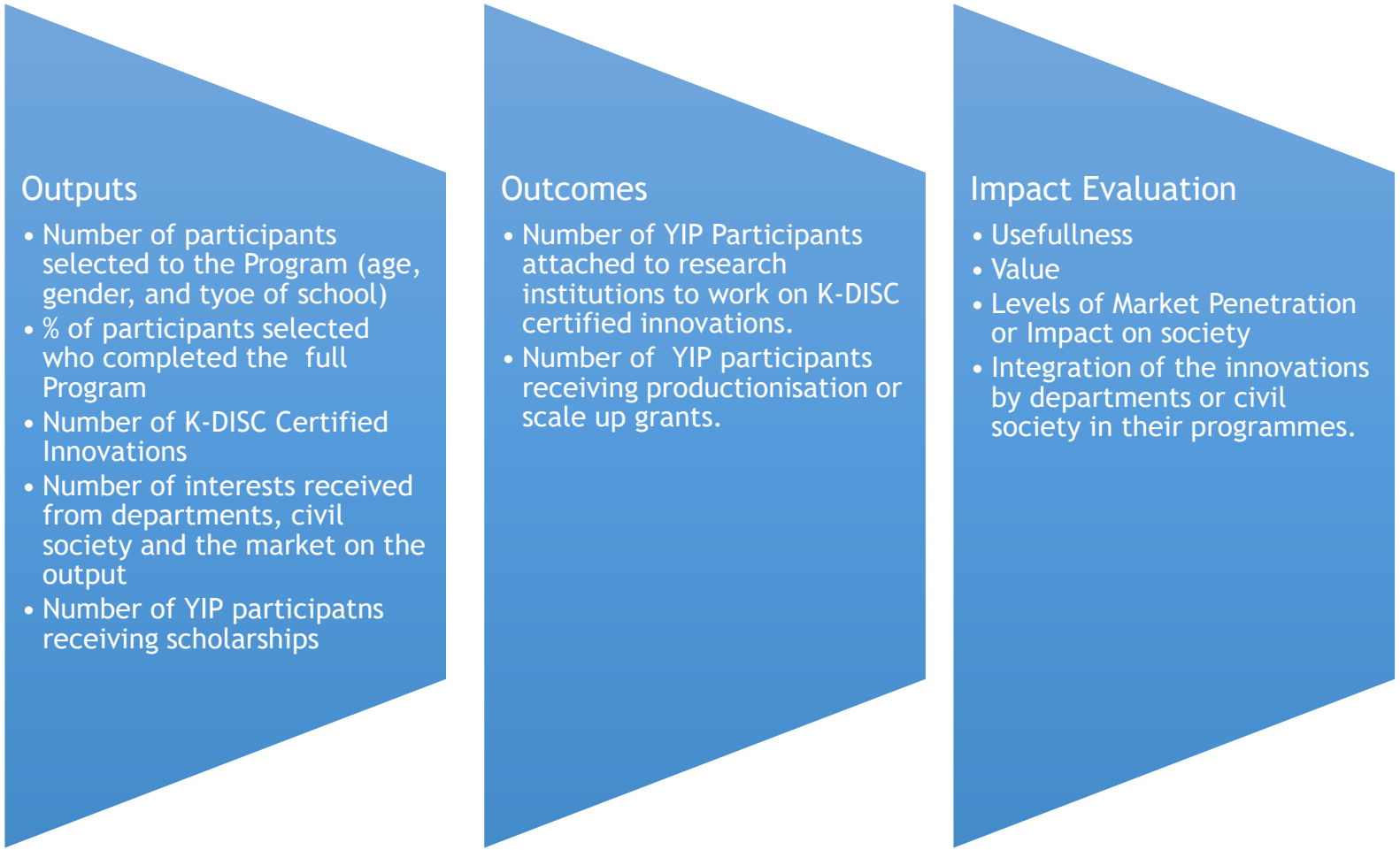


**Figure 3**

**RBM framework for K-DISC YIP**



*Annexure 1*

**Problem areas and solution domains of interest to K-DISC**

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| 1 | Infrastructure | Transportation systems | highways, airports, railways, ports, inland shipping, urban transport | Traffic accidents, environmental pollution, increasing number of vehicles, traffic congestion, unsustainably high energy consumption per passenger, urban sprawl | Traffic management designs, parking access changes, walking and bicycling improvements, traffic control, containerisation, carbon foot print, congestion pricing, eco-tax, ethanol fuel, high speed rail, hybrid vehicles, vehicle efficiency, electric vehicles, transit-oriented development, rapid bus transit system, aerial cable systems, improving water transport systems, multi-model transit |
| | | Power | electricity generation, transmission and distribution, renewables | Increasing peak demand to base demand, constraints in interstate evacuation, power quality, electrical accidents | Carbon foot print, eco tax, promoting energy conservation, smart grid, promoting renewables, safety culture and use of modern safety gears, eco tax, carbon foot print |
| | | Water structures | bridges, dams, dykes, canals, pipelines, valves, pumping systems | Siltation in water structures, poor maintenance and support system | Inflatable water structures, Bhandara irrigation, Interconnection of water |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | | | | sources and improving conservation through lining |
| | | gas and oil production transport and distribution | refineries, petrol pumps, gas filling and dispensing stations gas pipelines distribution system | Air pollution<br>In adequacies in downstream industries and ancillary industries | Ethanol fuel, Fuel tax |
| | | Telecommunication | landline, satellite, broadband and wireless | Dropping calls, blind spots | Wireless technology, smart city, smart village |
| 2 | Agriculture and Allied Sectors | Agriculture and allied sectors | farms, food and agro production units, cold storage chains, milk, meat, fish processing units, diary | Food security in Kerala, pesticide residues, fragmentation of land holdings, absentee landlordism, shortage of labor | Aggregation to achieve scaling, mechanisation productivity enhancement, labor bank green army, lease land farming, contaminant free food, organic food, producer companies in agriculture, animal husbandry, diary etc. |
| | | Forestry | natural forest protected areas | Endangered forest species | Massive afforestation and participatory forest management, rehabilitating degraded forests, conserving reserves and protected areas afforestation, compensation programme, joint forest |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | | | | management, biodiversity conservation, increasing productivity of forests. |
| 3 | Public Services and Governance | Water supply | drinking water, wastewater, sewage | Water quality issues, depleting ground water table, water pollution, drinking water shortage, | Grey water management, storm water storage management, ground water augmentation, recycling, reverse osmosis, desalination, better utilization of spare capacity of big irrigation systems, drip irrigation sprinkler irrigation systems |
| | | Waste management | solid waste, hazardous waste, landfill | Waste dumping sites, hazardous waste disposal, plastic disposal, dog menace | Waste to energy, recycling, decentralized waste processing |
| | | Public buildings and services | public health, hospitals, schools, libraries | Inadequacies in public service delivery | Weatherisation, passive solar architecture, renovation upgradation, quality Improvement, marginalised groups and inclusion |
| | | Local services | police, fire protection, public services outside local government | Inadequacies in public service delivery | safety, disaster handling |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | Recreation facilities | museums, parks, beaches, civic centers | Inadequacies in public service delivery | cycling, pedestrian pathways |
| | | Local level Governance | Decentralisation | Poor service delivery | Result based management, transparency, accountability, participation, |
| | | | Local governance | | |
| | | State level Governance | Governance best practices | | |
| | | | E-governance | | |
| | | Health Care | Primary Health<br>Secondary Health<br>Tertiary Health | Return of previously eradicated infectious diseases, emergence of new ones, rapid increase of life style diseases, prevalence of health problems specific to women and the aged, high suicide rates and problems of mental health,<br>constraints of government hospitals, excessive privatisation of health sector, rising treatment costs, dearth of human resources in health care, lack of health sciences research, entry of self-financing medical education | Preventive health and health education, transforming PHCs as family health centres, improving basic infrastructure, reforming outpatient management procedures, improvement of infrastructure of taluk, district hospitals and tertiary care systems and developing them as referral facilities,<br>medical research focusing on Kerala specific health issues<br>pharmaceutical research focusing on biodiversity, |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | | | | medicinal plants and traditional knowledge,<br>Social control on corporate private hospitals,<br>Strengthening of palliative care movements. |
| 4 | Human Resource and Skill Development | Higher Education | University Education | Inadequate accountability, Quality of education, Inadequate infrastructure, poor employability, Commercialization of education | Faculty training academy, hub and spoke model, research based innovation, improvement in quality of university system, centers of excellence, ICT Skills, Soft skills, curriculum upgradation, teacher improvement |
| | | | Technical Education | | |
| | | | Medical Education | | |
| | | | Other Professional Education | | |
| | | School Education and Literacy | Elementary Education | Inadequate accountability, quality of education, Inadequate infrastructure, Poor employability, Commercialization of education | Centers of excellence, improving quality of training, vocationalisation, teachers training, academic monitoring, assessing learning processes and achievements, problem-based learning, activity-based learning, international and national equivalence |
| | | | Basic Education | | |
| | | | Secondary Education | | |
| | | | Vocational Education | | |
| | | | Adult Education | | |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | Skill development | Academia industry bridging | Poor employability, Skilled unemployment | Up- skilling, re-skilling labour force, aging society, shortage of requisite skilled persons, community college, very large multi skills training centres, skills training destination, long term skilling, National Skills Quality Framework, knowledge exchange networks, convergence of skill development initiatives, massively open online courses (MOOC), recognition for prior learning, demand driven curriculum, State Skill development mission |
| | | | Vocational training and formal training bridging | | |
| | | | Employability enhancement | | |
| | | | Craftsman training | | |
| | | | Information Communication Technology (ICT) Skills | | |
| | | Entrepreneurship | Startup promotion | Preference of public sector jobs over private sector jobs | Self-Employment programme, incubators, social entrepreneurship, grassroots innovation, credit guarantee fund, entrepreneurship hubs |
| | | | Incubators | | |
| | | | Mentors | | |
| | | | Risk funding schemes | | |
| 5 | Industry Commerce and Entrepreneurship | Modern Industries | Agro food processing | Industrial relations, Environmental challenges, Scarcity of land | Innovative methods of addressing land availability, industrial clusters, trade fairs, |
| | | | Textiles and garments | | |
| | | | Electronics | | |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | | Biotechnology and Nanotechnology | | Improving infrastructure, industrial zones, industry parks |
| | | | Wood processing | | |
| | | | Mining | | |
| | | | Petrochemical Complex | | |
| | | | Export oriented products | | |
| | | | Medium Small and Micro enterprises | | |
| | | Traditional Industries | Coir | Cost of production, challenges of substitution products, shortage of raw material, poor technology infusion | Mordernisation, quality control, marketing, diversification, clusters, trade fairs |
| | | | Handloom | | |
| | | | Cashew | | |
| | | | Handicrafts | | |
| | | | Bamboo | | |
| 6 | Public Finance | | Additional resource mobilisation | Infrastructure deficit, fiscal crisis | Need to sustain achievements in human development, needs |

| Sl No | Sectors | Sub Sector | Micro Sector | Problem Areas | Solution Domains |
|---|---|---|---|---|---|
| | | | Alternate sources of funding | | to improve infrastructure for ensuring growth, Kerala Infrastructure Investment Fund Board (KIIFB), resource management |

*Annexure 2*

**Sample of Possible Innovative Interventions**

| Types of Innovations[13] | Illustrative Market Innovation. | Illustrative Social Innovation |
|---|---|---|
| | *improving the mix of target **markets** and how these are served* | I*nnovation that helps to solve a pressing social issue or responds to an important social need* |
| **Product or Service Innovations** – A good or services that is new or significantly improved | • New or modified products based on scientific or technical or knowledge in any sector or sub-sector such as agricultural and allied sectors, industrial, energy, water resources, transportation, irrigation, etc.<br>• Environment friendly products or those that diminish impact or footprint on the environment including recycling & converting waste to energy or innovative use of solar energy<br>• Technological innovations to adapt to climate change<br>• Inclusive green growth and organic business development<br>• Improved services through use of digital technology (for example that respond to emerging needs or disasters/emergencies)<br>• Strengthening or improving value chains through locally adapted approaches to enhance growth and reduce poverty<br>• Improved entrepreneurial education and incubation services as well as innovative business development services<br>• Innovative income generating ideas in agriculture and allied industries that also generate employment and improve productivity | • Efficient services to fulfil current or emerging community needs<br>• Ideas that help to increase the quality and equity of education or health services<br>• Innovations in improving or creating new aspects of community care services including children<br>• Systemic approaches to community care of young offenders<br>• Systematic approaches to caring for people (including children) with mental disabilities or other learning challenges<br>• Improved community services for the elderly so as to avoid institutionalisation<br>• New services to new groups such as those who are terminally ill<br>• Innovations leading to fundamental transformation of social and cultural arrangements (say in IEC)<br>• Exploiting digital technology to provide better social services<br>• Democratic platforms where diverse actors can participate and develop capacity<br>• Preservation of Indigenous Knowledge |

[13] The basic definitions and types of innovation (sometimes referred to as 'shapes' or 'typology' of innovation) are established by Organization for Economic Cooperation and Development (OECD). The latest revision of these is the Oslo Manual which defines innovation "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" [OECD, 2005, p. 46].

| Types of Innovations[13] | Illustrative Market Innovation. | Illustrative Social Innovation |
|---|---|---|
| | *improving the mix of target **markets** and how these are served* | I*nnovation that helps to solve a pressing social issue or responds to an important social need* |
| | • Improved modernisation, productivity, and quality of traditional industries<br>• Better information services in rural areas<br>• Innovative use of nanotechnology or biotechnology<br>• Fostering sustainable growth and increasing jobs<br>• Improved software development courses<br>• E-procurement<br>• Capacity development and Multi-skill training<br>• Innovative use of block chain technologies<br>• Innovative use of robotics and artificial intelligence<br>• Innovative use of drones and unmanned aerial vehicles | • One stop service center for all Government social transfers |
| **Process** - Implementation of new or significantly improved methods of production or processes of delivery of the product | • Knowledge networks and markets through use of ICT to foster diffusion and application of knowledge<br>• New or significantly improved methods of production or delivery of a particular product<br>• Synergies between private and public sector, for example in providing extension services through linking research, extension, and education<br>• Technology adoption and innovation in agriculture or allied services such as horticulture<br>• Changes in adapting agricultural practices to climate change | • Improved operational efficiency, better working practices, competitive advantage and flexibility that ensures sustainable development of public sector offices, to deliver services particularly to persons with disabilities, elderly populations, marginalised communities<br>• Effective and efficient involvement of NGOs<br>• Empowerment of citizens<br>• Using technology to improve delivery of social services |
| **New marketing method** | • New methods utilising digital technology to reach customers such as e-sales | • Transparent and efficient provision of social and economic services to customers |

| Types of Innovations[13] | Illustrative Market Innovation. | Illustrative Social Innovation |
|---|---|---|
| | *improving the mix of target **markets** and how these are served* | I*nnovation that helps to solve a pressing social issue or responds to an important social need* |
| | • Developing Multi Stakeholder Platforms of producers, customers, retail, wholesale outlets with traceability etc | |

## *Annexure 3*
## Financial Calculations (2018 – 21)

**Consolidation**

| Sl No | Consolidated Head | Y1 | Y2 | Amount |
|---|---|---|---|---|
| 1 | IT Tools | 18.00 | | 18.00 |
| 2 | Advertisement and Digital Marketing | 10.18 | | 10.18 |
| 3 | Honorarium of Support Staff and Mentors | 16.80 | | 16.80 |
| 4 | Ideators out of pocket expenses | 4.80 | | 4.80 |
| 5 | Evaluation | 23.50 | | 23.50 |
| 6 | Fellowships | 40.00 | | 40.00 |
| 7 | Consultancy | 35.00 | | 35.00 |
| 8 | Pre-challenge | 14.75 | | 14.75 |
| 9 | Partnerships | 85.00 | | 85.00 |
| 10 | Challenge | | 6.00 | 6.00 |
| 11 | Scholarships and guidance | | 92.40 | 92.40 |
| 12 | Overheads and Contingencies | 24.80 | 9.84 | 34.64 |
| | **Total** | **272.83** | **108.24** | **381.07** |

**Detailed Breakup (2018 – 21)**

| Sl No | Head | Head | Amount | Remarks |
|---|---|---|---|---|
| 1 | Portal for Talents, Ideas, Talent Screen Agencies, departments recommending, Mentors | IT Tools | 5.00 | DDFS Integration, Document Management System |
| 2 | Video Conferencing | IT Tools | 1.00 | Web conferencing solution |
| 3 | Support system for Idea Exchange based on SLA | IT Tools | 12.00 | I proving Idea Rocket |
| 4 | Advertisement- All India Radio, Doordarshan, Press | Advertisement and Digital Marketing | 7.50 | C-DIT |
| 5 | Press releases | Advertisement and Digital Marketing | 0.03 | C-DIT |
| 6 | Notice Boards of Educational Institutions | Advertisement and Digital Marketing | 0.05 | C-DIT |
| 7 | Communication to Student Unions | Advertisement and Digital Marketing | 0.05 | C-DIT |
| 8 | Communication to probable ideators | Advertisement and Digital Marketing | 0.05 | C-DIT |
| 9 | Other advertisement and advocacy | Advertisement and Digital Marketing | 2.50 | C-DIT |
| 10 | Call Centre Support | Advertisement and Digital Marketing | 0.00 | C-DIT |
| 11 | Support Staff (3 persons with honorarium of Rs 40,000 each) | Honorarium | 14.40 | CMD |
| 12 | Mentors Honorarium and travel (5,000, 4 per district, 1 year) | Honorarium | 2.40 | |
| 13 | Out of pocket expenses for ideators (1000, per 40 ideators, 1 year) | Stipend | 4.80 | |

| Sl No | Head | Head | Amount | Remarks |
|---|---|---|---|---|
| 14 | Evaluators Workshop (10 persons each handling 50 synopsis per day- ten days) | Evaluation | 5.00 | KSSM |
| 15 | Entry level Camp 3days (60 students per location- Tvm, Kochi, Kzd) | Evaluation | 1.50 | KSSM |
| 16 | Pitching of ideas workshop B-HUB Trivandrum | Evaluation | 3.00 | KSSM |
| 17 | National Selection Committee (3 national experts) | Evaluation | 4.00 | |
| 18 | Mentor Identification Process (interview from 200 persons) | Evaluation | 10.00 | |
| 19 | Fellowships for promising ideators | Fellowships | 40.00 | HR Agency |
| 20 | Mentors Kit | Consultancy | 5.00 | |
| 21 | Fundamentals Workshop, Bootcamp Consultancy (Design Thinking Systems Thinking, Creative Thinking, Gaming, Collaboration) | Consultancy | 30.00 | |
| 22 | Fundamentals workshop (2days, 40 persons) | Pre- Challenge | 2.50 | KSSM |
| 23 | Bootcamp Workshop (5days, 40 persons) | Pre- Challenge | 6.00 | KSSM |
| 24 | Mentors Camp (28 persons, 2 days) | Pre- Challenge | 2.50 | KSSM |
| 25 | Innovators Evaluation Camp (40 persons, 3 days) | Pre- Challenge | 3.75 | |
| 26 | Parternship with Cambridge for mentoring | Partnerships | 25.00 | |
| 27 | Partnership with Imperial College for mentoring | Partnerships | 25.00 | |
| 28 | Partnership with Babson College, Ashoka | Partnerships | 25.00 | |
| 29 | Community of Practices | Partnerships | 10.00 | |
| 30 | Challenge event (40 persons, 3 days) | Challenge | 6.00 | During 2019-20 |

| Sl No | Head | Head | Amount | Remarks |
|---|---|---|---|---|
| 31 | Scholarships (22 persons, 25000, 12 months) | Scholarships | 66.00 | During 2019-20 |
| 32 | Mentorship (22 persons, 10,000,12) | Honorarium | 26.40 | During 2019-20 |
| | Overheads | | 34.64 | |
| | | **Total** | **381.07** | |

## Annexure 4
## Program Schedule (2018 – 19)

| Sl No | Activities | Apr-18 | Apr-18 | May-18 | May-18 | Jun-18 | Jun-18 | Jul-18 | Jul-18 | Aug-18 | Aug-18 | Sep-18 | Sep-18 | Oct-18 | Oct-18 | Nov-18 | Nov-18 | Dec-18 | Dec-18 | Jan-19 | Jan-19 | Feb-19 | Feb-19 | Mar-19 | Mar-19 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Initial activities | | | | | | | | | | | | | | | | | | | | | | | | | Notification of April 30 |
| 2 | Registration of applicants | | | | | | | | | | | | | | | | | | | | | | | | | Registration closes on June 30 |
| 3 | Evaluation of applications by Kerala Start up mission | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | First Initial evaluation workshop by KSUM (60 x 3) | | | | | | | | | | | | | | | | | | | | | | | | | Mentee selection completed on 19 July |

| Sl No | Activities | Apr-18 | Apr-18 | May-18 | May-18 | Jun-18 | Jun-18 | Jul-18 | Jul-18 | Aug-18 | Aug-18 | Sep-18 | Sep-18 | Oct-18 | Oct-18 | Nov-18 | Nov-18 | Dec-18 | Dec-18 | Jan-19 | Jan-19 | Feb-19 | Feb-19 | Mar-19 | Mar-19 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Revised submission by students | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | First level screening | | | | | | | | | | | | | | | | | | | | | | | | | Pitching workshop on 20,21 October and 11 November 2018 |
| 7 | National level screening | | | | | | | | | | | | | | | | | | | | | | | | | National Workshop 1st December 2018 |
| 8 | Fundamentals workshop | | | | | | | | | | | | | | | | | | | | | | | | | February – March 2019 |
| 9 | Bootcamp | | | | | | | | | | | | | | | | | | | | | | | | | April 2019 |

| Sl No | Activities | Apr-18 | Apr-18 | May-18 | May-18 | Jun-18 | Jun-18 | Jul-18 | Jul-18 | Aug-18 | Aug-18 | Sep-18 | Sep-18 | Oct-18 | Oct-18 | Nov-18 | Nov-18 | Dec-18 | Dec-18 | Jan-19 | Jan-19 | Feb-19 | Feb-19 | Mar-19 | Mar-19 | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Mentors Selection | | | | | | | | | | | | | | | | | | | | | | | | | 2018 November 2, 3 and February 2019 |
| 11 | Mentors Workshop | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Innovators Evaluation Workshop | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | 2019 Challenge | | | | | | | | | | | | | | | | | | | | | | | | | 13,14,15 December 2019. |
| 14 | Mentor support & Monitoring | | | | | | | | | | | | | | | | | | | | | | | | | |

# ANNEXURE 2- STRATEGY PAPER OF MANCHADI – TEACH MATHS FOR KERALA


# ‘Manchadi-Teach Maths for Kerala’ Improving Skills and Competencies in Mathematics among Adults and Children

## Kerala Development and Innovation Strategic Council (K-DISC)

**Version 11.0**

**12-01-2020**

# ‘Manchadi-Teach Maths for Kerala’
# Improving skills and competencies in Mathematics among Adults and Children

## Introduction

1. The pace of mathematizing in the world is ever increasing daily.[14] Mathematics is the cradle of all creations without which the world cannot move an inch. There are countless examples of mathematical patterns in nature’s fabric. Snails make their shells, spiders design their webs and bees build hexagonal combs. Mathematics assists the development of human thinking, particularly critical thinking not only to solve mathematics problem in schools and colleges, but also to better understand and address everyday life problems.

2. Mathematics plays a very important role in daily lives of most people. A tailor, knowingly or unknowingly uses geometry in designing cloths, uses mathematical formulations in determining the amount of material she wants, and uses simple mathematic functions to compute the cost of the final product. Men and women involved in commerce constitute many for whom mathematics is an important matter. A housewife shopping in a market uses a broad range of math knowledge from multiplication to estimation and working out percentages. Be it a cook or a farmer, a carpenter or a mechanic shoe keeper or a doctor or an engineer or scientist a musician or a magician everyone needs mathematics in their day today life. The sports page or the financial pages of any newspaper show the importance of being literate in maths to function effectively in this globalising world. Other elements of mathematical literacy, particularly important for daily life, are obtaining and interpreting quantitative information and data, reading charts, timetables, calculating simple and compound interests, and other presentations of data.

3. Mathematics is without doubt important in the lives of children. A report prepared by prepared by the Organisation on Economic Development in 2016 states that: *More than ever, students need to engage with mathematical concepts, think quantitatively and analytically, and communicate using mathematics. All these skills are central to a young person’s preparedness to tackle problems that arise at work and in life beyond the classroom.* [15] Another important and interesting finding in the 2016 OECD is that differences in children’s familiarity with mathematics concepts can help explain a substantial share of performance disparities in Programme for International

[14] Davis, Philip J. (1987) "Applied Mathematics as Social Contract," Humanistic Mathematics Network Journal: Iss. 1, Article 3. Available at: http://scholarship.claremont.edu/hmnj/vol1/iss1/3
[15] OECD (2016), *Equations and Inequalities: Making Mathematics Accessible to All*, PISA, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264258495-en.

Student Assessment (PISA) between socio-economically advantaged and disadvantaged students. The Report finds that high quality mathematical education, and thus education practice and policy, are an essential part of the solution for social equality. This finding has tremendous validity, given the high levels of inequality that are emerging in Kerala.[16]

4. A rapid literature review, clearly indicates that a solid mathematical understanding is helpful as typically understood not only for children but also for adults in all walks of life. Consequently, in many parts of the world, there are various experiments to teach not only children but also encourage youth and adults to learn mathematics for application in situations that are important for them. Naturally, this varies from place to place, depending on the socioeconomic context prevalent in each community. Annexure I lists some interesting examples from other parts of the world.

5. Some of these experiments argue that mathematical proficiencies and critical socio-political consciousness can be developed within a framework which connects classical mathematical knowledge and community mathematical knowledge. Classical mathematical knowledge is the formal abstract mathematical knowledge embedded in academics, while community mathematical knowledge is the tacit knowledge rooted in years of shared lived experiences of the communities. Scholars like Paulo Freire argue that by posing relevant questions about their own individual and broader existence in a socio-political context community knowledge can be enriched into something more critical for social action. Critical knowledge is the capacity of reading the world collectively and transforming it together. The community lab is a mechanism of connecting the world of classical knowledge and community knowledge and creating critical knowledge through real life practical problem solving.

6. The organising and presenting mathematics in this formal way stretches from Euclid and and the formal presentation results in unambiguous academic communication. However this was rejected by SCERT. The approach adopted in Kerala was that mathematics is a human activity. The organized product of mathematics is result of human activity. There is a need to present mathematical concepts with a task showing the need of the concept within practical life. The approach of presenting mathematics in a structured manner, and confronting the leaner with a long and difficult process of doing mathematics, often imbibed through a rote method is an inversion of the process that led to mathematics. In such an approach the learner has to struggle to find out which questions gave rise to mathematics and which

[16] Kerala, Poverty, Growth & Inequality, http://documents.worldbank.org/curated/en/714181504169813713/pdf/119248-BRI-P157572-Kerala-Poverty.pd

problems were solved by it. The natural process of mathematics ie, being led by questions, problems, curiosity and arriving at mathematics is derived to the leaner. Meaning and innovation are taken away from the leaner. There is opportunity for reflection and intuition that leads to a theory in such a process.

7. Even though the Kerala text books adopted an approach of avoiding an axiomatic based structure presentation of mathematics the transition to driving mathematical learning towards a natural process by learner by the learner has not happened in the classroom. This could have given the learner opportunities for practising mathematisation based on contexts and also practising learning trajectories with exploratory activities quantitatively and qualitatively. The process of reinvention by the learner does not happen and discussions around the individualized trajectories giving opportunity for the learner to justify, compare and reflect different approach to problem solving leading to collective development also does not happen.
8. There is a need for addressing this gap in classroom practice. Community Maths Lab (CML) is an enquiry to develop an activity design which is completely child centred based on the following process:

    - Using contextual problems ie. problems which are experientially real to children, which they can understand easily, get engaged with and solve by some means by using manipulatives or by mental methods of calculation, providing space for different learners to present different , interpretations and solution strategies and also providing the designer teacher to bring out the key mathematical idea which she has in mind.

    - Use of horizontal mathematisation for ordering, schematising and building a model of reality so that it becomes amenable to be dealt by mathematical means going beyond conventional word problems (in which no mathematisation is done); and use of vertical mathematisation of level raising of the learners by organising, symbolising and model building from the paradigmatic situation in which children have oriented themselves (thus making it completely distinct from an empiricist approach focussing on horizontal mathematising only, a structuralist approach which confines itself to vertical mathematising and a mechanistic mathematics approach where both forms of mathematisation are missing).

    - Direct teaching and drilling is avoided and the contextual real life mathematisation model are created in a natural self-evident way that fits with the child's informal strategies as if they could have been invented by the child and adapted in new situations under the guidance of the teacher.

    - The children going through the process of re-inventing and constructing their knowledge through models or methods to solve

their problems should be given opportunities to communicate, argue and explain their model thereby verifying and developing their own mathematical ideas. The designer teacher should be able to conclude collaboratively with the children mathematical concepts and knowledge. The children are thus engaged in explaining, justifying, agreeing and disagreeing, questioning alternatives and reflecting.

- Adopting a holistic approach in which leaning strands are not dealt with as separate entities but instead intertwining of learning strands is exploited in problem solving by building cross connections across various concepts.

## Innovative Element

9. It is well accepted that mathematical acumen can help enhance business and livelihood skills by developing a person's critical thinking, analytical skills, and problem solving capabilities. However, while there is significant focus on enhancing the skills of school children through improving their mathematical abilities, there is relatively much less focus on out-of-school children or unemployed youth and adults.

10. Building relevant capabilities of unemployed youth and other adults, and increasing their employability is highly relevant to Kerala's growth strategy, especially since like the rest of India, it does not have an abundant demographic bulge. In addition, Kerala currently tops the unemployment rate among major states at 12.5% against the all-India level of 5%, making it the third highest in the country after Sikkim and Tripura (Annual Employment-Unemployment Survey 2015-16 conducted by Ministry of Labour and Employment). The State's Economic Review 2016 notes the unemployment rate among the youth is high in Kerala with 21.7% without a job in rural areas, while the figure is at 18% in cities and towns. It adds that the youth unemployment is prevalent in Kerala because young people lack adequate skills, and work experience in emerging areas.

11. This is a key innovation in this Program. The rapid literature review found few examples of initiatives with such focus on adults as a separate group in math labs, although in many experiments, parents of children participated in the experiments. In the proposed Program, therefore, an additional focus on adults and youth, particularly from marginalized groups, is proposed as a pilot. Given the high levels of literacy in the state and the significant additionality that a keen understanding of mathematics can bring to their lives and opportunities, it is believed that there will be sufficient demand for such an initiative. This said, the innovation has risks that will need to be carefully considered and mitigated in its design, and culturally and age appropriate modules and tools will need to be prepared.

## Goals and Objectives of the Manchadi Program

12. The Manchadi Program will aim for a more results oriented and problem solving society in Kerala through wider and more explicit application of mathematical knowledge in real-life. It will achieve this goal by setting up Community Math Labs at the grassroots across Kerala. Specific objectives of the Program will be as follows:
    - Universal mathematizing at the community level;
    - Enhanced ability of children age 6-12 to think and reason, to visualize and handle abstractions, to formulate and solve problems, and
    - Employability of aspiring adults and unemployed youth in improving their livelihood through real life application of mathematics.

13. The overall framework for the Program and three related but discrete components for achievement of these objectives are briefly described below.

## Components of the Program

14. The Manchadi Program will essentially operate within the framework of a **Community Maths Lab** (CML), which will aim to design and implement effective community mathematical centers or spaces in public spaces for universal mathematizing. A CML shall create a space to help children between the ages of 6-12 and adults (including parents, teachers, housewives, professionals, unemployed youth, workers from the formal and informal sectors) to learn and share abstract concepts through concrete experiences which will increase their understanding of the ideas. Opportunities would be provided for bringing in relevant and tacit practical knowledge as well as appropriate formally acquired theoretical knowledge to encourage a tailored and developed process of applying Math to everyday situations and practices through hands-on-activities. Methods and learning environment will be tailored for both adults and children, who will be encouraged to be creative and think freely while at the same time learning and applying maths to improve the rigour of their thinking and approach. Options for schema for community mathematics lab are provided in the Annexure 1.

15. The Community lab will be developed as a place where qualified community animators and volunteers/activists would interact with learners based on instructional materials. Community play things toys, computer programmes and games have become important tools for community learning. Apart from these augmented reality, virtual reality and gaming shall be also used. This could also allow individual adults and children to address the variations in the manner and speed of their learning. The lab method enables the participants to experience the joy of personally discovering principles and relationships as well as cultivating favorable attitudes towards mathematics and improving their creative thinking, analytical skills, and their problem-solving ability.

16. As stated earlier, the CML will have three components. The first focuses on adults in the community and children alike and is called Universal Mathematizing, and the second is called Special Programs for Children. The third is called Special Programmes for youth adults. These are described below.

## 1.1 Component 1:Universal Mathematizing

17. A library of community problems would be created in each location, based on problem matrices identified by the local government and development agencies at the grassroots level covering productive sector, infrastructure sector and service sector. Each of the problems would be segregated into sub-problems. A prioritization will be attempted in consultation with the target participants, based on perceived effect of the problem on the population in the local government, spatial dimensions, and effects on marginalized groups.

18. Problems requiring an integrated multi-dimensional inter-disciplinary problem solving approach could be identified through consensus and a root cause analysis of the problem using a cause and effect analysis. The root cause analysis matrix can be revisited whenever required based on consensus.

19. The problem matrix, the prioritization ranking, the root cause analysis etc. would be used for developing a series of real life scenarios of problem posing and interventions. The objective shall be to develop the capability of integrated problem identification through participatory appraisal methods. This would involve posing questions for breakdown of the problems into sub-problems, understanding cause and effect relations, and developing a framework for collective enquiry, collecting information on methods of measuring the gravity of problems, standards and benchmarks for assessing problem, best practices etc. and how, scenarios of ongoing problem solving could be recorded and impacts assessed. The community labs would have support system to use social media, web, mobile and WhatsApp for unified communication, problem enquiries and for collaborative assessments. The community problems would be used as tools for universal mathematizing by the SMT and DMT.

## 1.2 Component 2: Special Program for Children 6-12

20. The Special Program for Children aged 6-12 will improve the personal, cognitive, and social empowerment of children to achieve desired societal goals of enhancing mathematical skills of the community and increasing the number of children pursuing mathematics. The community lab would create a real-world context for the children of ages between 6 and 12 to apply the knowledge and skills which they acquire in their school, helping them to extend their learning environment and handle real situations with the support

of their parents and the community. The Maths Lab will enables the children to engage and relate with Math through a variety of multimedia tools, physical manipulative and activities to help students imagine and observe the various facets of Maths.

21. The CML will include books, games, puzzles, teaching aids and other materials for engaging children. They can be used both by the student by their own and together with a trainer to explore the world of mathematics, to discover, to learn and to develop an interest in mathematics and contribute greatly to the learning of mathematical concepts and skills.[17]

## 1.3 Component 3: Special Program for Youth and Adults

22. The CML for youth and adults, particularly from marginalized and unemployed groups, will provide a flexible and convenient space, which would cater to enhancing their employability. Specifically, CMLs will aim to impart unemployed youth and other adults meaningful learning opportunities that are grounded in business and linked to enhancing their livelihood, employment or entrepreneurial opportunities. It will aim to help enhance employability skills such as critical thinking, analytical skills and problem solving, which many of our youth lack today. While CMLs will be open to all, given the limitation in terms of resources, priority will be given to ensuring equitable access to high-quality learning opportunities for unemployed youth between 18 and 30.[18]

23. As a pilot, this component will focus on three areas, namely: (i) improving livelihoods, (ii) financial literacy, and (iii) entrepreneurial mathematics. There is now general recognition that doing business involves several skills, namely the ability to commutate percentage, decimals and fractions, understand markups, financial statement analysis.[19] Furthermore, the empirical attribute of the entrepreneurial reasoning reportedly makes mathematical training advantageous to any aspiring entrepreneur.[20] Such modules will also help to acquire and strengthen basic financial literacy, which will help participants to estimate their financial needs and decide when to borrow and when not to borrow. Entrepreneurs also need grapple with numbers, graphs, accounts, maximize profits and minimize costs.[21] Entrepreneurial mathematics would include for example reading and interpreting tables, charts and graphs; computing discounts and markups; solving problems related with percentage, ratio and proportion; determining unit costs, total costs, take the mystery out of budgets, financing, credit, and

[17] http://mathedu.hbcse.tifr.res.in/wp-content/uploads/2014/01/Mathslab-English-Manual.pdf
[18] OECD (2016), *Equations and Inequalities: Making Mathematics Accessible to All*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264258495-en.
[19] https://www.huffingtonpost.com/steve-mariotti/start-up-math-a-pioneerin_b_2498604.html
[20] https://www.linkedin.com/pulse/20140708183646-131466034-how-can-mathematics-give-an-unfair-advantage-to-entrepreneurs
[21] https://www.smesouthafrica.co.za/Solving-the-x-Why-entrepreneurs-need-maths/

costs. It will help more sophisticated participants understand a comparison of various methods of financial investments, understanding various taxes, compare insurance programs, and understand business performance.[22]

### 1.4 Development of Modules

24. Age and culturally appropriate modules will be developed by expert groups for all 3 components. These modules will not aim to make the participant a mathematician, but instead help to improve their critical thinking, analytical skills, and their problem solving ability. Particularly, for the component focused on youth and adults, the CML will integrate technology into the curricula to make instruction more efficient and engaging for this group through simulation, animation and internet activities. [23]

25. The Program will develop a rich resource kit for use by the SMT and DMT, including good technology support through a dedicated Learning Management System, a mobile based system over voice, WhatsApp and internet, a Video streaming, audio streaming and multimedia support. This will be integrated with the SMT for sharing good practices in teaching and learning. Community Radio shall be also actively used. Computer based tools like GeoGebra, Matlab shall be also used along with study aids and kits.

## Creating a Friendly Environment in the CML[24]

26. **Location**: The CML should be easily accessible to all, in particular for children and their parents. This should be the priority criteria for the DMT in identifying a space. This should be the priority in determining a space. One easily accessible space would be the library facilities that exists in several parts of the state. Other options could include community and public buildings accessible outside office hours and on holidays.

27. **Infrastructure**: The basic infrastructure necessary for a friendly CML would include: theme and activity spaces, multimedia computers with software, education play systems, games, simple instruments for measurements projection equipment, television monitors, DVD players white boards, bill boards, notice boards essential furniture, racks for books and toys etc.

28. **Flexible Times of Operation**: For children and their parents, the CML will work on weekends and on holidays. If it is convenient CMLs can be organised in evenings on working days. In the case of adults and youth, there may be need to have CMLs operate at varying times. This may not be standard across CMLs and may be determined by the DMT based on the local context and

[22] http://www.gaebler.com/Entrepreneurship-and-Math.htm
[23] What mathematics does everyone need to learn? http://mathedu.hbcse.tifr.res.in/wp-content/uploads/2014/01/KS_08_marc_what-maths-does-evryone-need-to-lrn.pdf

[24] Please note that a standard protocol will be established, ensuring that each CML will have flexibility to tailor its facilities to he needs and priorities of the local context.

community interest. For example, if young housewives are expected to attend the CMLs, then it may be necessary to see whether the CMLs can be opened only for women on selected afternoons. For teachers and other programme functionaries' flexi timings would be decided locally based on needs and convenience. The CML would evolve a minimum number of hours of engagement through practice.

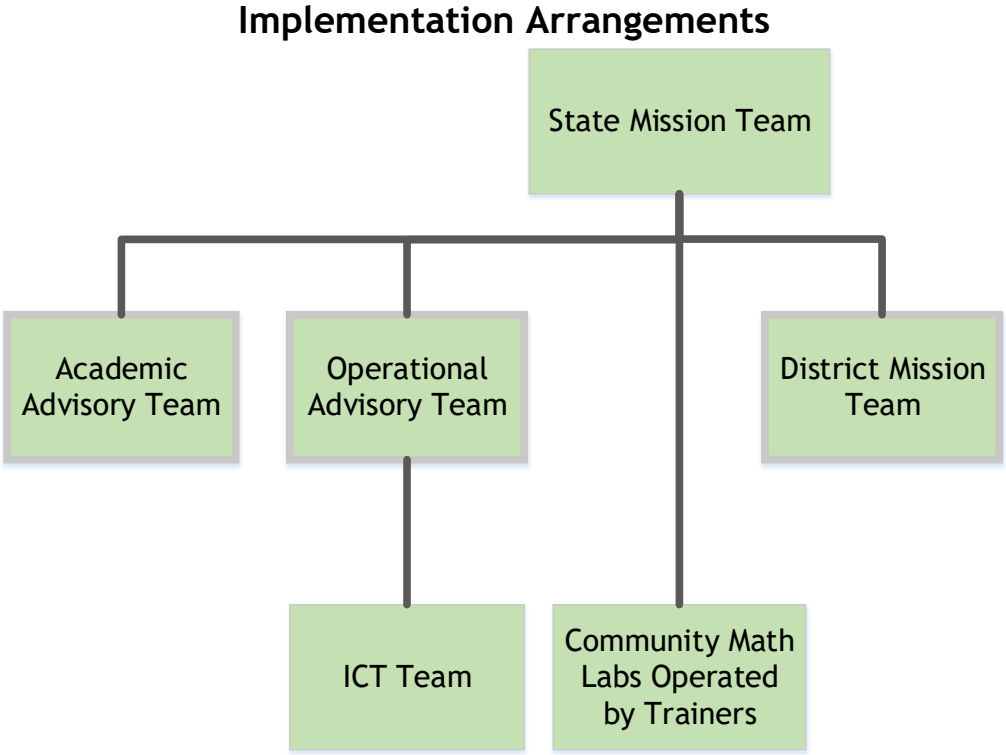



*Figure 1: Suggested Organization Structure for Program Management*

29. The implementation arrangements shall include an organizational framework as indicated in Figure 1.

## 1.5 State Mission Team

30. A team of retired experts, college level teachers and school teachers who have a common understanding on the curriculum and the assessment approaches would create a State Mission Team (SMT). The SMT would be supported by an Academic Advisory Team and an Operational Advisory Team. The latter will be supported by an ICT team for technology based instruction, ICT based assessment and programme monitoring.

31. The SMT would consist of 2 Zonal Coordinators each for 4 Zones. (Zone 1: Kasaragod, Kannur, Kozhikode, Wayanad, Zone 2: Malappuram, Palakkad, Thrissur, Zone 3: Ernakulum, Idukki, Kottayam, Zone 4: Alappuzha, Pathanamthitta, Kollam, Thiruvananthapuram) and 2 District Co-coordinators

each for every district. The State Mission Team shall have two state coordinators also.

32. **Responsibilities of the SMT** are suggested below:
    - Review need for any policy or program adjustments that may be necessary;
    - Developing and issuing a strategy document for the program after the pilot stage and when ready for replication;
    - Put in place District Mission Teams (DMTs) to support the establishment and operationalisation of the Program;
    - Overseeing the activities and monitoring progress of the program against stated objectives in the state;
    - Preparing annual reports on progress and results of the program to be submitted to the Government.

## 1.6 District Mission Teams

33. **District Mission Teams (DMTs)** will be established at each district-level. Responsibilities of the DMTs will include:
    - Work in collaboration with the library movement or as otherwise decided;
    - Oversee the functioning of the CMLs within their district, and confirming that they are functioning in a manner that is likely to achieve its objectives;
    - Mentor the animators, responsible for final implementation at the community level, and assess the quality of their work; and
    - Oversee and prepare and submit brief semi-annual progress reports to the SMT.

## 1.7 Animators

34. Trained animators will be allotted to each CML. These will include:
    - 3 animators trained in maths
    - 1 PRA trainer well versed in developing community problems and
    - 1 community organiser
    - 3 senior maths teachers preferably those who are retired

35. **Qualifications of the Animators**: The trainers shall be graduates with at least a subsidiary in Mathematics or graduate engineers who have papers in Mathematics up to the pre-final year. The community trainer would be a peoples' plan activist. The PRA trainer would be preferably a social animator exposed to PRA activities in Kerala The senior mathematics teacher shall be school teachers with an orientation towards community work and working with young children.

36. **Training of Animators**: The trainers would be required to undertake a competency assessment in handling the community labs, the community empowerment and the interaction with children. An online technology

platform would be created for the SMT and DMT to integrate with the trainers for continuous feedback monitoring and support.

## Strong Partnerships

37. Strong partnerships, keeping the General Education Departments and its various arms in teacher training and educational research at the Centre, shall be operationalised. The experts associated with Academic and Training arms viz. State Council of Education Research and Training (SCERT), State Institute of Educational Technology (SIET), State Institute for Educational Management and Training (SIEMAT) and Kerala Infrastructure and Technology for Education (KITE) and programme specific functionaries of Sarmagra Siksha Abhyan etc. District School Mathematics Association which might have good resources in certain locations shall be also involved. Support from National level groups like Navanirmithi Learning Foundation, Pune, Jodo Gyan, Delhi, Home Baba Centre for Science Education Mumbai, The Institute of Mathematical Sciences, Chennai shall be mobilised. The international and national experiences outlined in Annexure 1 shall be appropriately integrated.

## Program Implementation

38. The implementation shall be initiated with pilot initiatives in 5 local governments. A review of the pilots will be conducted in March 2019 to assess whether the CMLs are progressing in the right decision and are likely to achieve their desired objectives. If assessed to be successful, the SMT will recommended the pilots for replication in a phased manner to additional and selected number of panchayats across the state. Given public demand and interest, it will also be reviewed as to whether other age groups and pre-school interventions should be targeted during 2019-20.

39. A draft timetable is proposed in Table 1. The campaign is expected to begin operation in August and CMLs established during Onam holidays in the four pilot districts.

| Table 1: Draft Timetable to be Finalised and Completed on 20th | | |
|---|---|---|
| Action to be Taken | Responsibility | By Date |
| Presentation of Draft Concept Paper to K-DISC Board and feedback integrated | K-DISC | July 8th |
| Preparation of (i) Needed Terms of Reference; (ii) Standard Protocol for testing for CML; (iii) Finalisation of Experts groups based on draft TORs; (iv) Trainers of Trainers identified, and draft agenda for such Training prepared | K-DISC along with Expert Groups | July 30th |

| Table 1: Draft Timetable to be Finalised and Completed on 20th | | |
|---|---|---|
| Action to be Taken | Responsibility | By Date |
| SMT established and first Meeting of State Mission Team held:<br>o Approval of Design of Pilot MCL<br>o Pilot wards finalised<br>o Identification and establishment of DMT<br>o Dissemination strategy to be implemented by DMTs in pilot wards approved<br>o Approval of basic and preliminary standard protocol for each CML<br>o Approval of Terms of Reference for various activities stated below<br>o Approval of criteria to select trainers to implement the program in the CML | K-DISC to organise | July 30th |
| Dissemination of information on CMLs initiated by DMTs in pilot local governments | DMT | Sept 30 |
| A first set of resources, educational technology platform, and supplementary material prepared as per TOR, appropriate for pilot areas | K-DISC to put together Expert team to prepare Materials by July 15th | Oct 10 |
| Experts develop assessment tools for children and adults not focused on testing rote knowledge but on different dimensions of learning both at entry and for periodical progress assessment as per TOR | K-DISC to put together Expert team to prepare assessments by July 15th | Oct 10 |
| Identify potential trainers based on agreed criteria | DMT in consultation with SMT | Oct 10 |
| Training module to be developed<br><br>First Training of 10 Animators each from a pilot area to be completed | Implemented by August 1 | Oct 10<br><br>Oct 15 – training will involve hands on testing of modules by animators |
| Pilot to be Initiated in 5 Local Governments | | During November |

## Financial Resources for Manchadi Program

40. The budget will need to be worked out. However, it is anticipated that a quantum of resources for the programme shall consist of voluntarily services as in the Total Literacy Campaign and the rest supported through CSR and philanthropic contributions
41. The CML lab space, expenses for day to day running including rent, electricity charges, water charges and cost of furnishing shall be met by local government. Cost of material, honorarium for animators, faculty and volunteers shall be met by K DISC

## Monitoring and Evaluating Results

42. There are two types of assessments that need to be simultaneously carried out for the pilots in order to make a decision on whether to replicate or not.
    - The first will involve monitoring a set of agreed indicators to assess the operation of the program at the CML and state levels (a set of sample indicators are provided in Table 2).
    - A second level of evaluation will assess the learning at the individual level with in the CML. For this, a method of computer-scored diagnostic pre-test and post- test, preferably executed using a tablet or mobile for a direct measurement of skills learned, shall be developed and implemented for all participants at the CMI.

43. A monitoring system established in each CML will capture activities in each Centre. Table 2 provides a set of sample areas that will be captured in each center. In terms of assessment of performance, each participant in CML activities will need to undertake an age-appropriate assessment at entry and at the end of a year of participation.

Table 2: Monitoring Indicators for the Pilot

| Dimension | Sample Indicator | Method |
|---|---|---|
| Assessment of Inputs | ○ Number of CMLs established<br>○ Cost for establishing each CML (actual cost and quantification of volunteer time and contribution) | ○ Electronic registration for each individual attending the CML |
| **Outputs**: Number of participants attending activities in CMLs | ○ Number of adults by age, gender, profession, and employment status<br>○ Number of children by age, gender, mother's education, BPL/APL, Community | ○ Registration System at entry and individual attendance register during each visit |
| • **Early Outcomes**: Performance of CML | • At least 25% of adults who come to the centre are teachers by profession<br>• 50% number of children show sustained participation in CML, Centre activates over a period of 6 months in the first year<br>• The majority of adults/and or youth who come to the CML aim to improve their employability | • Electronic registration<br>• Periodical survey to understand satisfaction with service level<br>• Walk through observations by LSG functionaries and other civil society representatives |

| Table 2: Monitoring Indicators for the Pilot | | |
|---|---|---|
| Dimension | Sample Indicator | Method |
| | • Satisfaction levels of participants who have regularly attended activities at least for 3+ months | |
| • **Intermediate Outcomes:** Individual student and adult competency increased | • Learning achievements of participants<br>• Children pass with significantly higher marks in their standard exams | • A method of computer-scored diagnostic pre-test and post- test, preferably executed using a tablet or mobile for a direct measurement of skills learned shall be planned out.<br>• Surveys conducted |
| • **Impact – Long-term outcome** | • Teachers strengthen methods of learning maths with math lab model lessons<br>• Youth and adults attending the CML are able to engage in productive activities | • Periodical surveys |

## Assumptions and Risks

44. As with any innovation, there are several assumptions that underlie the Program design, which if unrealized could set substantial risks to the innovation. Table 3 lists the likelihood of risks and how the design could mitigate this, and Box 1 provides key principles that will guide the implementation of the Program.

| Table 3: Assumptions and Mitigation of Risks | |
|---|---|
| Assumptions | Mitigating Risks |
| Adults change mind-sets and participate in the Centre's activities realizing the benefits | ○ Able to associate some key members of the local community so as to gain credibility<br>○ Centre has a physical learning environment that is pleasing to both adults and students<br>○ The centre should be set up in a prominent place to ensure access for children from grades 1-7<br>○ Age-appropriate activities would be included tailored to the needs of the community.<br>○ Schedules will be such so as to ensure that children and other special groups such as unemployed youth or housewives will find it convenient to participate |

| Table 3: Assumptions and Mitigation of Risks | |
|---|---|
| Assumptions | Mitigating Risks |
| | ○ Organise early events in the form of community events festivals so as to attract community members. |
| Parents will divert their children from traditional tutors who promise marks in exam to the lab, which they may see as an untested experiment | ○ Focus during the pilot will be on children aged 6-12, with relatively more free time<br>○ A campaign will be held to ensure that people understand the parents and others understand the benefit of participation<br>○ Parents, particularly mothers, will be encouraged to stay with their children so that they can understand the purpose and methods of the MCLs<br>○ Anganawadis workers would also be involved actively in the campaign for preschool children.<br>○ Demonstrate some quick wins that will show that participation in the CML will help to improve their child's performance in Maths<br>○ Target children who come from weaker sections of societies |
| Centre is able to develop interesting quality age-appropriate and absorbing tools and mechanisms | ○ Experts, with knowledge of Kerala ground realities, will be engaged to prepare the tools and provide training to volunteers who will operate the CMLs.<br>○ Technology based teaching and learning methods shall be actively pursued with a comprehensive ICT based assessment framework |
| Teachers will participate voluntary in Lab activities creating a link between learning Centre and formal system in schools | ○ Disseminate knowledge and information on Maths Lab as a support for teachers<br>○ Function on weekends to facilitate the participation of teachers and academics |

*Annexure 1*

## Experiences from elsewhere

Some interesting experiences on teaching and learning of mathematics elsewhere could also be considered in building the campaign.

i. Mathematics Education Collaborative (MEC), a Washington based non-profit works in partnership with school districts and mathematics leaders to secure a well-informed public committed to improving maths education for every student and teacher. MEC offers a series of community math nights for teachers, administrators and public at large and runs projects where teachers, parents and the community collaborate evidenced with professional development of teachers and impressive student learning outcome gains. Among the collaborators are Jo Boaler, Stanford mathematics professor who argues that new approaches -- group work, real-life examples and solving problems students can relate to -- have the potential to transform the way students interact with mathematics. Traditional methods, which emphasize students learning key principles and facts, have resulted in schools in which too many students feel early on that they just "don't get math," and shy away from the subject.

ii. It is well known that Singapore mathematics curriculum has developed a focus of problem solving. The development of mathematical problem solving requires good understanding of mathematical concepts, proficiency in mathematical skills and processes, a positive attitude towards and an awareness of one's thinking processes. Singapore has adopted a unique approach called heuristics to support students in problem solving. At the primary level the heuristic method uses a visual representation of information presented in a visual problem which eventually gets implemented as an arithmetic representation. The Concrete-Pictorial-Abstract (CPA) method has been taught in a structured way beginning with simple problems including whole numbers, ending up with challenge problems involving fractions, ratios and rates later. There is a consistent manner in which the diagrammatic method is linked to the symbolic notation later. The model method has facilitated transition from a dominantly arithmetic method to an algebraic method. There are also other heuristics such as work backwords, simplifying the problem, guess and check etc. The model method and heuristics has developed interesting online systems like www.thinkingblocks.com in US and www.mathsheuristics.com. Thinking blocks is a learning site filled with math games, logic puzzles and a variety of problem solving activities. Maths heuristics developed by a Singaporean school teacher turned entrepreneur Sunny Tan, offers a total learning experience offering five integrated platforms viz. Programme, Books, Mobile Apps (teachers, parents), Web videos (webinars, face book live, streaming video sessions) and Virtual Classrooms. He has developed a four module curriculum covering Unit Transfer Method (UTM), Model Approach to Problem-solving (MAPS), Heuristics Approach to Problem-solving (HAPS), and Higher-Order Thinking Skills (HOTS) which is implemented as a part of the total learning experience.

iii. While the pedagogy for mathematical learning and teaching in Singapore, the good quality text books are well appreciated widely little is known about the teachers network and learning circles which had been central to Singapore Ministry of Education strategy to foster teacher collaboration and learning, (a) The Learning Circles (LC) used Action Research methodologies (Initial Reflection-Act-Observe-Critical Reflection) to challenge their pedagogic practices and to improve them.(b) LCs shared the learning outcomes through personal journals of teachers, group reflective journals, teachers network publications, teacher led workshops, teacher network conferences and websites. (c) Teachers contributing more than twenty hours to the network or have written or edited at least three publications for the network were recognized as teaching network associates. (d) Cluster of schools were grouped into zones and a Centre of Excellence (CoE) established with a coordination mechanism for Knowledge Management. The CoE had a recording studio with videotaping and editing capability and a Maths Teaching and Learning Lab. (e) Participation in LCS and CoE were on an invitational mode. The Thinking and Learning Communities have now emerged as the Academy of Singapore Teachers and Association of Mathematics Educators which contributes substantially to professional development of teachers in Singapore

iv. Confrad Wolfram from Wolfram Research[25] had been advocating that mathematics education should make the greatest possible use of computers for performing computation. He advocate leaving students to concentrate on the application and interpretation of mathematical techniques. He also argues that computers are the basis of doing math in the real world and that education should reflect that and that programming should be taught as part of math education. They have set up a website www.computerbasedmath.org for developing a high-concept maths curriculum with computer-based computation at its heart—redefining maths as the anchor subject for computational thinking across all subjects, centred on real-life problem solving, not historical hand-calculating techniques.

v. Educational Initiatives, Ahmedabad was established in 2001 by a group of Alumni from IIM, Ahmedabad. They have developed ASSET an international benchmarking test which gives a clear-cut picture to teachers where students stand. During 2008-10 they conducted a student learning study, jointly with Indian Statistical Institute, National Institute of Educational Planning and Administration and University of Michigan covering 1.02 lakh students in 2400 schools in 48 districts in 18 states and 1 Union territory. The study was supported by Google and provided immense insights on children learning to various stakeholders. In 2010-11, Educational Initiatives with the support of WIPRO conducted a study- Student learning in Metros across five metro cities covering 23000 students, 790 teachers, 54 principals from 89 schools. The study checked whether students are learning with understanding and whether they are able to carry out higher order cognitive tasks. The study brought out accurate and deep understanding on learning outcomes in the study area. Based on this experience

[25] Wolfram Research has developed Mathematica software and the Wolfram Alpha a computational knowledge engine or answer engine.

of these studies and their own efforts in various schools in different parts of India Educational Initiatives has developed an adaptive learning programme called Mindspark to teach primary school students Math according to their current levels of understanding. On trying out the tool for ten months and 27 hours per school year an impact of 0.19sd on test scores in the first year and 0.20sd in the second year, was achieved, both of which are statistically significant, the evaluation being organised, matching students with almost identical baseline test scores in schools, in the same states, using the same curriculum, charging similar fees. A key feature of Mindspark is the ability to finely benchmark the individual student as well as analyse the data to identify patterns of student errors and precisely target content to alleviate conceptual bottlenecks that may be difficult for teachers to diagnose or address at the individual student level in a classroom. The application showcased in “The Economist” as a edutech product of promise is platform agnostic and can be deployed through computers, tablets, smartphones and could be used both offline and online. One of the limitations of the educational initiatives experiment is that it does not open up an opportunity for collaborative learning of the child and reduces the process of maths of a child to a personal private affair with education the application and direct teaching inputs which are improved based on peer comparison and continuous comprehensive assessment.

## *Annexure 2*

## Schema for Community Maths Lab

Options for schema for community mathematics lab are provided in the Table below. The mathematics lab shall have various corners and spaces for activities such as those listed below. This is not an exhaustive list and will be expanded as new demand is expressed by communities and/or human resources are identified. All activities will not be available in each CML but will depend on the availability of expertise in the community and demands of communities.

| Sl No | Thematic area | Broad scope |
|---|---|---|
| 1 | History corner | Evolution from counting, study of shapes, motion of objects to abstract discipline. |
| 2 | Mechanics | Simple machines, lever, pulley, wheel and axle, inclined plane, screw, mechanical advantage, laws of motion, measuring weights, instruments |
| 3 | Music | Rhythm, scales, intervals, patterns, harmonics tones overtones pitch etc. |
| 4 | Art | Artists, painters, sculptors, discussing symmetry, golden numbers, perspective view and proportions, golden ratios, morphing, fractals, virtual reality etc. Kolam arts, mathematical properties like natural segmentability |
| 5 | Astronomy | Astronomical units of time, orbits, celestial motion, distance of telescopic measurements, resonances, eccentricities, trigonometry, almanac |
| 6 | Biodiversity | Quantification of diversity, Shannon entropy diversity index, Renal entropy, Richness index, Simpson index etc. |
| 7 | Optics | Exploring of optical illusions study of reflection, refraction, mirrors, lenses etc. |
| 8 | Life related | Measurements of tailors, carpenters, petty shop owner, auto driver, bankers calculations |
| 9 | Livelihood mathematics | Household income expenditure, seasonality, livelihood diversification, vulnerability, risk mitigation, cost reduction, increasing costs of inputs, markets |
| 10 | Measurement zone | Estimation, measurements, verification, validation measurement of length, area, time, volume, weight, Fermi problem, Fermi question, Fermi estimate. |
| 11 | Survey and Cartographer corner | Clinometer, Brundton Compass, revenue record system, map reading, cartographic maps, thematic maps, topographic maps, GPS |

Another important is to look at a major local problem in totality in time series and spatially. A variety of common community problem frameworks available locally could be taken as

the starting point. These are only listed as frameworks and an expert team has to look at how it could be linked to children's learning and at the same time for adult learning.

**Indicative outline of major community problems**

| Sl No | Major Problem | Sub Problems | Data sets |
|---|---|---|---|
| 1 | Community Problem (spatial) | 1. Drinking water accounting in a micro drinking water project | - Water supply demand matching<br>- Consumption patterns<br>- Seasonality variation |
| | | 2. Water balance assessment in a micro watershed | - Supply demand matching<br>- Consumption patterns (domestic, agricultural, commercial)<br>- Seasonal industrial<br>- Time series |
| | | 3. Transformer based distribution losses in a locality | - Supply demand matching<br>- Consumption patterns (domestic, agricultural, commercial, industrial)<br>- Daily variations<br>- Monthly variations |
| | | 4. Transportation studies | - Transportation network<br>- Options<br>- Commuting patterns<br>- Traffic, transit issues<br>- Cost of transport |
| | | 5. Habitat studies | - Supply demand matching<br>- Consumption patterns (domestic, agricultural,<br>- commercial, industrial)<br>- Costs and distribution<br>- Time series |
| 2 | Community problem (non-spatial) | 1. Viability of a small enterprise | - Input costs<br>- Product costs<br>- Prices<br>- Competition |
| | | 2. Livelihood planning | - Resources assessment<br>- Income expenditure mapping |

| Sl No | Major Problem | Sub Problems | Data sets |
|---|---|---|---|
| | | 3. Health studies | - Seasonality calendar, daily activity clocks<br>- Business development services matrix, fractograms<br>- Beneficiary centered ranking of subsectors/interventions<br>- Supply demand matching<br>- Morbidity patterns<br>- Mortality patterns<br>- Interventions<br>- Time Series |