APPENDIX OF REFLECTIONS OF THE PAPER - THE POSSIBLE MISSING INGREDIENTS IN ENGINEERING HIGHER EDUCATION –MASTERING SELF, AGENCY TO SHIFT DISEMPOWERING NORMS AND SOCIALIZATION AND MASTERING TECHNICAL SKILLS

BACKGROUND OF PARTICIPANTS OF BNBSHIFU PROGRAM

We feel there is some relevance in sharing some background and some common experiences of college and in some cases work before we joined the BnBShifu program. We all studied engineering in colleges affiliated to Pondicherry University or Anna University in villages around tier-II/III cities as shown in Table 1.

Who	Age	Course	M/F	College Location	Work-ex
Shifu1	23	B.Tech. EEE	M	Ariyur, Puducherry	0
Shifu2	23	B.Tech. ECE	F	Serumavilangai, Karaikal	8 months
Shifu3	24	B.Tech. ECE	F	Serumavilangai, Karaikal	0
Shifu4	24	B.E. EEE	M	Chellankuppam, Cuddalore	1 year
Shifu5	24	B.E. ECE	M	Mailam, Villupuram	9 months

Table 1: Background of participants (and authors) of the BnBShifu program

Some reflections also include reflections from new joinees who have been in the program for 3 months and are called NewShifu1, NewShifu2.

Shifu2: When I was studied my B.Tech the syllabus was outdated and I didn't work on real world projects. I didn't even notice my progress on the daily basis. The college culture was memorizing theoretical or derivation questions and writing in exams to score marks without knowing where I can apply the concept. I thought scoring high marks will help me to get a job in the tech industry. After college, I got a job as a data entry operator. There I didn't get time to take care of my health or engage in any other activities. I felt there was no progress in my learning except achieving the given target number of entries. I felt down and that I was not good enough to find a job in the discipline I studied.

Shifu1: In my college they focused only on marks and I was trained to clear the paper and not get arrears. To clear exams I memorized all subjects. If anyone asked me a question I would tell the memorized definition, but had no in depth to explain further. Sometimes I even forgot the definitions as I had not understood it. Even in practical exams I memorized the circuit connection by using a manual. The lab staff did not offer us an explanation even when asked as they felt it was not needed to pass the practical examination.

NewShifu1: When I completed my B.E, I took up a job for three months, but I was not satisfied as each day was the same. Every day when I went home I felt bad. The experience of my friend who was in the BnBShifu program inspired me. I could see the change in him he had become responsible and was at his full potential. I was also interested in electronics and learning practically and had not found such a place before. While filling the application form, I felt more connected with the people and the program.

REFLECTIONS TO DESCRIBE THE BNBSHIFU PROGRAM

Shifu4: When I first heard about the program, I thought that it will be like other usual courses of training in programming, but it was totally different from my imagination.

The application form itself was completely different from any other application I had ever seen. It asked about personal *information* (e.g. biodata), personal *knowledge* (e.g. if I prefer to work early in the mornings [lark] or late at night [owl]) and personal *wisdom* about self-analysis, self-awareness, self-regulation, responsibility. Especially the wisdom section where they asked for universal value, cultural shift, responsibility, and healthy habits was a different experience for me.

NewShifu2: The application form was unique that made me notice myself in depth and made me realize that I was not practicing good habits. I wanted to practice them and explore the new environment.

Shifu4: When I joined the program we started the day with Surya Namaskar, running and Anna Paana meditation. We then had team meetings often with RTL (Radical transformation leadership) training sessions (Monica, 2017) and then we concentrated on learning skills and then I practiced to make myself perfect. We interacted with each other and with our mentors to learn and also had sports or gym in the evening, at times we watched TED talk and reflected on it and the day was completed with book reading and daily reflection.

The RTL program helped me to find what I stand for and be one with my universal value; the program offers different tools that connect real-life experiences and help me see problems from my universal values and come up with solutions that are in line with them and the shift I want to see in the world. It helped me address my bias and socialized fears and gave me a path to overcome them. Here we had a learning and supportive environment which helped me to grow along with peers and reflected daily. The financing was to pay it forward that allowed me not to put in any funds but to live and learn. It offered no degree, only an opportunity to 'to invest in myself' and to have an opportunity to do technical engineering work at the end of it.

NewShifu2: We to do programming in scratch & python programming, responsibility, logical thinking, to be independent, Vipassana, RTL, communication skill, understanding maths in a easy and visual way.

Shifu2: The BnBShifu program supported me learn about myself and notice my progress and growth. This program created the space for learning and personal growth of myself and others by creating a learning community. When I came to know someone is investing in my progress without knowing who I am, where I come from, made me feel that someone cares about my progress. Everyone here also engages in STEM education with children. I got an opportunity to explore different domains like VLSI layout design, programming in different languages, learn math differently, attend MES 11 (Mathematics and Society) conference. This program made me competent to work in technical skills, competent to take classes for 9th-grade children, and help me notice and transcend the gender bias within me.

Shifu1: In this program I learned I stand for kindness and equity for myself and others. I committed to spending a year in the BnBShifu program as an input from my side. The output of the program is, I learned VLSI schematics & layouts, Scratch, Python & SKILL programming, Radical Transformation Leadership (RTL), Spoken English, Maths class, Book reading session, and Vipassana. The outcome of the program is that I learned to do analog and digital layout. I also notice that what took me over a month can now be done within a few days. I not only became more efficient, but what I do is more effective and has less errors. I learned to meditate and notice myself. I also changed my food pattern to a healthier diet and avoid

snacking.

I used to feel uncomfortable around people and I preferred being home, so this program was a new experience and challenge for me. I thought I can learn more technical knowledge coming to this program, but here, I also learned useful life skills and RTL tools. The program also gave me time and space to think about the purpose of my life.

This program helped me to notice that only earning is not going to fulfill my life so I learned to serve and help others. I started teaching children, what I know, while teaching I noticed that I'm also learning from them.

NewShifu2: I studied in an alternate education system in school. After completing my school, I didn't find the education system like my school, it was inconvenient for me to adapt the situation in my college and higher school. As soon as I heard about the BnBShifu program, I wanted to join it as it sounded like my school. I was restricted from joining here by my family because it was a residential course, but in time I convinced them. After joining I felt really happy that I was back to the education system that I was longing for. I wondered how the people here were confident in training people who don't have basic knowledge in programming.

NewShifu1: All application forms generally ask for details about my achievements, background qualifications and marks. But this application form was different and had questions that made me think about myself for some time. Reading about the kind of suggestions of healthy practices like waking up early, yoga, meditation gave me faith that I can progress in the BnBShifu program.

The BnBShifu program helped me learn Scratch and Python programming and Layout. The RTL tools helped handle the problems I face. By following the ground rules like giving respect to material, being on time, completing the task in a given time. Practicing Vipassana helped me realize the flow of breath and sensation in each part of my body. TEDx talks and documentary videos made understand their English (same language subtitling) as well as the different thought on the world and I reflected on what I learned from the videos. Filling my timesheet and daily reflection helped plan and notice my progress. While preparing for the English session I learned the meaning of the new words and their pronunciation. At the session and shared my knowledge. I can now create animation Scratch projects that were innovative or demonstrated a concept. I played with it and it reminded me of my childhood days when a teacher used to give me visual puzzles which I could implement now. I felt fulfilled. It understand the basics of coding, logic and learned other coding languages by comparison with Scratch. In layout I learned to floorplan and route digital blocks. Through collaborative learning I learn alternative ways of problem solving and to be efficient. I also learned to interact and engage with different people, share my knowledge and acknowledge them.

Shifu3: BnBShifu program created the opportunity of learning and progress for myself and others. When I heard about this program, I thought that this is different from my college so I joined. Here the first one or two weeks it felt that we were doing so many things like learning technical skills, sport, meditation, and following new ground rules like speaking in English, being on time. But, as I settled in I learned time management and created time for everything to have an enriching day, each day. It also helped me improve my confidence and my proficiency in spoken English. We also had access to a space with games and puzzles created for children where I went to learn and refresh myself. Every week we visited some places in Auroville and met new people who they shared how they are serving the community and what they care about I was inspired to be courageous and independent like them. Once a week we also presented what we learned to others. Everyone in the program had taken up accountability like managing the kitchen, finance, maintenance, and so on this made me more responsible and

accountable.

1) How did the program encourage youth to connect to their universal values*?

Shifu1: All of us have universal values within us, but we do not notice them or not act from them. This program had RTL which helped me think about my universal values I really care about for myself and others. Whenever I share an insight, I start by sharing my universal values. I stand for equity and kindness for myself and for others. When I keep on telling my universal values they became automatic I acted though equity and kindness. The words allow me to connect to what I deeply care about, but I'm not stuck to the words and understand their essence is the best that I can be. I believe RTL tools, templates and distinctions can also support youth to connect to their universal values.

Shifu4: This program encourages youth to understand their universal values and ground them towards their value with the help of RTL. It starts with the searching what a person deeply cares about and makes him/her understand their stand. Then with various tools, templates and distinctions connect it to life. It helped me change my mentality from caring only for 'me, myself and I' to caring for 'myself and others'. In addition, the BnBShifu program supported my problem-solving ability even technically and gave me confidence in facing the problems instead of getting into fears and also enhanced the ability of both independent thinking and interdependent thinking.

We had ten days of Vipassana meditation which helped me to come out of my cravings and accept the reality to move forward. It helped to develop a concentrated mind.

Shifu2: I learned who I am being when I am at my best i.e. the universal values I hold within. I noticed that what I admire in others are qualities I want to develop within me. After discovering my universal values, I started to work from them. It made me think differently of how I can handle situations. I started to notice situations when I was not in my universal values and reflect and shift my mindset. The impact and outcome of practicing some RTL tools is it made me notice my own bias towards gender-ism and my own background conversations.

Shifu5: The complete awareness of my values and for what I stand for came after attending RTL workshop with Dr. Monica Sharma. The connection with whatever I do will have my values with it knowingly or unknowingly where the enrichment of the work develops in the phase of my values for everyone's growth. Here the values have important essence of connection for goodwill, strength and supportiveness for everyone universally.

NewShifu2: I could identify my universal value that I deeply care about, after identifying them I found that I carry my value in most of the actions I do and was courageous, confident, stable and satisfied in being my stand.

NewShifu1: Before joining the program, I don't have an idea about my stand. The first thing, I learned from the BnBShifu program is my stand and universal values.

Shifu3: This program helps me become more self-aware and I discovered the inner values I stand for equality and happiness, through RTL. I used tools in RTL to overcome my fear and work courageously. It also made me aware of what I am doing in every situation and I learnt how to process experiences and learn from them. I started to design my projects using CFSR. I can breakdown the problem and what are the actions I can do differently to progress. I learned to be responsible.

2) How did the program support develop system thinking, noticing patterns and five minds of the future?

Shifu5: Disciplined mind: I have learned to still myself to focus on what I learn deeply and then broaden it without getting into distractions. The course gave me the time to not need to jump from one topic to the next and stay with topic till I understood, applied and remembered it. I found this way of learning to be an investment for my life and it stood as a north star for my life as a programmer and being human.

Respectful mind: Learning here at BnBShifu gave me a strong understanding about respect when I saw the learning without hierarchy here. Learning from each other and supporting others to learn emphasized respect for everyone. Everyone has something they can teach and something they can learn and respecting others has supported my self-esteem and confidence.

Ethical mind: I already had the sense of being moral, but this was perfectly sculpted when I attended a 10 days Vipassana course. It helped me be moral and dignified and supported put the RTL tools in practice not only being moral, ethical, but also integral (whole) from input to the outcome for the wellbeing for everyone.

Synthesizing mind: This one is my greatest learning here for me and I can now see this is where the real learning happens. I used to memorize information, but synthesising the learning helps me retain and look for patterns using it in different contexts and doing more with less words. This included learning programming and problem solving in codewars, be it reflections at the end of the day, processing a TED talk or attending a workshop.

Creative mind: There are no ready-made answers to important challenges and I learned to be creative and be able to adapt. There can be one good answer, but I learned to look for alternative possibilities that emphasis goodwill. The idea that I can support others when I invest in myself is a creative learning in itself. It is something I never learned in my college or university. Even teaching children towards the later part of the course using project-based learning me wonder why this is not done in our education system in schools, colleges and universities.

Shifu2: First I start to learn the basic concepts in a domain. After I learned the basics, I completed a task in that domain. After completing several tasks, I worked to synthesize the new ideas that I learned. Then I connected new learning with what I already knew. This helped me to learn new domains easily. Unlike in college, here I got the time to work on something and practice it in depth. When I heard presentations from others summarizing what they had learned and I needed to present my own learning I learned to synthesize.

Shifu1: This program was not stuck in the patterns of how we learned in college. Here we didn't have any time limits to learn. If I was really interested in a topic, I could work on it day and night till I get deep into the concept. Here I had an individual mentors in each semester who were practitioners in the field who helped me reflect. I got a good opportunity to learn many useful things from them. Here I got all facilities to learn and to develop myself and support others.

NewShifu2: The learning pattern followed here is simply different and useful – I would get introduced to a new topic, then I would practice it on different tasks till I finally mastered it. This really helped me feel satisfied and built my confidence and self-motivation. I started my course by learning Scratch (a visual programming tool) that gave me some idea about programming and playing with it really helped me to think in a logical and innovative way. I found this useful later when working in python. Then I worked in python and codewars that helped me try new ways of solving a problem. I used to avoid attempting difficult unfamiliar tasks. But now, I have the confidence and want to engage myself in new activities with an open minded and broad thinking. In my college I had to write my exams and they wanted me to clear

my exams and didn't bother whether I understood what I wrote, whereas here I have time to explore myself. Here I have more options in what to do, I can go and spend some time in a lab set up for children to solve puzzles, games and work with practical material to learn maths concepts, I have sports, Gym, cycling – these options help keep my mind refreshed. Here I have an individual mentor to guide me. They guide me to learn things practically and even without examinations my learnings can be measured by the tasks I am able to complete. I also have daily self-assessments that I fill that help me observe my progress. Earlier I didn't have any basic knowledge about programming and now I am satisfied that I have used my last three months usefully.

I had book learning session which I found very interesting, I came to learn many new things there and questioning myself. Most of the books that we covered was based on contemporary "Teaching". I came to know more about teaching and what is it about, few examples are: a) I learnt that a teacher should not discriminate his/her students when they give an incorrect answer, instead they should find the misconceptions behind the answer. b) students should be given both subject knowledge as well as extra-curricular activities, and c) to give children real life projects to learn from are useful for them. Most of the books we read reflected how we were learning in the Shifu program.

NewShifu1: In my college I blindly followed my books without understanding what was written or knowing where to apply it, but here, I learned through activities/challenges and games which I found interesting and useful. As I solved challenges, I wanted to take up more challenges again and again. In my college, I was told there aren't enough materials to work on things practically, even if there were instruments, I was not allowed to work on them much, but here I was allowed to work on them and explore and find different patterns until I was satisfied. I also find all activities are inter-related, when I finish a task and move to the next, the earlier task is still useful for my current task. Other courses offer degrees and certificates and marks but don't guarantee a job, but here I can gain knowledge and at the end, I get placed in a job also.

Shifu3: In college the focus was only on marks but in BnBShifu we gained more skills and knowledge. Even though my specialization was VLSI layout all of us started by learning scratch and programming. Initially, I wondered why I was learning programming, but as we went along I realized that I had developed my logical thinking and problem solving ability that I applied to my specialization. I used the same in the electronics lab and the idea of taking small tasks and going in depth and completing it helps me learn something new that I can use to work efficiently in the next task.

3) How did the program build confidence in skills and in competence to move from being dependent to independent to interdependent?

Shifu1: When I was new to this program, we experienced doing experiments in an electronics lab. This was very new to me, I never had this kind of exposure in my college where I just followed instructions and did not have a chance to do individual work. The experience of staying here is very interesting and useful for me and also this is my first staying without my parents and I learned to move from being dependent to independent. Taking up the responsibility of organizing the kitchen was both a challenge and a learning experience and I collaborate with the other members to support kitchen staff as well create good menus. There were many challenges when being responsible for the kitchen and I used the RTL tools in these situations that supported teamwork and collaboration and helped me learn interdependence.

Shifu2: Initially, I was dependent on my mentor to learn new techniques and skills in VLSI layout, then I was given tasks. As I completed tasks, I felt more confident to work

independently. I noticed it took more time to complete tasks compared to when I had peers who I could talk to. Sharing of new learning and discussing with peers made me feel interdependent and more efficient. This built my confidence and faith in working as a team.

I initially trained as a layout engineer, but there was an opportunity to learn and work with a designer which I took, then again to learn design automation with programming …The initial training in layout and design in the automation of the same and be able to adapt and be confident in more than one area.

Shifu5: After graduating from electrical engineering, I was confident I'm not the type to learn programming. When I joined the Shifu program a personal mentor was assigned for me and he guided me based on my capability. I was introduced to learning at my own pace online using the Coursera platform that had many courses that were project based. Every time I made a project, I felt more confident. When I got stuck, I got the support of my mentor who would ask me questions rather than just give answers. After that I was introduced to codewars a website for challenges in coding at various levels. Here, I needed to pick my challenge and I started to understand where my level was and could see how I was able to take up challenges at higher levels as I got better in programming. I became independent and could assess what I was capable of. Relating what I do with my values and in resonance with the five minds of the future gave me interdependence.

NewShifu2: By doing codewars, scratch and also interactive python I have to complete tasks, the completion of tasks itself motivates me and stimulates me to do more. Though in the beginning I felt alone, later I collaborated with others and there was peer learning among us. Earlier I have noticed difficulty in discussions with others including my parents who wouldn't consider my points of view. But, using the RTL tools I notice that I am now speaking effectively and am able to communicate clearly and that my points are being considered.

NewShifu1: Here we are asked to find answers instead of giving it as I was used to in college. Initially, I felt helpless. It took more time to learn new things and adapt myself, but later I understood that while searching for answers, I learned many alternative answers and also learnt how to find answers myself. The Shifu program helped me explore many places in Auroville like Matrimandir where one could meditate peacefully. Integral education (development of the whole being) was a new concept that I found interesting and useful rather than rote learning. Here I had learned many things other than skill development and I had the opportunity to do things I'm interested in Gym, cycling, electronics lab, sports. I became aware that I can take accountability and be responsible.

Shifu3: In the beginning I was very dependent on my mentor. After learning layout techniques and doing small challenges I got the confidence to work independently and take on further challenges on my own. Whenever I learned new techniques and ideas in technical skills, I shared them with my team for their progress. Whenever I got stuck, I got suggestions from my team and mentors these built interdependence.

4) How did the program built the ability of self-assessment as well as provide timely feedback?

Shifu1: In this program we had an opportunity to record our insights - reflections about what I learned and feedback about how I feel here in our daily reflections. Our mentors read and interacted with us and this helped to clear our doubts in the same day itself. Our mentor's also youth who had learned here were very kind with us and easily approachable and gave us the time needed to support us.

Shifu2: Getting the input and feedback from my mentors, helped me to level up my state of progress. In technical skills, mentors supported me and gave feedback that helped me notice my gaps. In time I started noticing my own gaps and this self-assessment had a major role in

my progress and learning e.g. noticing how much time I took, what ideas from a previous tasks I could have used to complete this task.

Shifu3: In college the assessment was based on marks and memorizing outdated material. I just got marks and neither got feedback from my teachers nor did I find where I made mistakes to correct myself. But in the BnBShifu program mentors supported me to do my work and they gave feedback to improve myself helping me identify where I am and progress swiftly.

Shifu5: I feel self-assessment of looking at patterns of how I did things and how I can make it better is the best way of assessment and helps get many creative answers. This gave me courage to neither give up if I don't get the answer not stop with a single answer. I resonate with perseverance and I have learned a lot by making mistakes and finding new ways to address problems not only with technical work, but also with becoming a better human being by developing courage and compassion for myself and others.

NewShifu2: By writing my daily reflection and timesheet, I spend time to reflect on the day this helped me identify my mistakes and correct them. My individual mentor doesn't give me answers, but gives tools for me to learn myself and guides me. By learning myself I can learn more, try things, try again and again, get stuck, ask for help, learn and then complete it which I will retain forever. Here I worked on things practically and gave my full potential and found it interesting too.

NewShifu1: While working on my project if I had a doubt, I could discuss it with my mentor who would suggest a path rather than give a solution. This helped me understand how it is happening, why it is happening, and what should be done after. When I take this effort what I learned automatically stayed in my mind and I did not need to memorize it as I did in college.

If I need to teach others I can now share it with confidence in more than one way so it can be understood. My mentor helped set timelines for my tasks and if I took too much time he suggested easier and efficient approaches. While filling my daily reflections I could recognize my feeling, what all I have done, and what could be done differently. It acts as a reference and my mentor also reviews it to support me. At the end of the week all mentors and mentees meet share progress, present tasks or projects and get feedback. This also helped me learn what others were doing and learning. Other than this, I even get feedback when playing sports, gym, and English and Math classes.

5) How did the program help learn to live a healthy and wholesome life and design projects that use skills to benefit others?

Shifu4: With the help of CFSR (an RTL Tool), we can build a project and find out the issues with this, we can find the solution before a problem raised. We have accountability like kitchen maintenance, ground maintenance, etc… which helps us to do multitask and gives a responsibility towards every work.

With the help of mentors, we can get continuous feedback based on overwork and also based on day-to-day reflection. Mentors are the supporting tool for us to grow learning new things and our problem-solving ability. In this program, we have adopted a new lifestyle with the help of Surya Namaskar, meditation, and food habits.

Shifu2: I learned to work with the schedule and also create one that allowed me to engage with the different activities I want to do. I learned it is important to have both physical and mental fitness to lead a healthy life.

I was inspired by seeing my mentors work and contribution towards the education and progress of others (including me) they stretched in their roles as a facilitator, mentor, and Engineer. I choose to do the same in my life and lead a wholesome life.

Shifu1: For me RTL play's a major role to live a healthy and wholesome life and design my projects that use skills to benefit others, for example, if I have any issue with anyone in this program I will use RTL tools to sustain the healthy relationships. Developing good habits of being disciplined about eating times, and being healthy mentally and physically.

NewShifu2: I have learned things in depth, so I believe that I can teach and help others in understanding these concepts. Other than technical skills and reading I learnt more about myself that will be useful for me to be an effective leader and change maker. I could run my life happily by following RTL tools. Vipassana, Surya Namaskar that keeps my mind and body healthy.

NewShifu1: I became more self-aware, from RTL I learned to face my problems with confidence and to take them as an adventure and used RTL design templates to design solutions that solves the problem, shifts system and culture and is grounded in-depth my universal values. I felt responsible after attending RTL. I learned to respond and not to react. RTL gave me the confidence to be an effective leader. I can understand things even better by working on things practically and visually so I find this environment was useful that I haven't experienced in my college and school life. I also didn't have resources like a personal laptop each of us have to work. Here I have access to practitioners who guide me and I found there is collaborative learning. Practicing Vipassana I am able to concentrate, focus, and be more attentive than I was before.

Shifu3: This program not only improves technical skills, but also supports living a healthy and wholesome life physically and mentally. We are doing Vipassana meditation which helps me to purify my mind. It allows me to face life tensions and problems in a calm and positive way and improve my fitness through sports and cycling.