Teachers' Perception towards STEM and VMC in SoSEs of Delhi
An Exploratory Study

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Abstract

The Government of Delhi established Schools of Specialised Excellence (SoSEs) in 2021 to serve students with an interest and aptitude in specialised domains. These institutions offer a variety of disciplines, like Science, Technology, Engineering and Mathematics (STEM) education, humanities, 21st century skills, armed forces, performing and visual arts from Grades 9 to 12. This study aimed to explore teachers' perception towards STEM and Vidya Mandir Classes (VMC) initiatives in SoSEs and identified the facilities and support services available in SoSEs, including challenges faced and adopted coping strategies of teachers. Questionnaires, semi-structured interviews, observation and focus group discussions were used to analyse data qualitatively. Further findings were analysed in categories like teachers' perception towards access to STEM education and improvisation of VMC at SoSEs, teachers' points of view towards the aim and nature of VMC versus mainstream education, challenges faced by regular teachers of SoSEs in connection with VMC classes. Most SoSE teachers viewed STEM education and VMC as a positive initiative to assist parents who could not afford the high costs of private coaching so that their children could pass competitive exams, such as IIT JEE, NEET, etc. Additionally, SoSE teachers also faced challenges like managing timetables, negotiating between NCERT textbooks and competitive reading material of VMC, and their own identity and responsibility. The study suggests recruiting or hiring teachers with an advanced understanding of

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STEM-related content and pedagogy. It also indicates a requirement to conduct VMC classes offline, beyond the school boundary so that learners can derive maximum benefit and balance with mainstream regular courses.

Keywords: *Schools of Specialised Excellence, STEM Education, Vidya Mandir Classes.*

Introduction

Board exam results are crucial for all students and parents, as they determine the students' future career path. Every parent wants their children to score well in board examinations, crack competitive exams like IIT JEE and NEET, and get admission into top colleges or universities. In the contemporary situation, at the university level, the Central Universities Entrance Test (CUET) exam is conducted to enter the UG level after the recommendation of University Grants Commission (UGC) 2022. The pressure and stress experienced by parents of students in Grade 10 and the graduating year of Grade 12 due to the intense competition at the entry-level have led them to actively search for coaching classes to secure their children's future and admission. Numerous studies, such as Lee et al. (2010) and Rohlen (1980), mentioned that private supplemental instruction has grown to be a global phenomenon in recent years (Mori and Baker, 2010). Other researchers, such as Unal et al. (2010), asserted, "Private tuition, like any teaching and learning interaction, has undeniably positive effects on individuals".

Students of school education worldwide suffer from the issue of quality attainment. Quality education is one of the main goals (Goal 4) identified by the United Nations (UN) in its Sustainable Development Goals (SDGs). India has made significant progress in achieving the target by the enrolment of male and female learners in schools at the secondary level, 94.81 per cent and 92.47 per cent, respectively, as per UN Reports. In India, school education faces various challenges regarding access, equity and quality parameters, such as teachers' unavailability, lack of digital access, poor infrastructure and the lack of enthusiasm for regular teachers' in teaching. At the state level, the Government of Delhi has taken many initiatives, such as the Reading Campaign, Pragati Series, Summer Camps, Mission

Buniyad, Happiness Curriculum and many more in the past few years to ensure quality education in schools.

Another micro factor is the existence of high-stakes formal examinations, a prerequisite to acquiring admission to higher education institutions, which increases the demand for private coaching even more (Stevenson and Baker, 1992; Bray, 1999). By looking at the situation and needs of the societies, Schools of Excellence was launched by the Government of Delhi in 2018, and in the 2020–21 session came the initiative of Schools of Specialised Excellence (SoSEs). Rajkiya Pratibha Vikas Vidyalayas, popularly known as RPVV or Pratibha, was affiliated with Central Board of Secondary Education (CBSE) and was renamed as Dr Bhim Rao Ambedkar School of Specialised Excellence (DBRA-SoSE). The entrance test is the only gateway for admission to the RPVVs. Admission of students is in the 6th, 9th and 11th standards. The SoSEs were choice-based schools for Grades 9 to 12 that allowed students to specialise in their chosen fields and cater to their needs. The Government of Delhi decided to get the help of NGOs, private coaching, etc. These schools seek to discover, foster and nurture student abilities, enabling them to realise their full potential. This school is affiliated with the Delhi Board of School Education (DBSE). The DBSE is a state-level board of education in Delhi. It was established in 2021 by the Directorate of Education, Government of National Capital Territory (NCT) of Delhi. The cabinet of Delhi approved DBSE on 6 March 2021 and it was officially registered on 19 March 2021. On 13 August 2021, DBSE was recognised by Council of Boards of School Education (COBSE), which allowed DBSE to conduct exams and grant certificates. The International Baccalaureate (IB) board provides specialisation in STEM, humanities, 21st century skills, and performing and visual arts, which are in coherence with Schools of Specialised Excellence in Delhi.

Schools of Specialised Excellence and Vidya Mandir Classes

The mission of these selected SoSEs was to set up the schools as Schools of Excellence, with proper infrastructure and the best teaching-learning practices in STEM education. Out of the total number of 31 SoSEs, 12 SoSEs were for STEM, and 7 for humanities and 4 for performing arts, while 7 SoSEs were chosen for learning 21st century skills. Including that 1 SoSE belonged to an armed force preparatory school in the Delhi region. These

schools cover Grades 9 to 12, whereas Grades 9 and 10 aim to provide foundational learning with specialised learning in science and mathematics. In contrast, in Grades 11 and 12, SoSEs offer a deeper understanding of STEM subjects, and students can choose engineering and medicine as an important stream. After qualifying for the aptitude test, students of Grade 8 who study in government, government-aided or recognised schools of Delhi are selected where 50 per cent of students are admitted from government or government-aided schools. The admission criteria are based on qualifying the screening tests.

The Government of Delhi has facilitated VMC in 2022 by partnering with one of India's pioneer institutes for JEE and NEET preparations. The VMC has the education partners under the project 'Dr B R Ambedkar School of Specialised Excellence'. The VMC has been synonymous with the country's engineering and medical entrance preparation, instilling faith among millions of parents, and building the dreams of millions of engineers and doctors.

The Rationale of the Study

In school education, test scores, rate of success in competition exams and dropout rates are generally categorised as outputs. At the same time, input factors depend upon the student's potential, coaching class, family support and school environment. After reviewing the research and field, it is inferred that several micro and macro factors are responsible for expanding private coaching in society. Studies indicate that household income, parental education and urban location are the three most influential micro factors (Stevenson and Baker, 1992; Tansel and Bircan, 2006; Dang, 2007). Private tutoring evolved due to the widespread belief that a student's academic performance directly correlates to their chances of future economic success.

School teachers are the key participants in creating and transforming the school environment to cater to the needs of children. In the majority of the research, it was found that the goals of schools or institutions can only be achieved if they have long-term, lasting and positive participation of teachers (Borawska-Kalbarczyk et al., 2018). However, the Government of Delhi, through the supplementary VMC class, tried to satisfy the needs of parents and learners who are from the low-income groups and have the potential to do their best in academics. Still, during the

execution of VMC, the regular teachers faced many challenges and concerns regarding the aim of VMC and mainstream education. So, to explore the perception of SoSE school teachers in the form of the teachers' voices regarding the understanding of STEM education and VMC, and their perceived preparedness about SoSE learners' expectations, the following research questions were framed by the researcher.

Research Questions

The research questions for this study were:

1. How do the teachers of Schools of Specialised Excellence perceive 'STEM Education' concerning VMC classes?
2. What are the facilities and support systems available in the school for the execution of VMC classes, including mainstream education?
3. What kind of change in attitude do the teachers notice in the learners after the integration of STEM and VMC initiatives in SoSEs?
4. How does mainstream education have a different aim than VMC classroom practices?
5. What are the significant challenges and concerns of the teachers of SoSEs regarding the integration of VMC classes as a support for mainstream education? How do they cope with the VMC classes?

Methodology

Under the qualitative research approach, the descriptive school survey method was adapted to explore the perspective of teachers of SoSEs towards STEM education and intervention of VMC.

Participants

Out of the total SoSEs, researchers selected 5 SoSEs related to STEM as a sample through convenient sampling for data collection from each zone of Delhi. The opinions of 15 teachers (11 males and 4 females) and 3 principals of different STEM SoSEs were included in a sample for data collection. A detailed description of their educational qualification and experience is given in Table 1 below:

Table 1: Sample of the Study

Name of the Selected SoSEs	Gender	Educational Qualification or Work Experience	Questionnaire or Semi-structured Interview	Focus Group Discussion
School of Specialised Excellence, Khichripur (East Zone)	Teachers: • 11 males • 4 females, • 3 Principals of SoSEs	M.Sc. in Physics/ Chemistry/ Maths/Biology B.Ed. and DSSSB Exam cleared • 10 to 15 years of teaching experience and an excellent academic record. • Principals who have more than ten years of experience in School Administration.	Total Teachers: • 15 (3 from each school) • Interviews of teachers and principals taken individually	• Five Teachers (One from each School)
School of Specialised Excellence, Civil Lines (North Zone)				
School of Specialised Excellence, Kalkaji (South East Zone)				
School of Specialised Excellence, INA Colony (South East Zone)				
School of Specialised Excellence, Sector-18, Rohini (North West Zone)				

Tools Used

The researcher used qualitative research tools to collect data. It included observation, open-ended questionnaire, semi-structured interviews and focus group discussions. The questionnaire related to the perception of SoSEs for teachers contained six open-ended questions which further categorised into three themes as shown in Table 2. These themes were often interconnected with the other themes, the researcher also tried to know the critical perspective towards supporting VMC classes which in majority of the research work was interpreted as shadow education.

Table 2: Questionnaire Related to Perception and Concerns of SoSEs Teachers

Themes	Open-ended Questions
Teachers' Perception and Understanding towards access to STEM education at SoSEs.	1. How do SoSE teachers perceive STEM education, and what facilities and support are offered to teachers in SoSEs? 2. What kind of change in scientific temperament do teachers notice in the learners after the integration of STEM in SoSEs?
VMC and Mainstream Education: Teacher's point of view.	1. How does mainstream education have a different aim than the application of VMC classroom practices? 2. Does the VMC supplementary coaching promote Shadow Education?
Challenges of Regular Teachers of SoSEs concerning the integration of VMC Class.	1. What are the significant negotiations done by the regular mainstream teachers at SoSEs? 2. Is the integration of VMC classes in SoSE schools referred to as the politicisation of education?

Periodic group discussions and informal interactions in Focus Group Discussions (FGDs) were conducted with each cohort of school teachers. Five teachers were taken from each selected SoSE, and interactions with them occurred in school and on telephone to know the challenges faced by the regular teachers in SoSEs. Some conversations took place during informal discussions by the researcher over several academic days and the teachers raised other concerns. The insights emerging from the inter-subjective spaces created during formal and informal teacher-student interactions, as well as researchers' reflexivity, also contributed to the data triangulation.

Data Collection Procedure

The researcher adhered to the research ethics and data was collected after getting permission from Officer on Special Duty (OSD) from the Directorate of Education, Delhi, to visit the schools through email and telephonic consent. The teachers were asked open-ended questions, which are mentioned in the above questionnaire, and through semi-structured interviews and informal interaction, all discussions were conducted.

Data Analysis and Discussion

The responses of the teachers were collected further, and thematic and narrative analysis was done. The responses are categorised into the following three themes for analysis and understanding of the teachers' perception towards STEM and VMC intervention in SoSEs.

Teachers' Perception and Understanding towards Access to STEM Education at SoSEs in Integration to VMC Class

The majority of the related research on STEM education exhorted the need to educate and support teachers to implement reform related to science and mathematics education. Teachers are responsible for creating positive classroom environments, so that students new to STEM disciplines will remain and flourish (Cabrera et al., 1999). When asked about the concept of STEM and how they perceive STEM education, after observation of the selected five SoSEs and interaction with the teachers, it was analysed that STEM disciplines in SoSEs provide potential in the learners regarding problem-solving skills, critical thinking and scientific attitude including its learners have become more career-oriented in science stream. DeWaters (2006) found that STEM courses assist students in resolving everyday problems and understanding the value of learning by systematically integrating information, concepts and skills. It was also analysed that government's intention towards this initiative was taken positively by the majority of the teachers. They shared their opinion that through this initiative, students are prepared to lead scientific research and innovation for the development of the nation.

During the discussion with teachers related to Question 1 of research—How do teachers of Schools of Specialised Excellence perceive 'STEM Education' concerning VMC classes?—one of the teachers defined STEM education from an interdisciplinary perspective and stated, "STEM education is an indispensable requirement of the 21st century that helps learners achieve learning outcomes across disciplines". This perspective was echoed by several other teachers, who highlighted the importance of interdisciplinary learning. One of the teachers also mentioned the same perspective, "STEM has science, technology, engineering and mathematics perspective which is holistic in nature, and this interdisciplinary approach is required to develop soft skills in learners". Another teacher mentioned, "STEM education encourages students to integrate knowledge from different subjects, which is

crucial for developing problem-solving skills". Additionally, most teachers expressed that STEM helps students discover their talents. They pointed out that students can explore and identify their strengths in various fields through STEM education. One teacher shared, "STEM helps students discover their talents by providing opportunities to engage in hands-on activities and real-world problem-solving". Furthermore, a female science teacher explained how STEM education differs from traditional science and mathematics curriculum. She emphasised that STEM requires an integration of project-based and activity-based approaches in teaching-learning practices, "STEM education differs from the traditional incorporation of science and mathematics curriculum with a competitive mindset. It requires the integration of project- and activity-based approaches in teaching-learning practices". Another teacher supported this view, who added, "Incorporating project-based learning in STEM education allows students to apply theoretical knowledge to practical situations, which enhances their learning experience".

The teachers stated, "STEM education equips students to cope with real-world issues and improves their academic performance". The teacher who teaches physics in Grade XII, supported this perspective and mentioned, "I am teaching physics and STEM education is providing us opportunities to teach about the real world with the help of related teaching material and rooted examples". So, after learning the different perspectives and views of most teachers, they understood STEM education as follows, "STEM aims to provide students with rigorous science education, supported by world-class infrastructure and specialised teaching". Students get an opportunity to engage with leading minds in science and technology from India and abroad, and are groomed to drive scientific research and innovation in the nation.

On the question of what they thought about the convergence of STEM and SoSEs, the teachers had integration of knowledge, techniques and expertise from multiple disciplines to form new and expanded frameworks for addressing scientific challenges, and opportunities. It was inferred that most teachers relate STEM education to the needs of the contemporary technical jobs' requirements, where desired skills for the job are related to the STEM field.

One of the teachers narrates his experience regarding the pedagogical approach. He said that teaching STEM subjects

required problem-based learning where the teachers facilitate a research-oriented environment. He also mentioned that for the successful convergence of STEM and SoSEs, teachers need more specialised in-service training workshops regarding pedagogical practices to teach STEM subjects". The teacher who got the opportunity to learn new approaches mentioned, "It is hands-on learning for students as we take classes in labs and provide them with different resources for experiments. They are learning in a better manner as I collect resources online to show them and relate with other subjects of STEM specialisation". Problem-based learning is also supported by a study by Bransford et al. (2002). He stated that it is well-suited for engineering and other STEM disciplines because it helps students develop the skills and confidence necessary to solve unfamiliar real-world problems.

The researchers also explored the Question 2 of research— 'What are the facilities and support systems available in the school for the execution of VMC classes, including mainstream education?. Concerning the above query, the researcher observed that no lab or practical activity was organised by SoSEs and VMC, especially based on STEM awareness. It was observed that there were well-equipped physics, chemistry and biology labs and facilities, such as proper ventilation, sink and lab attendants. For higher classes, there was an individual segment of the library with comfortable reading seats in each school. Journals, books, question papers and competition books, including base books of NCERT, were all available in the library. Regarding access resource availability, teachers also mentioned, "Classes of SoSEs are well-equipped with high-class digital resources like government facilitated projectors, monitors and Wi-Fi. Tablets were also distributed to each student and teacher in the SoSEs. This is also reflected in their response towards pedagogical approaches".

Regarding the Question 3 of research, teachers were asked about the kind of change in attitude they noticed in the learners after integrating STEM and VMC initiatives in SoSEs. Some of the teachers critically reflected on the integration of VMC classes at SoSEs that these classes are not able to ensure attitude towards STEM education in the learners. This is because VMC signed their contract with the government to create such an environment in school where learners found opportunities for the preparation of competitive exams like IIT, NIT, JEE, etc. They mentioned that

this practice is based on memorising facts and formulae and solving the MCQ test series only. So, teachers reported that the experimentation of STEM education at SoSEs has good intentions to help the parents of weaker section to help their learners with enrichment in cognitive knowledge through supporting VMC classes but more is needed to achieve the visionary purpose of STEM education in the future. From the interview with certain teachers of SoSEs civil lines, the other perspective was also found where the majority of the SoSEs teachers shared, "After specialised STEM integration at SoSEs, students become more interested and motivated to know their career in science and maths esteems, beside this, they are also engaged in the career preparation related to STEM disciplines in a more dynamic and cross-curricular way". One of the teachers mentioned, "We are trying to equip them with different resources. The workshops and training are conducted for teachers and students for a better teaching-learning process".

VMC and Mainstream Education in SoSEs Teacher's Point of View

Then, the teachers were asked the Question 4 of research—How does mainstream education have a different aim than VMC classroom practices?. Teachers' responses were categorised into two perspectives, one reflects the role of teachers in both systems while the other is based on the learners' point of view. As one of the teachers reported, "In SoSEs, teachers are not appointed to prepare the learners to qualify NEET and IIT JEE advance level exams, while VMC coaching teachers have their own teachers to teach on the high package for preparing learners for competitive exams at an advanced level". During the discussion, other teachers responded, "The regular teachers have masters and degrees in science, maths esteem, and a B.Ed. So, they have the expertise for teaching NCERT-based textbooks, including DBSE and IB Board Curriculum, while most VMC teachers have qualified B.Tech., not B.Ed. He said that the orientation of the VMC and mainstream education teachers are different and they differ in their approach to application". After observing VMC classrooms at SoSEs, it was found that these classes also differ in their mode of transaction as VMC was going online, while mainstream classes were held in SoSEs offline mode.

These classes also differ from each other in terms of assessment. After informal interaction, it was noted that, "The teachers of the mainstream school education were taken monthly, quarterly and half-yearly, and final test and exams to know the learner's competence concerning NCERT conceptual questions, while the VMC take phase-wise test was which conducted online sessions each Sunday". After an interaction with regular teachers, it was also recorded that in VMC, a formative assessment and feedback mechanism was conducted in the form of doubt-clearing sessions online from 6 to 7 pm. After reaching home, students logged in to the VMC portal and wrote their questions on the Google form to clarify, but the regular teachers did not take such sessions. One of the female teachers mentioned their experience from learners' point of view, "In mainstream education, students use NCERT books as reference material to clear their basic concepts and after conceptualisation, they prefer to read VMC study materials. So, from the learners' perspective, the aims of both classes are positively correlated and only differ in their difficulty level".

To explore the question of VMC supplementary coaching at SoSEs promoting shadow education, the researchers have tried to understand the supplementary tutoring in school. Shadow education refers to private supplementary tutoring beyond the hours of formal schooling (Bray, 1999; Buchmann et al., 2010; Stevenson and Baker, 1992). It describes a variety of learning opportunities and support that run concurrently with, or in the shadow of traditional formal education systems. It includes a range of extracurricular and private coaching, tutoring and enrichment activities that children participate in after school. Most of the teachers of SoSEs reported that this initiative of the government is based on providing equal opportunity to all those learners who have the potential to compete in advanced-level exams, but whose parents cannot afford the high fee of private coaching. So, it was determined that they consider it affirmative action and not shadow education. During interviews with teachers, they shared their views, "There are many advantages to such a kind of supplementary education, whether policymakers want to attain quality school education with a proper outcome and also critiques, in a comparative sense, existing practices of normal government schools, where teachers and learners both ignore the attainment of STEM skills in science stream learners".

The teachers said that, "Contrary to mainstream alternatives, through the integration of VMC, students can take advantage of extra help in problem areas, which allows them to think in alternate ways and raises their capacity to deal with high-difficulty value items, including its learners now able to use their knowledge at the application level". So, after the above narrative analysis, it is deduced that SoSE teachers took this VMC approach positively regarding learners' achievement and knowledge. Dang (2007) and Ono (2007) also found substantial effects of private tutoring on student achievement, while Briggs (2001) and Ryu et al. (2013) found negligible effects on learners' progress. Some teachers said, "VMC initiatives in SoSEs have focused on the competition exam only rather than learning. So, this kind of system is destroying mainstream schooling by rote learning". The same finding was supported by Majumdar (2014), who also stresses the need for reforming the mainstream education system in terms of recruiting an adequate number of teachers in schools. So, the dominant voices of the teachers and their response had usually been recorded as an affirmative action of the government towards the inclusion of those learners, who do not have the budget to pay for the extra coaching where they desire to prepare themselves for competitive exams.

Challenges and Concerns of SoSEs Teachers

Numerous studies by Anderson et al. (2004) have demonstrated the importance of a good school climate in determining whether education is successful or unsuccessful for both teachers and students. Every human task or endeavour revolves around motivation and the teaching-learning process is no exception. Many studies (Anderson et al., 2004) have supported this point of view to increase teachers' commitment and effectiveness. The most significant impact on students' success is exerted by teachers (Hattie, 2009). Teachers must be motivated, student-centred and sensitive to individual differences (Schleicher, 2012). Ensuring effective teaching involves several challenges. The most significant impact on students' success is exerted by teachers (Hattie, 2009). Consequently, the research finding suggests that ensuring effective instruction entails several obstacles.

To know the critical perspective of the teachers, researchers raised the following questions—What are the significant challenges

and concerns of the teachers of SoSEs regarding the integration of the VMC class as a support for mainstream education? How do they cope with the VMC classes? What are the significant negotiations done by the regular mainstream teachers at SoSEs? Teacher's comment, "They have issues concerning time constraints and workload as students have only nine periods, regular teachers can teach only four periods and the rest of the five periods, have taken by the VMC teachers in online mode. So, completing the syllabus and preparing the class schedule for every subject teacher is a challenging task for them".

The majority of the regular teachers of SoSEs demand the execution of VMC in evening sessions in the same schools in offline mode, as some of the teachers shared their voices, "They were not only facing the challenge related to time management but also, they face the challenge of least student attention in the classroom. The regular teachers are interested in teaching IB board curriculum or basic NCERT textbook exercises and references, but in routine classrooms, students are busy solving the exercises given in the VMC study material and they are least interested in the content the regular teachers deliver". So, the regular teachers of SoSEs also face challenges regarding timetable management and the learners' disinterest in classroom teaching by mainstream teachers.

Regarding the question, how do they cope with mainstream education and VMC classes? Their responses, like the aim and nature of mainstream education and competitive exams, were noted under the horizon. As stated in the above narratives, they mentioned that they are trying to effectively balance their responsibilities between mainstream education and VMC supplementary classes. Teachers noted that the schedules and routines they have to follow are daunting tasks for them. They may not be able to allocate time for planning lessons, grading assignments through individualistic reflection and conducting daily classes in both settings. The majority of teachers stated that the main concern was time management as they also have to attend various programmes in SoSEs, such as Mentor Teacher programmes, teacher development coordination programmes, international exposure, Core Academic Unit, etc., because of all these engagement teachers felt that their services were hindered. Some of the teachers expressed concerns regarding the challenges of meeting the demands of both classes within the school system. They highlighted that mainstream education focuses on conceptualising NCERT textbooks, leading to confusion

among students about which reference materials to use and how to prepare for competitive exams. Students had a lackadaisical attitude towards responsibilities despite being assigned assignments and actual work, feeling trapped between government initiatives and their talents. Some teachers suggested that additional support beyond the school setting, such as remedial coaching classes, could be beneficial if aimed at addressing students' needs rather than fostering competition. They emphasised the importance of gaining a deeper understanding of the goals of education in order to inform such initiatives and innovation.

It was found that each SoSE-trained, experienced regular teacher of subjects like physics, chemistry, biology and mathematics—with more than ten years of teaching experience, good academic records and results—was hired by the Government Pratibha Schools and SoSE. After interaction with teachers and the principal, it was found that the Government of Delhi needs to provide unique training to teachers of SoSEs regarding the teaching of STEM subjects. In the name of STEM education, only the support for VMC classes was held there. Hence, the researcher found that the idea of STEM education was negotiated by the Government of Delhi on the cost of competitive exam preparation only.

After interaction with the principals of SoSEs, they were selected through proper screening and interviews. On the interval of the administration and leadership of the principal, there were no concerns or issues shared, and it was observed that they all felt proud and their self-esteem was higher because they were a part of SoSEs. During an interview with one of the principals, it was observed that, "I advocated that from the last more than 15 years and among the parents, even I had given my full potential to the previous schools where I was appointed, but as government took this initiative, I had found an opportunity to become principal. Now, parents and community members seem to recognise the school and its stakeholders as one of the best schools, similar to other reputed private schools. I also shared that now, students who are studying here, have higher dreams regarding their careers".

Some teachers also stated, "In contrast to other Delhi Government Schools where teachers depart at 1 pm with the same payment, they work until 3:00 pm. Most of the teachers said that they had already done their 20 to 25 years of job and had just 8 to 10 years left to do their best for this profession, and they also needed motivation, energy and incentive regarding their extra

time, work, and effort". Teachers also expressed concern regarding visitors who frequently visit the SoSEs because these schools are considered ideal role model. Teachers reported that they are proud that they were a part of reputed SoSEs, but at the same time, they occasionally need to invest more time to maintain the entire school. So, these visits constantly interrupted their teaching time. The SoSE teachers also shared their challenges regarding participation in training programmes organised by Delhi Board of School Education (DBSE), which interfere with their routine teaching. So, after informal interaction with several SoSE teachers, it was found that SoSE teachers are more burdened and engaged in extra responsibility. During the discussion on the question of how do regular and VMC teachers share their roles and responsibilities to understand the level of the learner?, the teachers of SoSEs shared their opinion that they all were assigned the duty to observe the VMC class when it was going online. The primary concern that regular teachers shared is that during the supervision of VMC class, if the learners raised any doubt, then occasionally due to the advanced level, the teachers were not able to answer sometimes. So, it was challenging for them to manage between foundational and advanced level content. They also faced challenges in dealing with the duty, like the observation of online VMC as guards and offline teaching as teachers.

Teachers were asked if the integration of VMC classes in SoSEs referred to as the politicisation of education. Consequently, the researcher cited Michael Apple's 'Politics of Official Knowledge: Does a National Curriculum Make Sense?' in response to the teachers' critical perspective. Apple (2000) has raised two questions in his paper, "Whose reforms are these?" and "Who benefits?". When these questions were asked to the SoSE teachers concerning the integration of VMC for the cause of STEM awareness among learners in SoSEs, most teachers in response to the first question said that in 2021, this initiative was taken by the Government of Delhi. For the second question, there were two kinds of responses cited by the teachers, one in which the majority of the teachers answered neutrally in terms of affirmative action of the government to benefit those learners and parents that belong to the low socio-economic status and the other response was, "After such kind of numerous experimentation in schools of Delhi, government tries to create such mass in the society, where parents, learners including teachers appreciate the intention of the government regarding quality

education, even after not being aware about actual quality STEM education, where robotic skills, coding, hands-on experience, STEM integrated PBL activity, scientist students-teacher partnership is required. However, in SoSEs, learners are engaged only with the alternative supportive coaching in the form of VMC, which is not sufficient for the development of scientific attitude in the learners". It was found that teachers mainly discussed such government initiatives in terms of positive and negative influence on students' outcomes in terms of their results in IIT and NEET exams rather than their impact on changing the learners' attitude towards science. Demirel et al. (2016) found that STEM activities enhanced positive attitudes toward science.

Finding and Suggestions

- Concerning the teachers' perception towards STEM Education and VMC Classes, it was found that the teachers of SoSE perceived STEM Education as an innovative initiative of the Government of Delhi for strengthening scientific attitudes and career-oriented exposure for the secondary and senior secondary students. The majority of the teachers responded on a positive note to the STEM education and VMC exposure, as they acknowledged that, for the first-time, middle-class parents and students were preparing their mindset for qualifying the highest-level competitive exams like JEE and NEET. One of the teachers made his point in SoSEs Civil lines in a suggestive way, "There is also the need to associate the school with university teachers and students to develop the interface with school and higher education so that, the majority of the potential learners will be able to crack university entrance tests to ensure a good career. Additionally, it was found that teachers agreed that SoSEs, through STEM education, nurture 21st century skills in learners. After interaction with the principal of SoSEs, it was suggested that to fulfil the objective of STEM education at SoSEs, there is a need to make SoSEs entirely residential for teachers and students, then execution of VMC and mainstream education, including the issue of travelling of teachers will be solved quickly".
- The facilities and support systems are available in SoSE. It was found that facilities like laptops and tablets are distributed to students. The VMC classes are held online,

with recorded lectures and doubt sessions taken by the VMC teachers on smartboards. Well-equipped laboratory facilities are available. Resource materials like books, journals, question banks, textbooks and competitive exam materials are provided to each student, and are available in the library. Regarding the change in the attitude of learners enrolled in STEM SoSEs, teachers mentioned that students and parents, both feel proud after admission to these schools, and students had a more confident and positive attitude towards opting for careers in STEM disciplines.

- Concerning the integration of mainstream and VMC classes, it was found that these classes were conducted offline and online. VMC Classes were focused on completing the syllabus of competitive exams by giving their learning material to each student of science stream, while mainstream teachers aimed to complete the NCERT syllabus and prepare students for board exams. The assessment is done regularly and tests are conducted online in VMC class. However, the teachers did formative and summative exams of the learners, following the board exam pattern. Concerning quality aspects of SoSEs, when teachers request some points on the kind of changes they need to maintain the quality of SoSEs. One of the young chemistry teachers of Class 12 suggested, "There is a need to create a scientist-student-teacher partnership to raise awareness regarding STEM education and related fields. SoSEs must hire young teachers with a PG in science and a B.Ed. degree but they need exposure to B.Tech. passed individuals include the need to organise STEM-oriented summer camps for the learners, so that they will attain STEM-oriented skills and be motivated to make their career in the respective field".
- Concerning challenges and concerns of SoSE teachers, it was found that they faced challenges like maintaining the correlation between the NCERT textbook and VMC learning material in context to the difficulty level of the questions. They also face challenges regarding maintaining the balance between the timings of VMC and regular school classes of each subject. One of the female teachers also mentioned, "There is a need to promote equal opportunity further, and make efforts to increase the proportion of minorities and women in STEM-related fields".

Conclusion

After analysing the responses and observations, it was found that there is an urgent need to recruit teachers with expertise in STEM education at SoSEs. Undoubtedly, it will be a great effort of the Government of Delhi to integrate the curriculum into the DBSE course. However, it would require expert guidelines and suggestive modules for the teachers of SoSEs, so that they can implement STEM education as per the curriculum. The study reiterated the need for graduate faculties on the school campus. Remaining access to the resources, such as equipment availability in the lab, library and digital resource access, are all found under good condition at each selected SoSE. The successful implementation of STEM in SoSEs requires quality training of the regular teachers in pedagogical skills. The study also highlighted the need to review teacher training programmes from a STEM perspective. Undoubtedly, teachers are the critical element in the transaction of STEM education and curriculum in the classroom, but in the absence of clear-cut advisory guidelines and administrative support, even a teacher with the best training cannot function optimally. So, the principals and teachers must have a clear vision and training regarding STEM education and its purpose. The study aimed to know the teachers' perception of SoSEs towards the concept of STEM, mainstream education and VMC supplementary education. After the narrative analysis of school teachers' and principals' opinions, it is concluded that both have a pretty good understanding of the concept of STEM education. However, most of them perceive STEM only in the sense of VMC execution, not as an education, which will be able to build problem-solving attitude in the learners and to orient critical perspective. Regarding VMC integration at the SoSEs School, there is a need to rethink the perspective of VMC's execution. Regarding the learner's career motivation, there is a need to choose those learners for the VMC exposure, who are willing and interested in passing the competition level exams. Otherwise, if they are not interested, they must be free to make their concept-building in another related field of STEM, such as to become astronaut, atmosphere and space scientist, biochemists or biophysicists, chemist, ecologist, geologist, physicist in agriculture and food scientist, veterinarian, biologist, microbiologist, pharmacist, nurse, laboratory technician, IT professional (technology, computer and security specialist), software engineer, computer programmer, database specialist, graphic designer, etc. After interaction with

teachers, it is observed that the students of Classes 9 to 12 decided to crack NEET and IIT, i.e., to become a doctor or engineer. The exposure to STEM disciplines in SoSEs provides potential in the learner's skills like problem-solving, critical thinking and scientific attitude, and students have become more career-oriented in science stream. It is concluded that in SoSEs, students receive VMC exposure as a STEM initiative education, further supported by top-notch facilities and experienced teachers who are engaged in extra workload.

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