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Transformational Changes in School Education through STEM in School of Specialized Excellence (SoSEs) Delhi: An Exploratory Study

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Abstract

Objective: Science, technology, engineering, and mathematics (STEM) education transformed Indian schools. This comprehensive new initiative of the Delhi Government gives students technocratic-meritocratic skills and knowledge. Breaking gender stereotypes creates an inclusive environment where girls feel supported and encouraged to pursue STEM careers. This article examines SoSE STEM students' perceptions of STEM learning and VMC support. **Methods:** On 22 March 2021, DOE Delhi opened SoSEs with world-class facilities and IB curriculum as per NEP 2020. All SoSEs include core learning levels, while higher levels specialise in STEM, humanities, performing and visual arts, high-end 21st-century skills, and armed forces preparatory school. SoSEs receive academic support from Vidya Mandir Classes, well-known for its engineering and medical entrance exam preparation programmes. The 75 SoSE (STEM) students and 15 teachers provided data via questionnaires and semi-structured interviews. Observation of classes 9th to 12th has done to explore how integrating online VMC programmes with regular school education affects school culture and teachers' enthusiasm to teach science stream subjects. Additionally, how SoSE (STEM) students balance their usual and online VMC academic schedules. **Results:** The study revealed that students had access to digital devices and well-equipped science laboratories. STEM activities in SoSE schools challenged gender and subject-based stereotypes while enhancing awareness of STEM-related career options. Students demonstrated intellectual readiness for diverse fields, including NEET, IIT-JEE, nursing, etc. They transitioned from rote learning to a deeper, conceptual understanding. Their problem-solving abilities improved through activities such as building robots and classroom tools. **Conclusions** Despite these gains, students faced difficulty aligning their regular board curriculum with the competitive demands of VMC classes. The VMC's online format required high levels of self-discipline and motivation, yet lacked the benefits of face-to-face teacher support, limiting interaction and personalized guidance.

Keywords: STEM, SoSEs, VMC as a Supplementary Support, Transformational Change

Introduction

India, worldwide, forory in the fields of science and mathematics (Manges currently) are currently facing a shortage of science, technology, engineering, and mathematics (STEM) majors and graduates (NASSCOM Survey 2020). Inadequate emphasis on science and maths education in our educational system has, unfortunately, resulted in students gradually losing interest over the decades. While at the same time, STEM occupations are expected to grow (Langdon et al., 2011; U.S. Bureau of Labor Statistics, 2018; NEP, 2020). This two-fold issue necessitates that STEM education in India becomes and remains a priority. According to the National Education Policy (2020), this priority must include broadening students' participation in STEM and increasing STEM literacy for all students, regardless of whether they plan to pursue a STEM major or career. Informal learning environments have been shown to improve students' interest in STEM (Mohr-Schroeder et al., 2014) and have been shown to increase the chances a student will pursue a STEM career (Kitchen et al., 2018; Kong et al., 2014). According to (Bell et al., 2009), interest and motivation are crucial factors in encouraging students to pursue STEM education because they help them learn and successfully retain STEM material. The world is rapidly changing in response to AICTE and NEP (2020). Machines may take over many unskilled jobs, and a skilled workforce will be needed. This could significantly increase the number of people working in data science and other fields, such as STEM. The number of STEM jobs is growing at the fastest rate in India. People, Policy Makers, and Educational Societies need to create a conducive environment to avail the opportunity and benefits of STEM Ashutosh (2021).

In India, most students have concluded that STEM subjects are too challenging, complex, boring, and uninteresting (K. Abdul Gafoor; Abidha Kurukkan, 2015), limiting their participation in STEM subjects and careers. Students in schools all over the world struggle with issues related to educational quality. One of the primary objectives (Goal 4) listed by the United Nations (UN) in its Sustainable Development Goals is quality education (SDGs). In India, several obstacles exist in terms of accessibility, fairness, and quality standards, including the shortage of instructors, inadequate infrastructure, a lack of regular teachers who are enthusiastic about their jobs, and others. Central Govt. initiatives under CSR and the Ministry of Science, like Atal tinkering Lab (2016), Robo Shiksha Kendra, Tinkering Lab, Blended Lab, and Future Leaders Lab, were initiated to promote STEM, including participation in Gin Initiatives. Initiatives like the Department of Science and Technology were created to inspire girls to seek higher education and careers in STEM sectors. The Delhi Government has

undertaken several efforts in the last decade to provide excellent education in schools, including the Reading Campaign, Pragati Series, Summer Camps, Mission Buniyad, Happiness Curriculum, SoEs, SoSEs (STEM) Partnership with renowned institutions and reputable National institutes like VMC, and many more. Higher secondary classes of the Delhi government schools have 57 percent female students, whereas 43 percent are in the science stream. This situation and stereotypes like boys for science and girls for humanities need to be broken now. To overcome such social stigma and stereotype beliefs, the Delhi government introduced VMC-based STEM Education to classes for students in classes 10 and 12th for NEET and JEE in SoSEs schools. Through the supplementary VMC class, the government attempted to meet the needs of parents and students from the low-income group who have the potential to excel in the classroom. There appears to be a conflict between the limited view of STEM in schools, which emphasises the more content-based domains of the subjects of Science, Technology, Engineering, and Mathematics, and a wider view of STEM in the real world emerging from economic and industry policy more broadly than just in India. According to this broader perspective, STEM is "a point of discontinuity, of society asking for a qualitative change in the objectives of education undertaken in the domain of the sciences," rather than just a collection of content knowledge in science, technology, engineering, and mathematics (LoThe students of SoSEs face some concrete issues the students of SoSEs during attending VMC So, the study intended to explore responses of SoSEs school students' towards VMC classes and STEM s jects which further influence their career goals, conceptual understanding, competition readiness, and parental satisfaction with the attainment of quality School education.

Rationale of the Study

The study is undertaken in the Government of NCT of Delhi School of Specialised Excellence. These schools are choice-based for grades 9 to 12, allowing students to specialise in their chosen fields of study. SwithEs are affiliated with the Delhi Board of School Education (DBSE). Their design adheres to the DBSE concept, which emphasises the need to move away from rote memorization by including assessments into regular teaching-learning activities and utilising them as tools for learning. DBSE has partnered with IB to match up to international standards. These schools have good infrastructure and learning teachers suited to teach a new-age curriculum with high technological assistance. The admission is based on an aptitude test and assessment in the specialised domains.

Students have the opportunity for experiential learning through projects, field visits, internships, etc., in their chosen field of interest, and also have the opportunity to learn foreign languages. The society has a positive outlook towards SoSEs and possesses a favourable cultural milieu for protecting the environment. However, despite several positive traits in students, there is a prevalent negative phobia also noted towards science subjects in these schools. Research reported that, in the Indian context, fewer students choose the science stream at the senior secondary level than the humanities. In Indian Society, there are stereotypes that boys are made for choosing science and maths, while girls are ok with humanities. Therefore, the question arises in the researcher's mind: How do SoSE schools break this stereotype and provide opportunities for girls to pursue their careers in STEM education? How SoSEs address the needs of science learners. Why do most STEM students find it challenging to compete in exams even if they have the support of VMC? Do teachers of SoSEs provide career counselling services to students? How do mainstream teachers interact with students during Vidya Mandir classes?

There is a strong need to explore the available discourse and education facilities in the schools. The nature of initiatives taken by students in schools needs to be explored, as well as how they are being prepared for careers in science, technology, engineering, and mathematics. STEM initiatives must be understood to make necessary amendments in the nation's ways. Therefore, the present study attempts to examine the responses of students enrolled in STEM schools towards perceived STEM learning experiences and improvement of VMC in SoSEs.

Research Questions

Based on the rationale of the present study, the following research questions were framed.

1. What resources and support systems are available in SoSEs to carry out VMC classes?
2. What are the effects of VMC classes on the learner's career aspiration, conceptual understanding, and competition preparedness regarding quality school education?
3. How do students balance the curriculum, including regular common subjects and specialized subjects?
4. What are the concrete issues, challenges, and perceptions of students related to VMC classes with a primary focus on STEM?
5. To what extent are parents satisfied with "VMC Classes" in the context of STEM education?

Objective of the Study

- To explore the availability of resources and support systems in the School of Delhi.

- To study the effects of VMC class on the learners' aspiration, conceptual understanding, competition preparedness, and their parental satisfaction regarding quality school education
- To explore the concrete issues, challenges, and perceptions of students related to VMC classes with a primary focus on STEM
- To know the parental satisfaction regarding STEM in the SoSE school and VMC class.

Methodology

According to Creswell (2012), qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social human problem. So the researcher used a qualitative approach to descriptive research. Creswell (1994) stated that the descriptive research method gathers information about existing conditions. The sample of 75 Students was selected through purposive sampling from six SoSEs (*SoSEs Kalkaji, SoSEs Rohini Sec-18, SoSEs Civil Lines, SoSEs INA Colony, SoSEs Karol Bagh, and SoSEs Khichripur*) from the STEM field of the Delhi region were chosen as a sample by the researchers. These schools cover students in grades IX through XII. Grades IX and X focus on foundational learning with specialized instruction in Science and Mathematics.

In contrast, grades XI and XII offer a better understanding of STEM subjects, with the option of majoring in engineering or medicine. The subjective data from students' personal experiences and shared instances was also gathered with the help of semi-structured interviews with 18 students of classes XI and XII from various STEM SoSEs. These SoSEs aimed to establish the school as a School of Excellence, complete with the best teaching and learning techniques for STEM education. A questionnaire with 10 questions about the various aspects of VMC, namely the effect of VMC class on the learner's career aspiration, conceptual understanding, competition preparedness, and parental satisfaction regarding quality school, availability of resources, and the teaching-learning process, was developed by the researcher to collect the data. A total of 6 VMC classrooms of NEET and JEE classes XI and XII (1 observation was kept from each school) were observed in physical mode between July 2024 and September 2024. The objective of this study and the instructions about the questionnaire were spelled out to the sample. The questionnaire was circulated to the students physically, and the collected data were then analyzed for further interpretation.

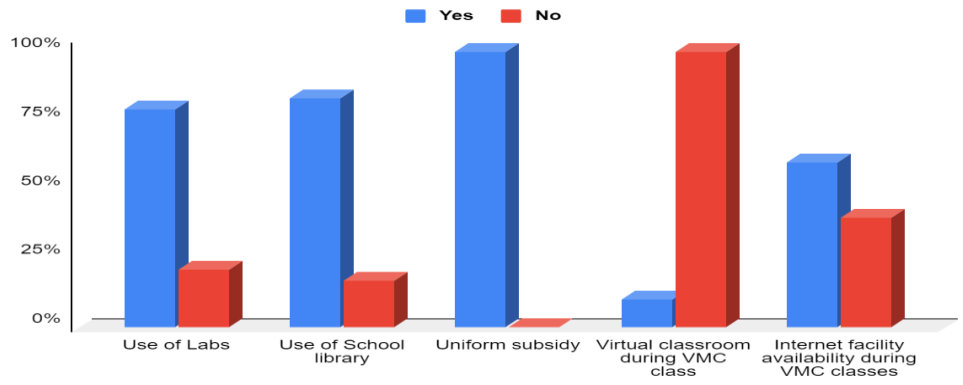
Findings and Discussion

The findings and discussion of this study are explained based on the following aspects such as resources and support systems available in SoSEs to carry out VMC classes, effects of VMC

class on the learner's career aspiration, conceptual understanding, competition preparedness and their parental satisfaction regarding quality school education, students perception related to "SoSEs" and "VMC Classes" in the context of STEM education, and various issues, challenges.

Availability of Resources and Support System in the SoSE school in Delhi to carry out VMC classes.

Educational resources play a pivotal role in achieving educational objectives and goals globally. The degree to which an educational institution accomplishes its objectives is directly linked to the availability of educational resources and how effectively they are used (Ekundayo & Alonge, 2012). Consequently, the interaction between inherent qualities and environmental factors affecting the quality of education and the productivity of staff members is a crucial concern that demands the attention of stakeholders in the education sector. Adopting flexible learning resources (Cutter, S.et al, 2010) is vital for shifting from a knowledge-focused learning culture to establishing a dynamic STEM education approach.



Educational facilities are tools or materials used to facilitate achieving goals. Graph 1 above shows the responses on the availability of school facilities and the support system needed for teaching and learning concerning STEM subjects and VMC classes. Results from this table revealed that most of the respondents, 79% of the students, agree that they use the science lab for practical work. They get the chance, whereas 21% of the stakeholders stated, "*Sometimes we hardly get the chance as we have insufficient time and the period gets over as we also have VMC class from 11.30 after the regular class*". 83% of the students stated that they use the school library and the books on different subjects and topics were available to them as one of the students stated "*There are enough suitable resources to support my STEM activity designs. Sometimes STEM activities require teaching outdoors, which help us to prepare suitable and related learning resources."* Students have been provided financial assistance by the Delhi government to achieve academic excellence as every student who is enrolled in SoSEs get help

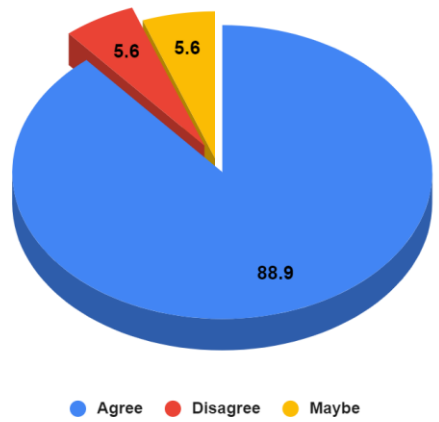
by providing them with a subsidy for school uniforms etc. Most SoSE students seemed critical when asked about the VMC class, which is carried out in virtual mode. There was a negative response from the respondents, as during the VMC class, there was no two-sided interaction between the teachers and students, because, as passive listeners, the class was not so effective and engaging. 60% of the respondents stated that the internet facility is available. However, the speed tends to decrease due to numerous concurrent connections, resulting in frequent disruptions during their IIT JEE and NEET classes.

During the researcher's classroom observations in SoSEs, it was noted that the classrooms were well-maintained and created an engaging atmosphere. The classroom setup, including smart boards in 11th and 12th-grade classes, was designed to facilitate an environment conducive to STEM learning. However, it is important to recognize that teachers and students' effective utilization of these resources plays a pivotal role in determining the ultimate educational outcomes. As per Owoko (2010), the concept of resources encompasses not solely teaching methods and materials but also includes the allocation of instructional time, along with the expertise and competencies of teachers acquired through their training and practical experience. Given that the curriculum was unfamiliar to educators and learners, notable adjustments were made. Notably, the VMC classes continued throughout the day, except for the initial four periods before the break, during which teachers conducted lessons aligned with the Delhi Board of School Education syllabus. It is worth noting that the Delhi Government has established its educational board, the Delhi Board of School Education, in collaboration with the International Baccalaureate. In SoSEs the presence of diverse learner support mechanisms within the schools encompasses tutorial programs, peer-based learning opportunities, supplementary classes (VMC), financial aid, and the provision of educational materials to support students were provided. However, there is a need for proper management of schools such as planning, organizing, directing, controlling, staffing, evaluating, establishing criteria, and executing other managerial functions related to the essential components comprising the learner support system.

Teaching Learning Process

Success in the teaching-learning process depends on the interest and motivation of the students (J.B. Deesha, 2022). It is the teacher's responsibility to ensure regular interaction occurs between the basic human capabilities of a learner and the culturally invented technologies so that it finally leads to enhancement in their cognitive capabilities (Afzal & Kalam, 2021). A 21st-century teaching and learning approach to STEM is one of the cornerstones of effective

learning. Integrating STEM can be challenging since it requires a new generation of STEM experts. STEM education should include problem-solving, critical thinking, creative thinking, and scientific thinking components to help students enhance their higher-order thinking skills (Baharin, 2018). The teaching and learning dynamics at SoSEs struggled to capture students' interest due to the demanding schedule and the added workload on teachers, which hindered their ability to perform at their best during instruction. Students were overwhelmed with homework from the DBSE syllabus, as they were still adapting to the new IB curriculum and the assignments from VMC classes. Furthermore, teachers at SoSEs had considerably longer working hours than their counterparts in other Delhi government schools.



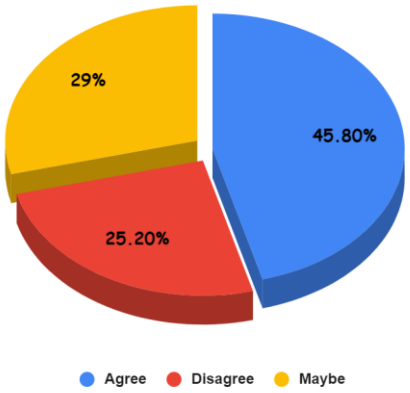
The above pie chart depicts that nearly 89% of the teachers agreed that the regular class related to STEM lacks a high level of engagement. One of the teachers stated that "*we are focusing on students to crack the IIT JEE and NEET entrance. We are overburdened with our jobs. We do not get any extra time to focus on preparing Video lectures or PPTs to teach in classes, as SoSEs is a model school of the Delhi government, one or the other activities regularly happen in our school, and we are busy attending the guest or other extra programmes. Besides this, the VMC classes affect the regular school process. We get very few lectures to teach in class, and must also be present as an attendant during the VMC class.*"

Based on the feedback from teachers and classroom observations, it can be deduced that the government's vision for the school includes top-notch infrastructure and supplementary coaching classes to prepare students for entrance exams such as NEET, JEE, and other science-related examinations, both in the medical and non-medical domains. The government aims to equip the school with the necessary tools to foster excellence in STEM education and ensure that students are well-prepared to excel in competitive entrance exams. While the outcome envisioned with the provided infrastructure is that of a quality workforce in the field of STEM,

the product depends on the process of using the provided resources. It is upon schools and teachers to decide how they best use the resources to complement their teaching and learning and how they implement them in their pedagogies. (Krajcik and Delen, 2017) Teachers need to incorporate scaffolds to support students in becoming familiar with STEM-related subjects.

Enhancing Computational Thinking among Students in SoSEs

Expanding upon the importance of enhancing conceptual understanding and knowledge building through supplementary classes, it is crucial to recognize that these efforts contribute significantly to fostering "Computational thinking" among students. "Computational thinking" is a foundational competence encompassing problem definition, problem resolution, and scientific rationale (Wing, 2006). Additionally, CT constitutes a metacognitive procedure encompassing sub-skills and predispositions for overseeing intricate problem-solving and creating models for phenomena that may not be directly observable (Dwyer et al., 2014). It enhances science education and elevates student involvement in STEM learning by integrating computational thinking into scientific inquiry, as suggested by Yang et al. (2018).



Among the responses received, 46% of the students agreeds schools, different subject classes assist them in gaining metacognitive process that involves sub-skills and dispositions for regulating complex problem-solving and modeling unobservable phenomena of STEM concepts. Conversely, approximately 25% of the students held a differing viewpoint. Although the majority of research (Bicer et al., 2015) on the mathematical thinking and scientific reasoning abilities of secondary students, has focused on the cultivation of computational thinking skills in secondary students (Lye & Koh, 2014).

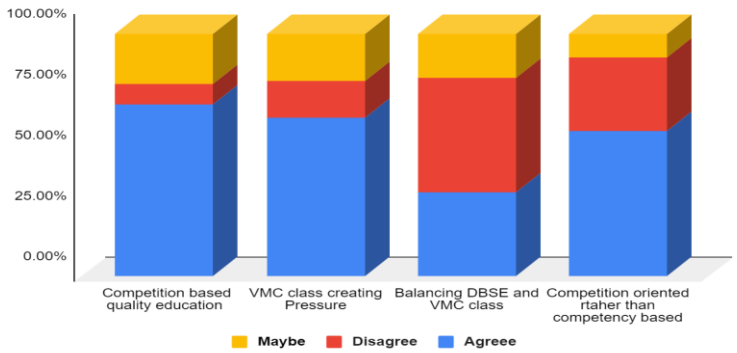
The students' verbatims was as follows: *"We are only focusing on the concepts related to IIT JEE and NEET exams to clear the important exam"*. *"The quality of STEM learning varies greatly. Some teachers are excellent, so they teach very well, but time constraints sometimes*

hinder them from delivering their best." 29% of the students were not sure about the knowledge building and understanding concepts, as they stated that "*to some extent it is clear, but not all. We learn theories, but practical application is limited, and hands-on experience in STEM is lacking due to time constraints.*

The verbatim responses provided above shed light on the intricate nature of STEM learning within the SoSEs environment. Through classroom observations and interviews with teachers, it became evident that the educational landscape in these schools is characterized by certain limitations, most notably, constraints on available time. However, despite these challenges, the teachers diligently try to provide the highest quality education possible. They strive to deliver their best within the constraints they face, ensuring that students receive a valuable and enriching educational experience. Incorporating computational thinking into the educational setting aids in equipping students for the future by fostering creativity and enhancing problem-solving skills, as noted by Fessakis et al. (2013).

Competition Preparedness or competency-based VMC class about STEM.

STEM is an initiative to encourage more students to pursue degrees in science, technology, engineering, and mathematics so that their nations may remain competitive and avoid falling behind other nations (Herschbach, 2011; Kelley & Knowles, 2016). 21st-century problems need STEM skills and competencies more than ever. Currently, we are at a stage where the number of STEM employment is expanding quickly and surpassing the number of STEM graduates. The National Science Foundation predicts that 80% of the occupations expected to be created in the upcoming ten years will require a large amount of maths and science expertise.

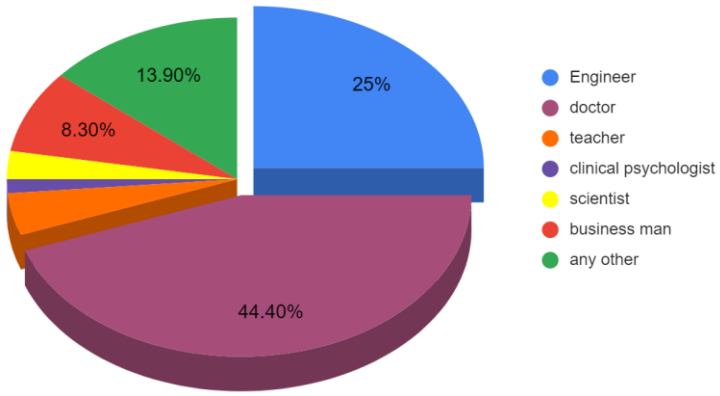


The above graph reveals that 70.80% of the stakeholders agreed with the statement that that VMC classes are trying to provide competition-based quality education. They have not only designed, delivered, innovated, and perfected the art of teaching, but have also guided and helped their students to realize their dreams, as in SoSEs schools, it is a way to communicate video lectures with the recorded class. The constraints of students here arethat they are

passively attending the class with one school teacher as an attendant. The VMC class focuses on the content that will help clear the entrance to JEE, NEET, and other medical and engineering exams. 65.30% of the respondents stated that VMC classes create pressure among students as they have to attend those online recorded classes with no interaction compulsorily, they also have to complete the assignments, give tests every weekend, and study the DBSE syllabus. Only 30.70% of the respondents agree that SoSEs are efficiently and effectively balance DBSE mainstream education and VMC classes. 75% of the students agreed with the statement and stated that VMC classes are more competition-oriented rather than competency-based because they only focus on marks and not quality.

SoSEs Learners Career Aspiration and the role of VMC class concerning STEM

Middle school children who value science are likelier to choose a STEM career (Tai et al., 2006). The development of the STEM workforce is crucial, but it is also crucial that our citizens acquire scientific and technological literacy (Milner et al., 2012). Career goals play a significant role in shaping an individual's study behavior in any higher education setting because they motivate the individual to achieve academic excellence. Lopez-Bonilla et al. (2012) identified that career aspirations are the most common motivations for course or programme completion.

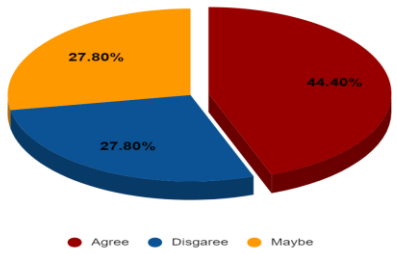


The above data reveals that entrepreneurship was the most emphasized career pathway amongst SoSE students besides the medical and engineering. Participants also raised their career choice into neuroscience, science, game development, and program development. A few boys expressed their career choice as a nurse, and only a very few students stated that they wish to be a teacher. Doctors (44.40%) and Engineers (25%) are some among the most liked careers.

Looking at the above data, there is a need for periodic career guidance seminars for students who are enrolled in SoSEs, especially VMC students, throughout their studies to stimulate career awareness and also nurture their enthusiasm to study for positive results.

Parental satisfaction regarding the quality of the school

Almost all the parents believed that the Delhi government is doing a commendable job of bringing overall improvement in the school education, as every parent wants schools with a good number of facilities in their area. The responses revealed that most parents appreciated the focus of government schools' focus on improving education and holistic development of children, unlike their private counterparts, concerned with increasing the fees and focused on extracurricular activities. The changing image of Delhi government schools has encouraged many parents to prepare their students to crack entrance to enrol in SoSE schools. The graph depicts that most of the parents' Qualification is class 10 and 12, and these SOS schools are helping low-middle-class income parents by keeping their wards directed towards quality competitive education.



44.40% of the parents' desires and needs are satisfied related to education. Whereas 27.80% of the parents are concerned about their ward's studies as they think that almost all the study in school is through VMC and teachers have little to share about students' regular assessments. After all these initiatives, the students have to attend various other compulsory activities regarding the deshbhakti curriculum and hobby hubs, which leaves them with less time to focus on what they want to do.

Students' perceptions and concerns related to "SoSEs" and "VMC Classes" in the context of STEM education:

The structured interview was scheduled and reviewed based on the students' comments. The result was based on the responses to all five items by the six SoSE school Science stream students of Delhi government schools and presented in tabular form in Table 1.

Table 1: Interview summary of SoSEs Delhi Government School Students

3 Students from each SoSE	How is SoSE different from other Delhi	What specific skills do SoSEs	Does VMC provide creative	How do you manage	How do SoSEs and VMC classes

		Government schools	possess?	or hands-on teaching?	regular exam studies and VMC preparation?	help you in attaining your goals?
1. Students of SoSE Kalkaji	Student 1- Student 2- Student 3-	Targeted career pathways. VMC classes STEM learning	Competitiveness. Engage in solving problems. Problem solving.	Focus only on the Entrance exam. Video lectures. To crackthe entrance	Regular 08.00 am to 11.30 am and VMc 11.30 to 3 pm No extra time	We aim to become a Doctor or Engineer, and VMC will aid Crackthe entrance exams.
2. Students of SoSEs Rohini Sec-18	Student 1- Student 2- Student 3-	One-day Exam preparation. IIT and JEE exams Infrastructure	No such skills, Experiments during biology class No skills	Deeper understanding Virtual classes Concept clearing	All day busy Study the whole day in school and after school, Homework.	W,e as Students, got an environment in which we can prepare for competitive examinations systematically and comprehensively.
3. Students of SoSE Civil Lines	Student 1- Student 2- Student 3-	Domain of Specialisation Experienced teachers One-day Exam preparation	building skills such as solving problems, logical reasoning, No skills	Prepare for competitive examinations. No interaction Passive learning	Attend school till 3.00 pm, reach home by 4 to 4.3 pm0 No rest. Completing school task	SoSEs give Students rigorous training, helping to develop a deeper and better understanding of concepts of STEM subjects.
4. Students of SoSEs, INA Colony	Student 1- Student 2- Student 3-	Career Pathways Crack Entrance. Talented Students	Problem-solving.	Focus ionmedical and engineering. Video classes Comprehensive	Time and study management are issues	VMC helps us to clear concepts related to the IIT and JEE exams
5. Students of SoSE Karol Bagh	Student 1- Student 2- Student 3-	Allow to Learn skills. World-class Infrastructure Top faculties	No Holistic growth. No skills. To crack the exams	No creativity Only Virtual class Entrance exam oriented.	Tense about preparation and no time to study for exams. Focus only on passing exams.	SoSEs with no cost provide a competitive environment for students with a weaker economic background to reach their goal..
6. Students of SoSE Khichripur	Student 1- Student 2- Student 3-	International Curriculum Experiential learning. DBSE Board.	Subject-based Experiments, No skills Some skills, like critical thinking	In a systematic and comprehensive way. Focus on IIT and JEE. Video lectures	Due to time issues, we skip school many times during exams. Lots of Burden.	We are getting VMC coaching free of cost with world-classs infrastructure to crack the entrance of IIT and JEE.

Participant observation was another tool used to gain deeper insight. The researcher closely observed the schools and the interviews to get the complete picture (beyond what was verbally communicated). Field notes were kept, and any important observation or detail for the research was noted.

In the *first item* of the interview schedule, they were asked the Students about how SoSEs are different from other Delhi Government schools, and most of the Students (40%) summarised it that Schools of Specialized Excellence are choice-based schools for grades 9 to 12 that allow students to specialize in their chosen fields of study. Students are prepared for targeted and

aspirational career pathways, which help them crack entrance exams like IIT JEE and NETT. (20%) said that its focus is on targeted career pathways in different specializations such as Science, Technology, Engineering, and Mathematics (STEM), Humanities, High-End 21st Century Skills, Performing and Visual Arts, and Armed Forces Preparatory School. Most participants agreed that it runs VMC classes, which help clear the exams in different domains. (90) % of the students stated, "*SoSE schools have world-class infrastructure for educating us. It allows us to learn many different skills related to STEM, and the faculty is also excellent as compared to other schools."* The majority of the students also stated that *"we get to study the International IB curriculum with no cost, which other schools will not provide., In SoSEs, we aim to provide experiential learning with the CBSE board."*

During the researcher's visits to the six different SoSEs, it was found that the school has ICT facilities available, which will bridge the divide between urban and rural schools, where information is only a fingertip away. It has a well-maintained building with an immersive environment. The walls are covered with informative prints, creating an immersive and inductive STEM environment. In SoSE classrooms, blended learning could be observed as the students interacted with the instructors or teachers and the learning materials in offline classes in schoo,l and through online mode in Vidyamandir classes.

From the above observations, the government has envisioned the school functioning with a high-quality infrastructure, including the additional coaching classes for preparing entrance exams like NEET, JEE, and other medical and nonmedical science-related exams.

The *second item* was to study the specific skills possessed by SoSEs. (30%) of the stakeholders said that SoSEs possess problem-solvinglls sucd (20%) said that s/he know different skills such as competitiveness and expertise in subjects of PCMB. (10%) of the students stated that they learn critical thinking skills auring STEM subjects, as some of the teachers do probing and brainstorming of the concepts and questions. Conversely, 40% of the students expressed a different perspective "*We have not acquired any such skills as we just have to focus on studies of school syllabus and then VMC class after the home assignments we also have to go for tuitions as IB curriculum is new to us and our schedule is such that we are not getting any time focus on ourselves"*

During the classroom observations and interaction with teachers, several noteworthy points came to light that SoSEs instill in their students a sense of competitiveness, motivating them to excel academically and professionally. It also emphasizes active engagement in problem-solving, fostering a culture where students are encouraged to tackle challenges head-on.

Problem-solving skills are a cornerstone of their educational approach. However, the researcher also observed that teachers often faced challenges due to time constraints. They were busy completing the syllabus, and their involvement in VMC coaching left them with limited time for interacting with students and equipping them with specific skills essential for holistic growth. Consequently, students may not receive ample exposure to delve into research, nurture their scientific acumen, or be encouraged to contribute to scientific innovations.

From the above observations and interactions, it can be inferred that Specialized Schools of Excellence (SoSEs) prioritize skills such as problem-solving, competitiveness, and expertise in subjects like PCMB. They aim to motivate students to excel academically and professionally, fostering a culture of active engagement with challenges. However, there is a notable challenge regarding time constraints faced by teachers, potentially limiting their ability to provide holistic skill development, including research, to students within the demanding schedule of SoSEs.

The *third item* was to know whether VMC provides creative or hands-on teaching, and the interview responses were that (70%) of the participants stated that it focuses only on cracking the entrance exam. The majority of the participants stated that *"the class is recorded in video mode and we just sit passively and listen to class if instead in case of any doubt there is no one to clear our doubt in school we have to note down and ask that questions on Sunday if they will respond then it is ok but its not possible for them to respond each query because the number queries are large."*

The researcher observed the classrooms and found that virtual classes and video lectures have become increasingly prevalent in the context of entrance exam preparation. These resources cater to students aiming to crack competitive examinations such as those for medical and engineering programs, focusing on IIT and JEE. These virtual classes aim to provide a systematic and comprehensive approach to exam readiness, emphasizing a deeper understanding of the subjects. However, it is important to note that these classes often lean towards passive learning, as there is limited interaction with teachers. Concept clearing and a thorough grasp of the necessary material are prioritized, making these virtual classes valuable for those looking to succeed in entrance exams. Nevertheless, they may not emphasize creativity or hands-on learning, as the primary goal is to equip students with the knowledge and skills required for their chosen competitive examinations through video lectures.

The *fourth item* was to know how participants manage regular exam studies and VMC preparation, The students expressed that, 80% of the participants, were unable to manage their time, and 20% said that they somehow manage with the guidance of their mentors. One of the

students expressed that *"managing regular exam studies alongside VMC preparation is extremely challenging due to our tightly packed schedule. We do not have any extra time throughout the day to refresh ourselves. We find ourselves continuously occupied with school homework and assignments, without any opportunity for rest."*

During the researcher's visits to the school, it was found that the school's timing was from 8.00 a.m. to 2.30 p.m. They had to study the regular school DBSC syllabus till 11.00 a.m., and after that they had a lunch break. After lunch, they had their VMC class to attend till 2.30 pm. Students reach home by 3.30 pm as they come from a long distance. Furthermore, they also have to go to school and do homework assignments so they hardly get any time for themselves. From the above observation and notion of the participants, it can be inferred that some of the stakeholders have experienced that the studies fully occupy their schedule, and they do not have much time to interact with the community in which they live socially. As per Delhi government Assessments, if designed effectively, they can aid in developing application, innovation, inquiry, and problem-solving skills in students. However, the above data shows that students are overburdened with the SoSE curriculum.

On the other hand, the *fifth and the last item* was to know how SoSEs and VMC classes help attaing goals. The majority of the students' responses were like "*Our primary aspiration as students in (SoSEs) is to embark on the journey to become doctors or engineers, and the invaluable support of Vidyamandir Classes (VMC) aids us in our pursuit of cracking entrance exams. Within the nurturing environment of SoSEs, we find ourselves well-equipped to prepare for competitive examinations systematically and comprehensively."* Another student stated, "*SoSEs provide us with rigorous training, enabling us to develop a deeper and more profound understanding of STEM subjects to crack the exams*. *Moreover, VMC coaching plays a pivotal role in clarifying concepts, but it takes too much time and sometimes they also ignoreit due to many queries. Our subject teachers could not solve our problems as they are not trained in the concepts of IIT or NEET preparations."*

In addition to this, it was observed by the investigator that the teachers were overloaded with excessive work, such as attending to guests during their visits, etc. Other teachers have to take many classes because of the scarcity of teachers who went for training due to the new curriculum in the school, such as DBSC. Teachers had an extra load to complete the syllabus on time as they had to help students succeed in the board exam. The significant aspect of SoSEs is their commitment to providing this competitive advantage to students from economically disadvantaged backgrounds, without incurring any cost. This inclusivity ensures that even

students with limited financial resources can aspire to reach their academic goals. The opportunity to receive VMC coaching, coupled with world-class infrastructure, free of cost, enhances the readiness to excel in the challenging entrance examinations for prestigious institutions like IIT and JEE.

Conclusion

The present paper aims to gain insight into the Students' Perceptions and Concerns towards Vidya Mandir Classes and STEM Education at the SoSEs Delhi. This study highlighted that Students have the requisite technological means for virtual education but are sceptical of the usefulness of solely online VMC lectures. Students also acknowledged the concern about the requirement for self-motivation, and the lack of direct teacher involvement to answer their questions and challenges. Students recognise the ease of virtual STEM classrooms and feel alienated, especially given their excellent skill in understanding complex concepts in science courses compared to their weekly contact with school teachers. While the government of Delhi focuses extensively on outputs, such as cracking the NEET and JEE entrance, less attention is focused on the inputs and structures of education. The result is a system that does not provide equitable access or opportunity to authentic, engaging learning experiences that bring the content to life. As the students' comments showed, their participation in the SoSEs in STEM learning experience addressed the limitations of formal schooling through the experiences provided (Bell et al., 2009; Meyers et al. 2013). Thus, in the current system, one implication of this study is the importance of high-quality STEM learning experiences to increase students' access and opportunity to engage in activities that contextualise and give purpose to their learning.

The findings of this research suggest a shift in the approach to STEM education. Students opt for in-person teaching that includes offline IIT JEE and NEET learning. This change aims to achieve the need for direct teacher-student contact. Students believe that employing an offline VMC classes approach in the SoSEs school will better prepare them for future employment options in STEM education. This strategy tackles their self-motivation concerns and guarantees that kids receive the required assistance and supervision from teachers, resulting in a more effective and engaging learning environment.

The study's consequences go beyond students' and instructors' immediate concerns, representing broader trends and issues related to technology integration in education. The need for a blended approach reminds us that, while technology is an excellent tool, human interaction and direction are still essential in the educational process. As educational institutions adjust to

the changing landscape of virtual and blended learning, it becomes increasingly important to understand and accommodate students' viewpoints and interests, thereby improving the quality of STEM education.

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