

EXPLORING NATIONAL MENTORING LANDSCAPE IN INDIA: ATAL TINKERING LABS AS DRIVERS OF NEOTERIC INNOVATIONS

Isha Sharma

Assistant Professor, ICccR & HRM, University of Jammu, Jammu & Kashmir, India.

Email: ishaoffice1986@gmail.com

Abstract: *The conceptual understanding of the term “mentoring” refers to the interaction centric interfaces between experienced mentors and protégés that are seeking career centric (instrumental) and psychosocial (relational) knowledge, advice or support (Schunk & Mullen, 2013). Mentorship is a collaborative process that is a “multidimensional relationship between mentor-mentoring team and a mentee that gradually shifts from earlier stages of engagement to later phases of purposeful developmental phases. Mentorship is also relational wherein the relationship between the mentor and the mentee is purely learning oriented and directed towards acquisition of skills. The distinctive characteristic of mentorship is the capacity of creation of “delicate balance between the process of learning and openness to change” (Pfund. C et al., 2015). Navigating across different definitional landscapes of mentorship, this paper unfolds the rationale behind conceiving a national mentoring initiative in India: Atal Tinkering Labs (a pan India initiative). The aim is to train school students in their formative years of development in the domains of creativity, innovation, 3D Designing and Computational skills for developing innovation centric mindsets and innovative career choices. The paper further tables the different innovation interventions brought by the Atal Innovation Mission and the complimentary mentoring models that fit into the different interventions.*

Keywords: *Mentoring, Atal Tinkering Labs, Atal Incubation Centre, Atal Community Innovation Centre, and Innovations*

INTRODUCTION

Mentoring as a learning intervention has been recognised as critical for learning across contexts and participant profiles, or we can refer to mentoring as a pervasive learning method for bringing about desired change. The much-validated outcomes of mentoring are socio-emotional/psychological support, development of new skills and career advancement (Haggard et al., 2011; Jacobi, 1991; Kram, 1985; Packard, 2016). Navigating the literary trends over the last four decades provides the basis for a systematic review highlighting the impact of mentoring on HEI’s and career development of students. The consolidation of more than 73 papers published in the timeline between 1986 and 2023 were specifically targeted at exploring the impact of mentoring approach and resultant career development outcomes. The exploration indicated that mentorship has a significant impact on the potential career development of students and even on behavioural outcomes. Suggestive recommendations that emerged include connecting mentorship with entrepreneurial

intentions, socio-economic profile and context sensitive mentorship models to be introduced and delivery modalities to be designed as per the context (Nabi et al., 2024).

Recent research proposes that mentor-mentee characteristics impact mentoring effectiveness (Forster et al., 2021); specifically in identity development and relatedness with each other (Parker et al., 2021). Lofthouse (2018) strongly advocates that to overcome such issues, the professional standards and mentoring outline should form the basis for mentor-mentee relationship building. Mentor selection is critical for the success of mentoring programs, as even cross-country research on mentoring has validated that mentor selection and attributes significantly impact the mentoring efficiency and outcomes (Mackie, 2020; Wilson & Huynh, 2019; Parker et al., 2021; Aderibigbe et al., 2022).

The naive extension of mentor-mentee relationship is partnership, wherein collaborative learning architecture is valued more than the traditional, rigid learning structures (Aderibigbe et al., 2018; Trevethan, 2017). This type of

collaborative mentorship is significant for those institutions that are genuine learning organisations and in this case, it is the schools that fit into the frame of being called learning centres (Estyn, 2018; Milton et al., 2020; Organisation for Economic Co-operation and Development, 2016).

Mentoring is also context sensitive as sometimes it requires radical reformulation of the “spaces” in which mentoring initiates to craft environments that promote learning across diverse mentee educational portfolio (Emdin, 2016). Referring to the classical mentoring form, which advocates flow of information from top to bottom, but in institutionally designed and defined routes and paths (Lewis & Olshansky, 2016; Montgomery, 2018b; Yun & Sorcinelli, 2009; Yun et al., 2016). The pertinent argument that emerges is the mentor-mentee configuration that is whether single mentor should mentor one protégé or multiple mentors and one protégé, thereby opening up many permutations and combinations of mentor-protégé relationships (Montgomery, 2017; Yun et al., 2016).

The response to the above stated argument rests in understating the different models of mentoring:

Dyadic Mentoring: Including traditional hierarchical dyads and mutual dyads with reciprocal mentoring from mentor and mentee.

Multiple Mentoring: Wherein multiple mentors are engaging single mentor with mutual recognition of both mentor as well as mentee.

Mentoring Triads: Mentoring triads consist of two mentors engaging one mentee, in which one mentor is a senior experienced and hierarchically more advanced.

Collective or Group-Based Mentoring: Is the newer form of mentoring wherein the collaborative arrangements amongst the mentors for engaging multiple mentees is taken care with strong emphasis on peer support.

Network Mentoring: Comprised of one mentee drawing learning as well as resource support from multiple mentors.

Nested/Hybrid Multi-Mentoring (Montgomery & Page, 2018): Comprising of mentor community (number of mentors) and mentees possessing the essentials of both network & collective mentoring.

In referring to these different mentoring models, the present paper aims to address the issue of relating AIM mentoring with the mentoring models presented in the literature. Moreover, diving deep into different mentoring models as stated, the model fit seems a challenge as there the mentoring vertical of Atal Innovation Mission possesses characteristics

of multiple models simultaneously. In succeeding sections, the attempt has been made to explore the mentoring landscape at AIM and relating it to the established mentoring models as evidenced in the literature.

The paper is conceptual and narrows down different mentoring models and the mentoring model launched by Govt. of India in the form of Atal Tinkering Labs. It outlines new mentoring contours in Indian context, which seeks and shall form basis for development of theoretical frameworks with conscious and significant attention given to the definitional explanation of mentoring and its measurement. An attempt has been made to explore different mentoring models, literature and specifying the connectedness of them to develop broader theoretical argument.

The study is conceptual and the data sourcing for the same has been done using secondary sources that include the official website of Atal Innovation Mission under the NITI Aayog. Being the flagship initiative, the data published on the mentoring vertical have been used to provide an overall understanding of the impact of Atal Tinkering Labs and the influence of mentoring on schools and their outcomes.

ATAL TINKERING LABS: FLAGSHIP INITIATIVE OF THE GOVERNMENT OF INDIA

The conception of Atal Tinkering Labs rests on the idea of connecting technology, science and innovations with community in specific and society at large, aiming to drive the economic growth of country like India. Innovation landscape of India has undergone structural reforms and increased interconnectedness amongst different stakeholders’ that include academia, state and industry. The stakeholders have been recognised instrumental in creating innovative mindset amongst the young budding innovators and entrepreneurs in their formative years of professional development. In response, there have been gaps in terms of deliverables of academia and resultant absorption of those deliverables by industry and henceforth as a response, the call was to infuse innovative curriculum in school education in Indian subcontinent.

Championing the need for reengineering Indian Education System, Atal Tinkering Labs is first of its kind and largest ever government led initiative in the history of India. The initiative was, conceived in 2016 and aimed to reform the present education system in Indian subcontinent and imbibe amongst the young learners the skills including creativity, innovation, critical thinking, social and cross-cultural collaboration. Such an initiative was initiated under the umbrella body of NITI Aayog, which is also the central body

under the umbrella of United Nations to act as watchdog for implementation of the Sustainable Development Goals in India by bringing transformation in the innovation and entrepreneurship landscape of India. It is pertinent to mention that NITI Aayog is the policy making body of the Government of India.

While drafting strategic and long-term policies, it shouldered the responsibility of creating Atal Tinkering Labs, a specialised space within schools aimed to developing entrepreneurial intentions amongst students, so that they can reason the logic of learning, experimentation, and test its application in society at large. ATL's are aimed at playing key in striking collaboration among state, central and sectoral bodies to promote innovation and entrepreneurship specifically targeted at higher secondary schools, higher educational institutions and research bodies, industry, and state governments through significant, public-private collaboration. This creates a hub and spoke model for the promotion and development of innovations across different contexts.

Atal Tinkering Labs are defined as institutional frameworks created at the school level for fostering innovation and entrepreneurial mindset. Envisioning the idea of cultivating "one Million children in India as Neoteric Innovators", the Atal Innovation Mission across India are fostering rather institutionalising— new verticals in school education system to foster curiosity, creativity, and imagination in young minds so that industry 4.0 skills such as design thinking, computational thinking, adaptive learning, and physical computing are harnessed amongst the students in their formative years of career choice development.

As Innovation Infrastructure, What Atal Tinkering Lab is: ATL is a workspace or work station through which students, in their early years of development can ideate in a do-it-yourself mode and learn innovative skills. The students are provided with the freedom to leverage the tinkering infrastructure, which comprises tools, experimentation kits, and equipment to experience the application of Science, Technology, Engineering, and Mathematics (STEM). They can connect with the community by creating solutions that are economically viable and socially relevant. Atal Tinkering Labs are inclusive of Industry 5.0 apparatus and technologies. For creating desired intentions amongst the students to innovate ATL's organise tinkering fests, competitions, exhibitions, product fabrication and workshops on STEM related themes. Driving the objective of sculpting the young ideas in a flexible, unrestricted environment, the Atal Tinkering labs are empowering young generation on the pillars of creativity, innovation, critical thinking, socio-cultural collaboration, ethical leadership and allied areas.

Table 1: Impact Profile of Atal Tinkering Labs

Sr. No.	Agents of Impact	Stakeholder Impact
1.	No. of ATL's in India	10,000
2.	Students' Engaged	75 Lakh +
3.	States and Union Territories (>722 districts)	35
4.	Mentors of Change	5800
a)	Knowledge Hub Sessions	5100+participant count
b)	Cities with Mentors	479+
c)	Schools with Mentors	4900+
d)	Hours Sessions Spanning Conducted by Mentors for ATL Students	5000+
e)	Students Engaged in ATL's	75 Lakh
5.	Innovation Projects Created	12 Lakh
6.	Atal Incubation Centres & Jobs Created	AIC's: 69; Jobs Created: 32,000
7.	Start Ups Supported	2900 (900+ Women Start Ups)
8.	Atal Community Innovation Centres	19
9.	Atal New India Challenges	24
10.	Domestic and International Partnerships	40+

Table 1 depicts the pan India presence of Atal Tinkering Labs (ATLs), as there are more than 10,000 ATL's in India, spanning 722 districts. More than 7,000 schools are funded, with more than 5,000 volunteer mentors are engaged, thereby impacting more than 75 lakh students. The resultant number of innovations created is approximately 12 lakh. These facts highlight the initiation and as well as scalability patterns of the Atal Tinkering Labs across India. The impact at the school level is also assessed and managed through real-time MIS systems and dashboards, with an aim to create problem-solving innovative mindset within the ATL and other communities.

WHAT DIFFERENTIATES ATAL TINKERING LABS FROM OTHER INNOVATION CENTRIC INTERVENTIONS

Mentoring

At the school level, Atal Tinkering Labs are creating innovative mindsets amongst the school students, wherein

students experience design thinking, analytical skill development, and creative problem solving, thereby enabling students at their nascent years of professional development to connect their learning with problem solving. In this direction, the Mentor of Change (MoC) Programme, initiated by Atal Innovation Mission, involves the voluntary engagement of mentors across the nation with multiple specialisations to provide pro-bono mentoring to ATL students. It aims to infuse within them the confidence of contributing to the nation building by creating micro solutions to the basic community centric problem by using the ATL space in their respective schools. The skilled volunteers, referred to as ‘Mentors of Change’ and they continuously engage with the ATL Lab students in their assigned schools and therefore act as catalysts in transforming the learning experience of students for acquiring skills that are industry ready, relevant, and futuristic.

The distinguishing feature of Atal Tinkering Labs is that these setups or spaces are non-prescriptive, therefore reducing the significance of instructor specific learning. The role of mentor is to act as enabler rather than instructor. The different enabling interventions that mentors provide to the students in ATL spaces include use of technology as a tool to express, adoption of design thinking approach for community problem solving, inspirational dialogues and mentoring, instilling innovative and entrepreneurial spirit and importantly driving behavioural change through continuous reinforcement of the idea of experimentation and problem solving amongst the students (see Table 2).

Table 2

Mentoring Vertical	
Knowledge Hub Sessions	5100+participant count
Cities with Mentors	479+
Schools with Mentors	4900+
Hours Sessions Spanning Conducted by Mentors for ATL Students	5000+
*At present students between grade 6th to 12 th utilise the Atal Tinkering Labs.	

Source: <https://aim.gov.in/overview.php>

Student Engagement

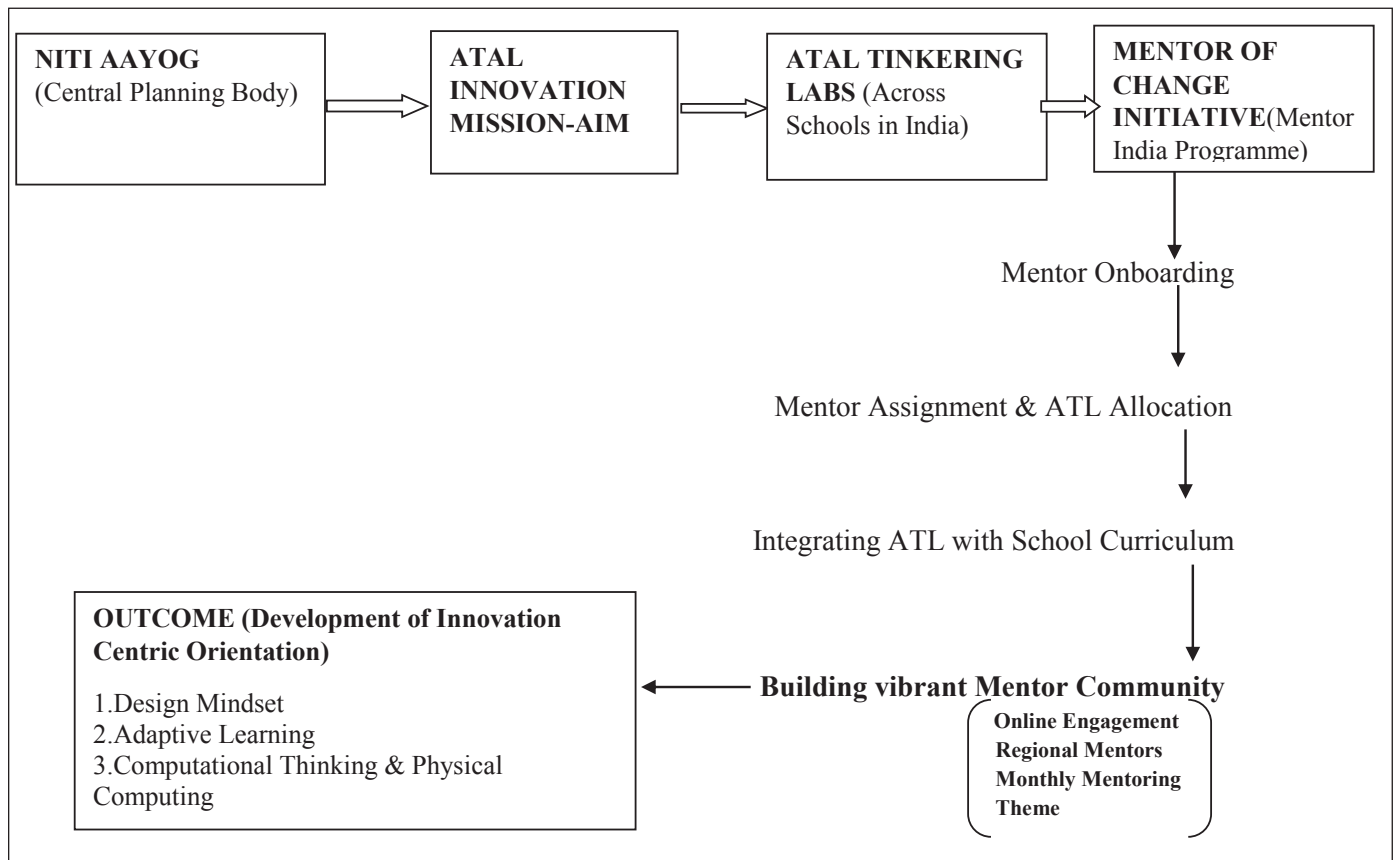
The Atal Tinkering Labs have robust student engagement system in place and in practice. The students, upon attaining

the appropriate age, are exposed to technological systems, experimentation, and innovation in ATL labs in their respective schools. Targeting high school students primarily through ATL intervention will enable India to create a dent in the Global Maker’s movement (Dougherty, 2012) and become a global innovation hub. The fundamental engagement at ATL’s include student-teacher-mentor support for experimentation, exploration, and follow-up through a self-learning path. The systematic inclusion of ATL Labs in the school curriculum is done by the school principal along with the teacher in charge and mentor/s associated with the Atal Tinkering Labs so that the institutionalisation of ATL spaces can be achieved through minimal resistance from other stakeholders, including subject teachers and parents as well. This results in the preparation of an ATL schedule, which helps students from Class 6th–12th to progress through the four levels of tinkering within a specific timeline. This will not only create a sustainable ATL student engagement mechanism but will also ensure that the ATL students advance with regard to their technological and innovation skills. The four levels of tinkering (ATL Immersion) include:

- *Pre-Tinker (Level 01)* - This phase occurs when the lab is newly set up within the school, and the goal is to encourage all students to visit, examine the equipment and technology, shed their doubts and anxieties of exploring something new.
- *Tinker-Club (Level 02)* - This is where the interested students keep coming back to the lab to learn digital literacy, computational thinking with Do-It-Yourself activities. The objective of this level is to transform interested students into tinkerers.
- *Tinker Lab (Level 03)* - In this phase, the tinkers are introduced to physical computing and building real time projects.
- *Post Tinker Lab (Level 04)*-Here, self-driven and interested students are further encouraged to continue to solve real world problems in systematic and research driven way, with guidance from the ATL-in-charge and mentors. (https://aim.gov.in/pdf/ATL_Handbook_2021.pdf)

This plan shall be integrated with the school curriculum in the form of an ATL schedule in consultation with the school management so that students get enough opportunities to successfully move through the different levels, graduating from students to tinkerers, makers and eventually innovators.

ATL MENTORING MODEL



ATL’s and Contemporary International Mentoring Models

Considering mentorship as a relational practice, and its presence across educational setups, it has been found that mentorship strongly creates a culture of learning coupled with self-exploration and identity development (Johnson, 2016; Lunsford & Baker, 2016). Globally different mentorship models have emerged and been applied in different mentoring programs, like dyadic, peer, group, distance, and constellation models (Lorenzetti et al., 2019; Nowell et al., 2016; Oddone Paolucci et al., 2021; Pethrick et al., 2020). Even though their application and adoption seem significant, they are present in some of the highly reckoned international mentoring programs like ELISS Mentoring Programme sponsored by British Council in India, Global Mentor Initiative, International ACAC Mentor Year Program and International Student Mentorship Program. Across all mentoring programs, ATL’s Mentorship is different in terms of scope, Mentor-Mentee relationships, Voluntary Engagement, Government Support and Central Level Funding.

What further differentiates ATL’s mentorship is the connect with states, considering federal structure of Indian subcontinent, ATL Collaborations, Capacity Building, Mentorship and Community Engagement & Connect with Higher Education institutions. It can be deduced that ATL mentorship follows hub-and-spoke structure to create an ecosystem of innovation & development of innovative skills among students. The significant differentiating feature is the capacity to act as feeder for more developed innovation facilities, as stated below.

Atal Tinkering Labs as Feeder to Atal Incubation Centres

AIM also introduced new vertical called Atal Incubation Centres across India with an objective to infuse sustainability and scalability to the new ideas. The ATL’s are also supporting incubation centres across India by providing them mentoring and financial support, thereby strengthening entrepreneurial ecosystem, comprising of angel investors and venture capitalists. Access to mentoring is a striking feature of the Atal Incubation Centre, where industry experts are engaged.

Atal Community Innovation Centre

Atal Community Innovation Centers (ACIC) across India serve the barren ecosystem landscape of those regions wherein mainstream innovation centric interventions are limited, thereby targeting Tier II and Tier III cities, their grass root level problems and issues. With an aim to reduce land to lab distance ACIC is targeted to be created in those areas that are community driven and where community problems are commonly championed by the local experts and opinion leaders, therefore creating an incubation space that is community sensitive and localised (<https://aim.gov.in/acic-overview.php>).

India and Indian innovations are characterised by the term “frugal” which means low-cost innovations but carving a formal approach to scale up these frugal innovations is the prime objective of the Atal Community Innovation Centres (ACIC). Even mentoring in such establishments becomes critical, as creating a formal approach for scaling frugal innovations requires substantial amount of research and expert handholding. The industry mentors and researchers across nation are engaged so that formally, the Community Innovation Centres can be created with scope for scalability and sustainability. The proximity of people with these institutions provides a rich opportunity to create communities of innovation wherein the local knowledge, context specific market needs and naïve skills can come together to create repositories of shared public knowledge. Further, proximity of formal innovation facilities also provides the ease of innovation routing and customer outreach opportunities with subsequent potential for mass diffusion of innovations.

It is pertinent to mention that an initial financial assistance of Rs. 2.5 crores are sanctioned to ACIC, covering infrastructural and outreach operations and engaging business or research mentors to provide directional training and mentoring for making their ideas viable (<https://aim.gov.in/acic-overview.php>)

Drawing Generalisations: One Dominant form of Mentoring or Switching across Different Mentoring Models?

Navigating, or rather trespassing, across different mentoring models that are dyadic mentoring, multiple mentoring, mentoring triads, collective/group-based mentoring, network mentoring, and Nested/hybrid multi-mentoring, it can be deduced that Atal Innovation Mission, across verticals has mentoring as central construct. Although the exploration of different mentoring models depicts that collective or group-based mentoring, which involves collaborative arrangements

among mentors to engage multiple mentees with a strong emphasis on peer support is dominant.

Further, the group-based mentoring also accommodates the variability of the mentees in terms of their characteristics, backgrounds and the overall mentoring settings. Exploring mentoring model of the Atal Innovation Mission depicts that being a group mentoring initiative, the contextual constructs, structure, and objectives of group mentoring vary. This y makes it evident that other forms of mentoring models are not significant in this mentoring case. Even research evidence demonstrate that group mentoring programs are compatible and successful in schools or institutions wherein formative years of student development are prime developmental agenda. The robustness of the mentoring programme at the Atal Innovation Mission rests in the spontaneity in mentor-mentee interactions, and therefore on parallel side the physical ATL space and ATL curriculum manages to bring some kind of consistency, stability and predictability amongst the schools, ensuring consistency and predictability.

The guiding principle behind group mentoring program involves that one mentor’s consistent interaction with mentees; impact the outcomes of group mentoring programs, but the mentoring across different innovation interventions deviates from the general guiding principle of group mentoring program. For Atal Incubation Centres, as they are generally established in higher educational institutions, the mentor-mentee systems are criterion based/filtered and specialisation oriented. Therefore, in such settings, network mentoring: that comprise of one mentee (institutional in charge/personnel for Atal Incubation Centre) drawing learning and resource support from multiple mentors serves the mentoring requirements of AIC mentoring.

Subsequently, for Atal Community Innovation Centres, network mentoring or collaborative mentoring suffer due to the criterion of specialised mentor engagement and consistent mentor engagement. The challenges faced by the ACICs are the identification of community innovators that will work in collaboration with the mentors. To manage such kind of community innovator-mentor collaborative interfaces, at central level, is providing community innovator fellowships in collaboration UNDP India to provide knowledge and infrastructure support to the aspiring community innovators. The mentorship in this case is primarily focused on developing business acumen and sector expertise, henceforth making it evident that mentoring will not be universal across all Atal Community Innovation Centres but will differ from case to case, depending upon community orientation towards innovation and entrepreneurship.

Select Reflections of Students Working with Atal Tinkering Lab Mentors

The theme (mentoring) included the reflections on Atal Tinkering Labs and the associated mentors therein. The respondents, including students actively using ATL spaces in their respective schools appreciated the concept of institutionalising the creative ATL space in their school curriculum and physical space. Observing experimentation and experiential learning in the ATL spaces, one wrote that:

“I had a lot of ideas for solving basic community level problems, but the school calendar and curriculum engagement limited my outreach to community problem solving, but the ATL spaces have triggered my quest to solve problems as we now discuss problem solving, ideation and experimentation over informal hangouts like lunch, post morning assembly and travel time from school to home.”

Also, one of the students described the experience of learning by doing in the ATL space as:

“That I exhausted all 3D kit for concept development, for every step of failed attempt in designing the final concept or prototype, i was curious throughout and my expressions that testify the fact were ‘ohhh’, ‘oh god’, ‘seriously’ and ‘come on’”.

The above reflections depict the connection that ATL’s have been able to create with the student community and not only connect but also the reciprocal prompt readiness of the students to accept such innovative changes in their formal education system. Not only student’s perception towards ATL’s was critical, but their relationship with the mentors attached to the ATL’s was to be gauged upon as they reflected that:

“Mentors are someone who come up at any time, and disrupt our monotonous classes/sessions, and I look at them as recess providers who drive us from classes to the ATL labs where we can play with science, and imagine without notebook and pencils”.

One instance that stood out for me and I could resonate with it was when one student asked that “If I innovate or create a project in the domain of artificial intelligence for solving societal problems, how can I do it with mentor”-so here the students are having this perception that mentors are specialists in the domain of industry 4.0 skills and they can work in collaborative arrangements with the mentors for designing prototypes.

DISCUSSION

The paper reflects upon the change that the Atal Innovation Mission has brought to the innovation landscape of India, primarily through Atal Tinkering Labs, and how mentoring has acted as a catalyst for driving such a change, which is a massive and pan India phenomenon. The case clearly states that Atal Tinkering Labs are the acting as nuclei to the overall innovation ecosystem devised by the NITI Aayog, Government of India, supporting Atal Incubation Centres and Atal Community Innovation Centres as the prime stakeholders that are students are being considered as prime agents of driving innovation centric change. Although Atal Tinkering Labs have highlighted the critical role of mentoring in achieving desired student engagement but the outcomes of ATL against set objectives need to be measured and explored upon as only the scalability of such like intervention is being undertaken.

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