

STEM EDUCATION GUIDED BY OUR WISDOM PROFILE TO ENGAGE WITH CULTURE AS AN ASSET FOR INCLUSION AND SOCIAL AND ECOLOGICAL LEARNING

Pratap Ganesan, C3STREAM Land, SAIER (Sri Aurobindo Institute of International Educational Research), prathap7618@gmail.com

Saranya Bharathi, C3STREAM Land, SAIER, saranyaa2991995@gmail.com

Muralidharan Aswathaman, C3STREAM Land, SAIER, murali@auraauro.com

Vasantharaj Gandhi, C3STREAM Land, SAIER, vasantharaj1000@gmail.com

Sanjeev Ranganathan, C3STREAM Land, SAIER, sanjeev.ranganathan@gmail.com

India is a country of diversity with many disempowering ISMs (e.g., casteism, religious fundamentalism, sexism) coming from strong socializations and rigid mindsets. This is more so in rural India where the intersectionality of these ISMs is dominant. How can we use our wisdom profile (Monica, 2017) to broaden the social profile to be an asset of inclusion rather than exclusion both for society and the environment?

What is an integral approach to STREAM (Science Technology Research Engineering Arts and Mathematics) education that engages with culture while addressing socio-ecological learning for equitable and sustainable change in rural schools? We present the theory and practice of transdisciplinary learning of Mathematics, Environmental Sciences, language, and art.

The theoretical framework is based on the work of Sri Aurobindo to make a national education that is integral (Aurobindo, 1921), Seymour Papert's theory of constructionism (Papert, 1986), and more recent work by Dr. Sharma Monica on Radical Transformational Leadership based on addressing ISMs using the conscious full spectrum response model (Monica, 2017).

In this paper we will focus on approaches we had adopted in Isai Ambalam School a rural school in South India in making culture and celebrations of Pongal, Karthigai Deepam, Aadi festival, Diwali, Christmas inclusive, eco-friendly, meaningful, and engaging not only socially, but also integrated into STREAM education with awareness of the environment.

The stories behind the festivals were seen from the perspective of universal values (like equality, care for people and the planet, responsibility, and well-being) as well as an opportunity for changing lifestyle at school and home to be more healthy and environmentally conscious. For example, we looked at traditional sweets that are made with jaggery instead of refined sugar as sweets in celebrations. Children studied about the health benefits as well as made these sweets at the school and then at home with parents. In Karthigai Deepam we made traditionally Maavali, a natural palm flower-based charcoal firework that is non-polluting and only creates sparks based on human powered centrifugal force. In Pongal, we looked at Kolam (the traditional patterns) and also looked at breaking the social patterns on only girls/women doing so. We

explored the Indian solar calendar used in Tamil Nadu and planned the Aadi festival by planting seasonal vegetables in our school garden. We also studied about Monsoon, and graphed and compared rainfall data in the month of Aadi in different states of India. We studied the palm leaf craft for a week to make 3D objects like birds, stars, and fish. For Christmas, we decided to make our own decorations with palm leaf crafts. We also made many innovative fair games and engaged with children from other schools with.

Context

C3STREAM Land (C3 is Conscious for Self, Conscious for Others, Conscious for Environment, +STREAM= STEAM+ R (Research), henceforth referred to as C3SL are rural STEAM centres in Tamil Nadu in India near Auroville. The programs are run by youth engineers who learn, grow, work, and teach children within their community. Auroville is a universal township which aims to embody true human unity with 3000 people from over 60 countries coming together to work on the needs of humanity including initiatives with the villages around Auroville. Most of the youth of C3SL come from the villages around Auroville and from Auroville and have made a choice to live and serve in their communities rather than move to the cities seeking better career opportunities for themselves.

STEM education can become “technology for the sake of technology” and miss out on addressing social, cultural and structural biases, and disparities, it can also ignore the development of the inner capacities of children. C3SL strives to address these as the deeper purpose of education by aligning all activities to the values of responsibility, equality and the courage to create.

The Isai Ambalam School where this paper is based on is one of the outreach schools of Auroville that aims to develop a child integrally and broadly follows the central board syllabus with around 150 children from the villages on the west side of Auroville including Kottakarai, Alankuppam, Raipudupakkam, Annainagar, Irumbai, Edayanchavadi, Pooturai. In demographics, the occupation of parents of the children is unskilled labor (35%), skilled labor (55%) and salaried workers (10%). The children come from different castes and religions.

Interrupting Disempowering ISMs

The theoretical framework of interrupting disempowering ISMs (Monica, 2017) brings out that disempowering ISMs come from strong socialization and rigid mindsets express themselves in many ways such as casteism, racism, patriarchy, discrimination, religious fundamentalism as shown in Figure 1. of the conventional setting that exists. Further intersectionality of encountering more than one ISM e.g. for a poor dalit women in India makes things significantly worse for many sections of society. Noticing that all of these come from the same mindset of scarcity, greed, survival mindset, domination and rigid ideology helps us understand that these cannot be

interrupted independently, but by embodying universal values and a mindset of abundance and contentment.

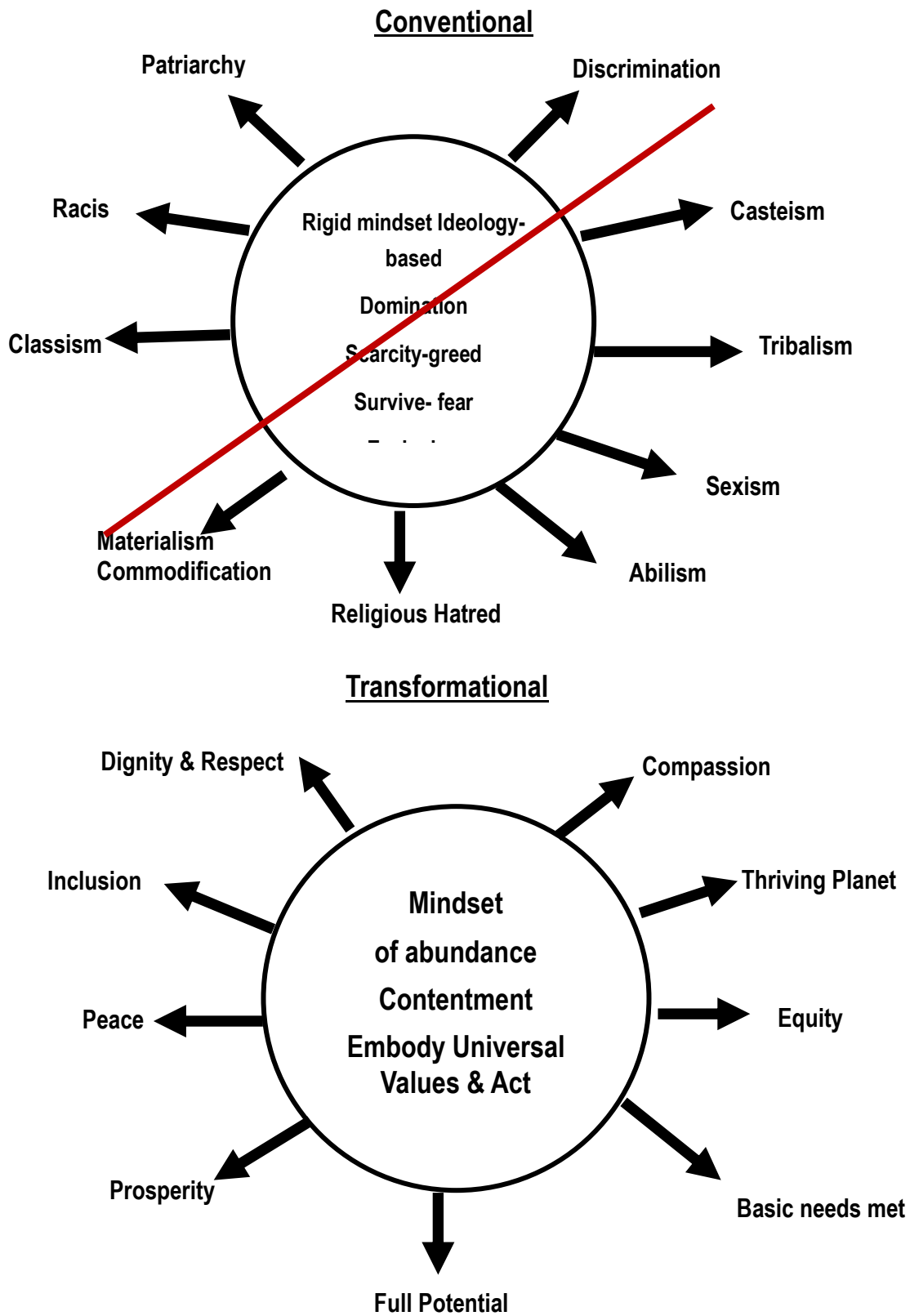


Figure 1: Interrupting disempowering social ISMs: Sourcing/embodying wisdom profile for strategic action (Radical Transformational Leadership Page No.222)

We can look at ISMs from the perspective of profiles or identities (Monica, 2017 pp.63-73) broadly classified as wisdom profile (values I embody), social profile (my socialization based on caste, gender, nationality, etc), personality profile (my unique style of expression), professional profile (my skill).

The wisdom profile represents the inner values (e.g. dignity, compassion, equity) and inner capacity (e.g. self-awareness, self-regulation, responsibility) that sees things as they really are; helps release the grip of fear, anger and anxiety; and leads one to compassionate action in the world.

Social profiles are the assumptions and conditioning that influence our perception of who we are and what the world is received from our family, religion, education, media, and culture. These assumptions and conditioning influence our perceptions of ourselves and others related to race, gender, caste, tribe, politics, nationality, etc.

In these profiles, it is the wisdom profile that can guide the other profiles specifically my social profile in order to be more inclusive rather than exclusive and interrupt ISMs.

As we are part of society these conditionings exist within us when they are unexamined and we felt the need to look at ourselves first before looking for these in society. In this regard, the paper addresses two aspects. First, the impact of the interventions on the facilitators who were involved in these initiatives (both as an autoethnography of the authors as well as reflections from other facilitators involved with these initiatives), and second, the reflections of children who were involved with these initiatives.

Research Questions

Based on the interventions as briefly described in the abstract and further illustrated later the research question being asked is what is an integral approach to STREAM education that engages with culture and has socio-ecological learning for equitable and sustainable change in rural schools. In specific, we review:

- Did my understanding of the festivals and their stories (narratives) change after the celebrations this year? If so, how?
- What values did I notice behind festivals and celebrations?
- Did I feel more or less included than before and why?
- Did I include others more than before and if so, how?
- What skills did I learn?
- Did I notice an unhealthy habit and change it?
- Was I more conscious about the environment and how?

These aspects we hope will help capture the outputs and outcomes as well as work on the aspects of skills, competencies, and inner capacities of capacity development.

Philosophies underlying C3SL

The philosophy underlying the approach for C3SL is based on the principles of progressive and constructivist thinkers like Jerome Bruner, Seymour Papert in the United States, and Sri Aurobindo in India. The philosophy of Sri Aurobindo of the

integral development of the child (Aurobindo, 1921) emphasizes self-knowledge and assumes an important relevance in the recent National Education Policy (Government of India, 2020) that is based on his work and states that “knowledge is a deep-seated treasure and education helps in its manifestation as the perfection which is already within an individual.” The philosophy creates guiding principles as facilitators on how we engage with children. The three principles of true education by Sri Aurobindo are:

- Nothing can be taught
- The mind needs to be consulted in its own growth
- From near to far

The first principle can be linked to the constructivist theory that knowledge cannot be forced into the mind of a child. The role of a teacher is not to mould or hammer a child into the form desired by the adult. The teacher is a guide, or mentor that supports and encourages a child in the process of learning, enabling them to evolve towards perfection. Our engagement with children follows this principle.

The second principle indicates that the child needs to be consulted in his/her learning. This is done at C3SL as the elder children plan what they want to work on and how they want to organize themselves to do it with the broad ground rules of respecting themselves, others and the materials. With younger children this aspect was put in practice in the co-creation of challenges along with them.

“The Teacher is not an instructor or task-master, he is a helper and guide”. It is with this spirit that we work with children. “His duty is to suggest and not to impose. He does not actually train the pupil's mind; he only shows him how to perfect the instruments of knowledge to him.” In this regard, we have worked with the children to look deeper and ask questions of what we celebrate and why and explore this with us.

The third principle is to work from near to far. To work from what is tangible and accessible to children to what is abstract to them. In this paper, we present how the children engaged with the cultural celebrations and festivals around them.

Self-awareness and personal transformation are necessary, but not sufficient for social transformation. The holistic capacity development of the child is looked upon not merely as skills, but also competencies and inner capacities based on the CFSR for capacity development (Monica, 2017, pp.236).

Interventions

Rather than look at each festival or celebration we will look at some common threads we intended to weave across the festivals (which are of course interrelated).

Narratives behind festivals based on values

We looked at the narratives and stories behind the festivals and looked for the most empowering narratives among them. This was done through the perspective of values that children could learn from these narratives.

This was an interesting exercise and we noticed that societal ISMs had changed some of these narratives e.g. Diwali in south India is a story of a partnership between Satyabama and Krishna. However, we noticed that many narratives available online including well-known mythological comics the *Amar Chitra Katha* had significantly reduced the role of the female character and made it patriarchal. We modified the narratives as well as created power points with a more empowering story of equality.

Similarly, the narrative of Diwali is generally about the death of Narkasura. In the story he was considered a divine child who got into poor company and turned evil. He seeks a boon that he can only be killed by mother Earth. His deeds eventually lead Satyabama as a reincarnation of mother Earth to end his life. At the time of his death, he attains enlightenment and understands the kind of life he could have led and requests Satyabama that the day should not be remembered for his poor choices, but his enlightenment hence as a festival of light. This we found was a far powerful narrative to the bad guy was killed. We hoped it could bring out responsibility of the choices one makes, looking beyond personal attachment for world betterment and self-awareness.

The many stories of Karthigai Deepam were reviewed from the perspective of values that can be learned from them. Humility, wisdom, care and compassion.

Pongal and Aadi festivals are environmental celebrations of nature and were an opportunity to bring children closer to nature and offer gratitude for the abundance. In Pongal, we looked at Kolam (the traditional patterns) and also looked at breaking the social patterns on only girls/women doing so. We made mixed teams of boys and girls who needed to work together to make their Kolams. We also looked at traditional Aadu Puli as a tournament as this was a strategy game and supported higher order thinking. We were able to play the game on a large ground with the children playing as tokens working with teamwork and coordination. The prizes were all vegetables. Some of the children were not so excited about winning vegetables and we shared the story of Totto Chan (Kuroyanagi, 1981), and her beloved school and how they too would have received these vegetables through their efforts and could put food on the table at home.

In Christmas we looked at caring and sharing not gifts, but ideas as games they made at a fair where they could play their games with others and play others games.

Creating something and doing research

The STEAM approach was to do something inclusive for the festivals and learn something or build something. Some of these are already mentioned above e.g. Kolams for Pongal, games instead of gifts for the Christmas Fair.

In the Karthigai Deepam, the children created Maavali. The children collected palm flowers, dried them, dig a pit to create charcoal from them, and powdered the charcoal to make fine dust that they tied in a cloth. They then created a structure with bamboo splits and tied it with a coconut rope to allow a slow burn of these Maavali. As the embers slowly release when the Maavali is spun it creates a spectacular spinning circle of fire which replaces the need or crackers for a spectacular light. The spinning also

gives great exercise and itself places a limit on how much you do and how much you sit back and enjoy giving opportunity to others.

The Aadi festival which were related to a month of rains was an opportunity for the students studied monsoon, rain patterns not only in their locality and state, but also across south India. The children also traveled the length of Cauvery in a week long tour up to Talakaveri in Karnataka understating the history and interacting with people in the other state. Interestingly, water distribution from Cauvery is a flash point in the politics of the two states, we believe such interactions at a personal level could reduce the conflict arising from narrow identities.

Changing from Unhealthy to Healthy habits

Celebrations and festivities in India are generally connected to sweets. This year the idea was to explore the nutrition in the food they eat both in gardening and also in junk food. The children then prepared healthy alternatives themselves at school and then at home. The culture of the school has changed in what children bring for friends on their birthdays for sharing.

Aadi festival was also used as a way to explore millets and also as a planting season explored for the nutritional content of these as compared to polished cereals available in the market. They also grew vegetables and were keen on tasting their own organic tender vegetables and also offering it to the kitchen.

Being conscious of the environment

Celebrations such as Karthi Deepam and Diwali are generally noisy and smoky with a large amount of crackers being used. This is also quite difficult for livestock that co-habitat the space as it is rural as well as pets. Most of these festivals were converted into a festival of lights and traditional fireworks that just works on fine embers significantly reducing the sound and smoke pollution caused by the children at the school.

The Aadi Magam was taken up as an opportunity to work with growing both millets and seasonal vegetables. The school leased a plot of land and was able to allocate each of the grades with some garden space that the children patiently made with raised beds layering compost and dry leaves and creating their own organic garden. They also cultivated herbal plants and some millets to see what the plant and the crop actually looked like as it grow up by themselves.

Along with this, we looked at understanding the monsoon and rain patterns and study Cauvery as an important river in South India that goes across states travels.

Research Methodology

These interventions were performed across the primary school from 3rd to 8th grade over the course of the entire school year.

As mentioned before, we the authors feel that we ourselves have our socializations and we used autoethnography to answer these questions ourselves. We also translated the

questions to Tamil to allow for accurate understanding of the questions as well as be able to work with the children with the same.

We gave both the English and the Tamil questions to facilitators who were at the school and experienced or supported the initiative at the school and asked them to reflect on the questions and give their responses in writing.

With children, we spoke to the children one on one and recorded their responses. For the youngest children in the 3rd grade, the answers were collected in a conversation with the group rather than one on one.

The collective data was of 13 facilitators of the school who were in some way involved with the school initiative over the course of the year and 55 children who choose to answer the questions individually. The responses from the 3rd grade are only used for trends. Since this is reflective work we have collated all the responses and will provide a cumulative report. In this report, we are bringing out the general trends as well as selective answers that might bring out an aspect that was unique and would be of interest to a larger community.

Survey Responses

The research questions are divided into a few types based on the intervention.

Intervention related to narratives and values behind festivals

Questions reflecting the broad understanding of the festivals and the idea of emphasizing empowering narratives as well as values behind the festivals at the school.

Question 1: Did my understanding of the festivals and its stories (narratives) change after the celebrations this year? If so, how?

In the responses some of the elder children reflected that they learned about all festivals, others chose to speak about specific festivals that had appealed to them like Diwali, Pongal, and Christmas. Many children in younger classes tended to speak more about the most recent festivals.

17 children brought up understanding and learning of the activities related to the festivals as a way to celebrate the festivals e.g. art of putting Kolam at Pongal and noticing that this year they noticed their mother doing it for all the festivals. One child brought up activities such as an oil cleansing bath as home remedies that can be practiced. A few brought up that they celebrated festivals with crackers, but this is not essential to the festival and harms the environment, and stopped using those.

Some children brought up the organization of the festivals at the school e.g. “Each class took a day to celebrate Pongal in their school during the Pongal week.” And three even brought up receiving gifts as vegetables as something new in the celebration of festivals.

Some responses were beyond the interventions mentioned here and reflect the general environment of the school over the last year had oriented towards looking for learning and values behind festivals even without the facilitators. In the Margazhi season which is cold in the morning the children in 5th grade learned to wake up early and enjoy braving the cold to participate in a month-long early morning singing event. Many of the 5th graders reflected on this event and what they had learned from it.

The responses from the facilitators for the first question were interesting, most conveyed a deeper understanding, searching and learning this year for example, “normally I don’t think (about) the story beyond (behind) the festival and I assume that I had known the story already, but after going deeper I came to know the actual story and the values behind it.”

Question 2: What values did I notice behind festivals and celebrations?

For the second question, other than three children others could identify values or qualities in a few words they had learned through the festivals. We felt it best to represent it as a word cloud in Figure 3. In a word cloud, the words used more often are represented in larger fonts and others in smaller fonts.



Figure 3: Values learned from celebration of festivals represented as a word cloud

The facilitators’ responses were often more elaborate e.g. “Each and every festival has some values, I noticed this year Harmony, against of the egoisms, created collaborative communities, helping tendency, to be honest to all, Love, wholeness and gender equality.”

Inclusion and creating something

We felt the next three research questions fit well in the interventions related to STEM and how the events were held.

Question 3: Did I feel more or less included than before and why?

Many 4th grade children shared that they felt happy celebrating with their friends. One child was explicit and said, “I always celebrate Diwali alone. This time I celebrated with my friends”. This helps us reflect that generally schools give a holiday for a festival or do a token celebration, but this time the children felt that their primary celebration was at the school.

Most children mentioned specific activities that they were very involved in e.g. “I was involved in Pongal kolam and making Pongal (cooking traditional porridge) class wise (with my class)”, “gardening for Aadi peruku”, “making Christmas handcrafts”, “in Karthigai Deepam Maavali celebration”, “Garden project presentation”. While it is possible that not all children were included in all activities, most children found something over the course of the year that they could actively participate and engage with. Five children said they did not feel more included than before, some among them indicated that they prefer being on their own.

The responses of the facilitators showed an interest to enquire why we celebrate festivals e.g. “I feel included more than before because of my interest to know and understand all the festivals and the reason for celebration.” It also showed a more collaborative effort between facilitators of breaking grade silos in preparation for festivals, narratives and activities e.g. “I feel more included by preparing texts based on each festival and teaching the values related to the stories. We share our text with our colleagues and get feedback based on the text.”

Question 4: Did I include others more than before and if so, how?

We felt that this question ties in with the previous question of how a child is involved in creating an environment for others. The response to this question from facilitators was of course expected as they were quite actively involved in organizing and coordinating the events e.g. “I included others to (be) involve (involved in) all the activities to celebrate the festivals, for example to collect the information from others and creating text and activities.” There was also clarity on engagement beyond the school e.g. ““Yes, I was able to include youth, parents and children from other schools (e.g NESS)”, ““Yes, I include (included) my children, parents and teachers.”

In the response of children they had included group activities such as, “While putting Kolam I involved girls and boys”, “involved my team mates and encouraged them to participate”, “prepared (gardening) bed along with others”, “We students made the Pongal without teacher help”, “involved others in Christmas decorating”, “in researching chemicals used for making crackers”, “in making kudil (hut) for Christmas”. Some responded to the question more generally and answered “include others while playing the sport games”.

There were also more interesting personal reflections like “I didn't spoke (don't speak to) my brother, but I asked my brother to play with my friends (in celebrations) and enjoy with my brother”, “Yes, included my relatives in the festival” and even one “I

included a pet for my relaxation”. Reflecting perhaps something they were able to do at home during the holiday.

Question 5. What skills did I learn?

Here again we find it pertinent to show a word cloud of the skills the children felt that they had learned. For the facilitators the skills were more of creating narratives, collecting information from the internet, organization, learning to type faster and of course some of the skills the children learned.



Figure 4: Skills learned in connection to festivals

Noticing and changing personal habits and attitude towards the environment

Question 6. Did I notice an unhealthy habit and change it?

Many children responded with having become kinder to others either by not scolding (fighting) with friends, or making fun of friends or putting them down e.g. “I will (used to) make fun of others, now I changed those habits”. Some pointed to changes in their eating habits e.g. “I (used to) eat chocolate, biscuits, and chewing gum, etc now I am changing to eating healthy peanuts cake, etc.” or “fruits instead of junk food”. Others talked about waking up early (5th grade Margazhi) “I wake up in the morning at 5.30 a.m. now, but before I used to get up at 7:30 a.m.”. Still others shared taking responsibility or working as teams. Many also mentioned that they avoid using crackers.

A couple of teachers mentioned health, but most shared about their attitude to work, “I avoid postponing and be out of integrity in my work”, “I left my superiority and involved in the activities with Integrity. I understood that I am a learner and can learn from anyone for my growth” and “Earlier I used to believe what others say as (about culture). But now I make effort to understand/research why it is so.”

Question 7: Was I more conscious about the environment and how?

Typical responses from the children were “avoid crackers and use oil lamps”, “watering and care for plants and trees”, “used palm made materials instead of plastics”. Some reflected further actions at home, “I asked my mom to don't burn waste”, “I learned to sowing seed and grow plant in my home and my school”.

The teachers echoed these sentiments and that they were having conversations with the children about the same.

Conclusions

Rigid mindsets and social profiles can lead to disempowering social ISMs. Interrupting ISMs requires a collective and concerted effort at a school of working beyond our silos of subject learning and use common threads. Our wisdom profile or universal values that we can embrace for everyone, everywhere provides this thread. Festivals and celebrations have strong social roots through now always universal. In this paper we review a year-long intervention at Isai Ambalam School of creating empowering narratives based on universal values, creating something or researching together, being conscious about health an environment as a way to stitch STEAM education in school and home life. We have also looked at various questions that would help us get a glimpse of the impact these make in learning values from festivals, inclusion and noticing changing our patterns.

Acknowledgment

We thank all the teachers of Isai Ambalam School Stella, Kavitha, Nirmala, Vasantharani, Parimala, Jagadhambal, Vinothini, Nandhini, Tamilarasi for their year long partnership and their responses to the survey. We thank Tamilarasan, Sandhiya Bala, Ajay for their support with conducting the survey. We thank Anita for her leadership at the Isai Ambalam school to make this creative intervention happen.

References

- Aurobindo, Sri. (1921). *The Human Mind, A system of National Education*, Tagore & Co. Madras (pp.1-8).
- Government of India. Ministry of Education (2020) *National Education Policy*: https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf pp.12.
- Kuroyanagi. T; Britton. D (1996). *Totto-Chan : The Little Girl At The Window*. Tokyo: Kodansha International.
- Monica. S. (2017). *Radical Transformational Leadership: Strategic Action for Change*, North Atlantic Publishing, at Berkeley, California (pp.63-73, pp.219-225).
- Papert, S. (1986). *Constructionism: A new opportunity for elementary science education*. Cambridge, MA: M.I.T Media Laboratory, *Epistemology and Learning Group* (NSF Grant Proposal).