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The NCERT encourages original and critical thinking in education. The JIE provides a forum for teachers, teacher educators, educational administrators and researchers through presentation of novel ideas, critical appraisals of contemporary educational problems and views and experiences on improved educational practices. Its aims include thought-provoking articles, challenging discussions, analysis, challenges of educational issues, book reviews and other related features.

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OFFICES OF THE PUBLICATION DIVISION, NCERT

NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016 **Phone : 011-26562708**

108, 100 Feet Road
Hosdakere Halli Extension
Banashankari III Stage
Bengaluru 560 085 **Phone : 080-26725740**

Navjivan Trust Building
P.O.Navjivan
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CONTENTS

Editor's Note

After the invasive storm of the pandemic, 29 July 2020 marked the dawn of a new and transformed era of Indian education system, with the advent of National Educational Policy (NEP 2020). The policy ideates to the strengthening of the diversified, green and viable catamaran of Indian education system—with stringers of access, equity, quality, affordability and accountability—to let it unceasingly sail through the 21st century ocean, brimming with vast array of futuristic opportunities. The policy strongly believes to foster a research culture, suggesting for classrooms conducive to critical thinking and investigation acting as incubators of exploration and invention. It recommends future-ready education and resilient learning system to cater to both indigenous and global demands. On reimagining the Indian education system, the policy frames it to be an inclusive and equitable education structure, promoting the idea of student driven learning, a framework which is technology rich and is in practice with contemporary teaching approaches, instilled with moral and cultural values for strong character building. The *Journal of Indian Education* enthusiastically works and extends its partnership in promulgating these tenets of NEP 2020 through its insightful articles and research papers based on the various themes of Teacher Education, School Education, Assessment and Inclusive Education.

Though, the contemporary education shift had already started way back with the technological advances in communication and web but it was the hard hitting COVID-19 which forced and incredibly accelerated the adoption of digital and virtual technologies in the education sector across the globe. Manisha R Vakil and Haresh Kakde analysed the perception of teachers and students about online classes discussing their opinions, choices, problems and comfort in using the advanced technologies of learning. It was discovered that technical issues during course transaction and lack of proper training refrained the teachers from efficiently using the modern virtual aids, thus, adversely affected their quality of teaching and students learning. Moodle is a learning management system that uses free and open source software to help educators create effective online courses. Jagpreet Kaur in her study created a moodle based life skills education module to analyse and understand its role in enhancing attitude and awareness of prospective teachers regarding life skills education as compared to traditional method of teaching. The higher enthusiasm of the prospective teachers in the experimental group for the online courseware corroborated their interest in using today's technologically savvy 21st century skills. Internet is a great tool, if used wisely and within check limits. Krishna Chandra Choudhary, Narinder Singh Rawat through

their paper, 'The Influence of Emerging Technologies on Human Conduct' tried to sensitise on the negative impacts of modern technologies on human behaviour while depicting how adolescent students have been massively effected. The author's finding on digital and virtual addiction seems to be raising critical concerns urging for swift and prompt mitigation measures.

The perceptions of student teachers toward teacher education programmes and its curriculum have always appealed the interest of researchers to reconnoitre the approaches and research gaps for betterment and advancement of the programme. Moni Yadav and Sunita Singh tried to dive deep into the subject calling the attention of the opinion-formers and policy makers on the student teachers' perceptions in relevance to curriculum coverage and students' acquisition of professionalism through contemporary B.Ed. programme seeking further improvisation of the programme and secondary teacher education. A mentally fit and well-adjusted teacher can only make teaching and learning rewarding. It is always the teacher's enthusiasm and confidence that drives the children's interest and motivates them to learn to reach the acme of intellectual achievement and holistic development as per NEP 2020 recommendations. Jasmin James, Augustine George, Prashobhith K P, and Jino Sebastian conducted a study on primary resource teachers group at a state level training programme in Kerala to demonstrate how a momentary practice of aerobics by these teachers immediately improved their mental well-being. Science plays an important role in our daily lives, influencing many of the decisions we make, moreover, NEP 2020 highly recommends that research in science education should be encouraged in order to foster the scientific temperament among students.

Kusum, though her study tries to examine the impact of scientific aptitude on academic performance of senior secondary science students in Haryana state based on their school, gender, stream, and coaching. The results manifested that students in private schools, female students, and students who take coaching performed better academically, having higher scientific aptitude than their peers. However, there was no statistically significant difference in academic performance between non-medical and medical students.

Parenting is a never-ending task and is inextricably linked to child development. Parents not only serve as a visionary for their children, but also as torchbearers providing the child with right guidance on lessons of life. 'Type of Parenting as a Moderator of Stress and Youth Problems in Adolescents' is a study conducted by Poonam Punia and Nikita Chaudhary to raise awareness levels on this critical subject while investigating the effects of parenting type on stress and other related problems of adolescent students discovering a positive correlation between single parenting and adolescent students' stress levels. Sukanya and Poonam tried to call the attention on the subject of

adolescent risky behaviour. They developed and standardised a scale named Adolescent at Risk Screening Scale (ARSS) to screen and gauge the at risk adolescents. An examination of the scale evidenced its content validity and internal consistency, thus, making it an effective evaluative tool to assess the efficacy of educational programmes promoting adolescent well-being.

Shivani created a bilingual (English and Hindi) science self efficacy scale for measuring self efficacy beliefs in science subjects among secondary school students of Haryana government schools. The scale included five dimensions of science self efficacy namely, 'self confidence', 'self regulation', 'self concept', 'perceived science efficacy' and 'outcome expectancy'. The statistical analysis evidenced on its effective usage as a reliable and valid tool in assessing the self-belief of students who, in general, struggle with understanding and applying scientific concepts. Physics and mathematics are so intrinsically intertwined that it is really beyond imagination to study each subject individually. And it is this interlace between the two disciplines that make it more enigmatic for students. Shyma Usman Abdulla, Mumthas N S in their article highlighted these difficulties of higher secondary grade students of Kerala in solving physics problems based on the application of mathematical concepts while citing an example of the topic 'Motion'. The end results of the research suggested that the teachers' should first try to identify the basic conceptual foundations of students before teaching them arduous theories and principles.

NEP 2020 lays stress on experiential and skill based learning framework for the school education which eventually hankers for more academically resilient learners. Rajwinder Kaur and Gagandeep Kaur explore the association between academic resilience and academic achievement in terms of academic confidence, motivation and ability to get goals, relationship with peers and adults. The conclusions lead to the idea that teachers should practice innovative teaching strategies leading to academic enrichment, concept formulation, and better understanding with development of resilience in students. Shankha Shekhar Rakshit and Sumedha Mukherjee in their article 'Whose Disability? A Centrifugal Quest to Confront the Stereotypical Views on Disability' portrays the society's rigid stereotypes on the crucial issue of disability. The authors questions the society's stereotypes and suppositions while probing them to introspect on their surmises with several illustrations of achievements of the people suffering from any type of physical or intellectual disabilities indicating how their conjectures lacked rationality and critical thinking over a matter. The paper highly advocates towards the sensitisation of society on the pressing concern of inclusive education. With the shift from traditional teacher centred learning to the contemporary pedagogical approaches for student centred learning, there arises a need for learning-based evaluation in education rather

than a testing-based culture to assess student performance and progress. Assessment for Learning (AfL) is one such evaluative approach which focuses on the personalised learning process rather than academic grades. In line to this thought, Sweta Gupta attempts to accentuate the potential power of formative assessment, which, when used in conjunction with summative assessment, contributes to improving students' learning and raising the educational quality.

Kamalpreet Kaur Toor through her study 'Private and Public Schooling: The Experience of Rural Punjab in School Education' explores the significant reasons for the rising demand of private school education in Punjab among rural community accompanied with the steady drop in the enrolment ratios in state's government schools. Her findings pointed on private schools consistent performance in terms of learning outcomes with the attendance regularity of the teaching staff and political conspiracies to be some of the pronounced grounds for the disparity in enrollment rates between the duos. Basic computational skills, quantitative reasoning, and spatial ability are all considered to be part of mathematical literacy and undoubtedly, it is a subject which requires mental rigor to excel on the results. Madhu B and Biju K did a critical analysis of the policy documents to canvas picture of the evolution of mathematics education in India to lay open the grey areas for upgradation and advancement.

We expect that our readers would be able to relate their personal experiences with the issues or concerns discussed by the authors of these articles or research papers presented in the current issue. We invite our readers from different levels of school education and teacher education to contribute in the journal by sharing their knowledge in the form of articles, action research reports, theoretical papers, book reviews, etc. Your valuable suggestions and comments for improvement of the quality of the journal are welcome.

Vijayan K
Academic Editor

Perception of Students and Teachers Regarding Online Teaching-learning during Pandemic Time

Manisha R Vakil* and Haresh Kakde**

Abstract

Internet and new technologies gained importance in several fields including education sector, which gave the scope for online classes. In addition to this, the COVID-19 pandemic worldwide has also added to the need and relevance of online classes making it necessary to understand student–teacher perceptions regarding online classes. The study is aimed at analysing the perception of teachers and students about online classes. It tries to explain the opinions of students with regards to the impact of online courses, their comfortability in its usage, and the support received from teachers in online classes along with teachers' opinions on efficacy, teaching practice followed and training received for an online class. The analysis was carried out using the data collected through two separate structured questionnaires for students and teachers in Vadodara district of Gujarat. Data were recorded in SPSS and analysed using descriptive statistics. The study reveals that students are comfortable with online classes and are getting enough support from teachers but they do not believe that online classes will replace traditional classroom teaching. It also finds that teachers are facing difficulties in conducting online classes due to a lack of proper training and development for doing online classes. Technical issues are the major problem for the effectiveness of the online classes. This study helps schools get a general view of online classes among teachers and students.

*PhD Scholar, Parul Institute of Arts, Parul University, Vadodara, Gujarat.

**Research Officer, Department of Special Education, All India Institute of Speech and Hearing, Mysuru.

Introduction

In India, quality in teaching-learning of primary education is important to be ensured because it is a reality that many students attend the public and Non-Government Organisation (private schools) schools. Private schools are imparting non-formal education beside the public schools. But they are under constant pressure to fill in the gaps left by declining state provision in the formal education system. The private school sector has secured importance within the primary education system of India, and its primary education programmes are independent of government management and involvement, as the programmes do not receive government fiscal support. E-learning is primarily referred to as the use of technology and network communication for teaching and learning (Nashir and Laili, 2021). Coman et al. (2020) has referred to e-learning as a technology-enabled transfer of skills and knowledge to a large number of recipients. It is among the technological trends in education that is expanding the quickest. Because of the internet and the world wide web, educational institutions have had to adapt their teaching methods in order to provide an optimum learning environment for their students. With the aid of internet-based technologies, Van der Spoel et al. (2020) suggest that an online class is a system where students can learn subjects, communicate with other students about problems, ask questions of the teacher, and share materials and track academic progress. According to Aliyyah et al. (2020), Mishra et al. (2020) and Motte-Signoret et al. (2021), online courses are so commonplace these days that they are probably expected in any formal education curriculum.

Moreover, the widespread COVID 19 pandemic also added to the importance of online classes (Unger and Meiran, 2020). According to Khan et al. (2020) in India, there are more than 370 million users are on the internet that are helping online education to grow at a fast pace. At present, more than 3 billion users are using the e-learning platform. Gopal et al. (2021) revealed that the growing Compound Annual Growth Rate (CAGR) percentage of online education in India is approximately 19 per cent by 2020. According to Choi et al. (2021), the recent report of Coursera, one of the world's largest online education providers, out of 18 million registered learners, 1.3 million users are from India, making it the third-largest market for online learning after the US and China.

The new National Education Policy (NEP 2020) in India gives importance on the development of cognitive abilities to each of the students, like—problem solving and critical thinking. According to Banerjee et al. (2021), NEP 2020 came to improve the quality of education. As per the findings from Chopra (2020), NEP 2020 is going to move from marks-centric to skills-centric, learning-centric to research-centric, information-centric to knowledge-centric and choice-centric to competency-centric.

Despite the quick advancements we see in e-learning, it is still in its infancy. In this situation, teachers and students' role-playing is given the appropriate weight because learning and motivation are greatly influenced by their views and attitudes. In the end, acceptance of both the students and instructors is key to realise the advantages of online learning. In this sense, the study attempts to assess teachers' and students' perspectives on the superiority of online learning over traditional classroom instruction.

Objectives of this Study

The main objective of this study is to analyse the perception of teachers and students about online classes. This research explains the opinions of students on the impact, comfortability and support of teachers in an online course, along with teachers' views on the efficacy, teaching practice and training for an online class. Also, this study attempts to identify the tools used for online class, reasons for not conducting online class (teachers' perception) and reasons for not preferring online class (students' perception).

Method

Study Design

This study utilised a descriptive quantitative design to obtain the opinions of the respondents.

Study Population

This study investigated the student teachers' perception of an online class in the school of Vadodara district of Gujarat. The respondents of this study consisted of all the students and teachers from different schools in Vadodara district, Gujarat. It identified students who are pursuing their studies in these schools via online mode. Teachers and students were selected for this study on a random basis. These students and teachers are from different academic level in the school. The population also diversified in demographic profiles like age, gender and native place. Yates formula was used to select sample size from the total population.

Study Sample

Simple random sampling techniques were used for the selection of the sample. The sample size consists of 68 teachers and 203 students from different schools in the research area. This research study conducted two surveys; one to the student population and the other to the teacher population.

Research Tool

Five-point Likert scale was used to collect the opinion of both teachers and students in the online class. Five-point Likert scale indicates 1 being 'strongly disagreed' and 5 being 'strongly agreed'. After constructing a questionnaire, to know the feasibility of the questionnaire, a pilot study was conducted and the questionnaire was reviewed. A survey instrument with demographic questions for students, demographic questions for instructors, questions for students regarding perceptions of

'Impact,' 'Comfortability' and 'Support from the teacher' and for instructors related to perceptions of 'Teaching Practice' 'Efficacy' and 'Training and Development' was available. Questionnaires were shared with the participants in the form of Google form. They were also informed that their responses and opinions would be kept confidential.

Data Analysis

The data were collected and recorded in a systematic way, which were later analysed by using Statistical Package for Social Science (SPSS) version 20. Collected data were categorised into demographic information, perception and tools used. Secondary sources were used for reviewing the concept and supporting the findings.

Results

Demographic Profile of the Respondents

The demographic details of both teachers and students were collected to know their background like gender, education, number of years of online teaching-learning experience of teachers and course pursuing, number of years in the online class of students. The following table explains the demographic background of the respondents (Table 1).

Table 1: Demographic Profile of the Respondents

Teacher's Demographic profile	Variables	N (%)	Student's Demographic profile	Variables	N (%)
Gender	Male	29 (42.6)	Gender	Male	62 (30.5)
	Female	39 (57.4)		Female	141 (69.5)
Age (Years)	Below 29	45 (66.2)	Course pursuing	Language subjects	114 (56.16)
	30–49	21 (30.9)		Mathematics and Science	43 (21.18)
	50 and above	1 (1.5)		Social Sciences	30 (14.78)
Teaching experience (Years)	0–5	44 (64.7)		Higher secondary school experience	15 (7.39)
	6–10	18 (26.5)			15 (7.39)
	11–15	2 (2.9)			15 (7.39)
	16–20	4 (5.9)			15 (7.39)
Conducting online classes	Yes	43 (63.2)	Taking online class	Yes	150 (73.9)
	No	25 (36.8)		No	53 (26.1)
Online teaching experience (Years)	1	35 (81.4)	Computer Knowledge	High	138 (67.9)
	1–2	7 (16.3)		Medium	60 (29.6)
	3–5	1 (2.3)		Low	5 (2.5)
	5 and above	0			

Table 1 indicates the demographic profile of the respondents, which show that females are major respondents in both teachers and students categorisation. Table reveals that—online classes were conducted by maximum teacher respondents while maximum student respondents attended the same. The majority of the teachers have a post graduation degree with B.Ed. qualification, and 60.9 per cent of the respondents are young faculty having teaching experience less than five years. About 80 per cent of the teachers are conducting an online class for the first time due to the COVID-19 pandemic. Responses were collected from the students of different fields of study. As to conduct online classes, computer knowledge or internet knowledge is essential, therefore, the researcher also asked the students about their level of expertise in computer and most of them had a high level of computer knowledge.

Tools used for Online Class

There are enormous numbers of online class tools available in the market where some of them are available for free, while other premium categories require payment. To know the popular tools used among participants, the researcher asked them to mention the tools they used for their online classes. For this question, participants can specify more than one option. The result of the matter is depicted in the following figure (Figure 1).

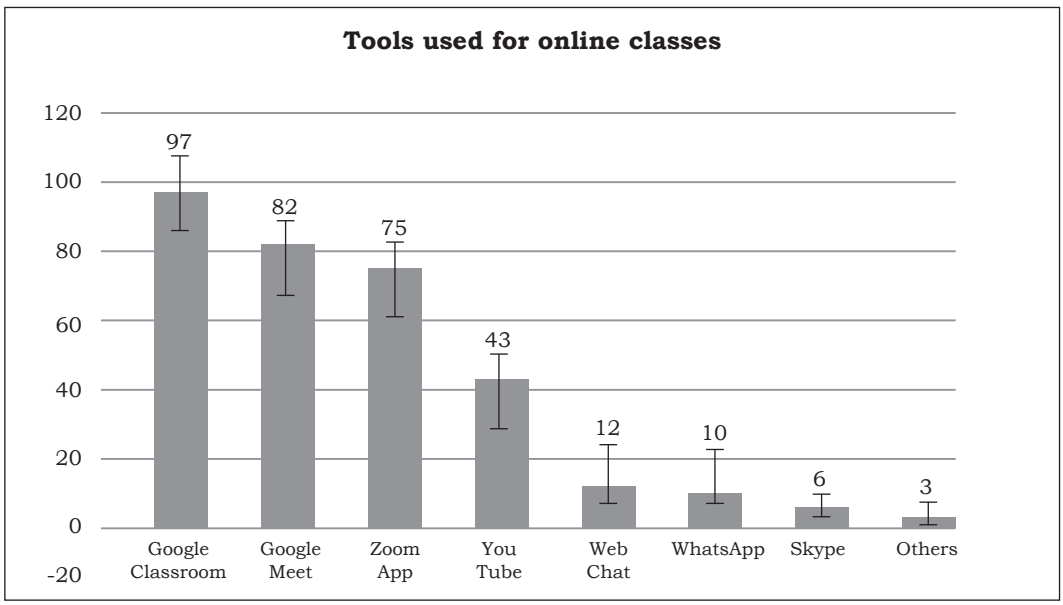

Fig. 1: Tools used for online class

From the above chart, we can quickly identify that among the many popular online tools available in India 'Google classroom' is mostly used and a preferred tool for an online class in Vadodara district while 'Google Meet' is the second most popular and preferred choice. Even though 'Skype' is the most popular online tool for communication, but here it is listed in least used tools. Here the interesting fact is that many academicians are using social network tools (WhatsApp) for online classes. This analysis explains that easy and convenient tools are used for online class irrespective of their purpose.

Students' Perception of Online Class

It is the students whose opinion matters the most in the education system. Online classes may become a chunk of the future education system, but it cannot be carried to the future unless students accept it. Therefore, the survey also asked students about their comfortability, support received from teachers and the impact of online class on their studies. To observe the selected variables, a questionnaire was constructed by asking statements on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Exploratory Factor Analysis (EFA) was performed to evaluate our survey instrument. The EFA was separately conducted for 'Impact', 'Comfortability' and 'Support' using Eigen values more significant than one as the criterion, while each of the variables suggests a one-factor solution. After that, we eliminated items with factor loadings below 0.50 (Table 2).

Table 2: Exploratory Factor Analysis

Factor	Statements retained	% of variance explained	Communality
Impact	I have a positive impact on my studies due to online class	73.349	0.843
	Online classes have increased my technological literacy	9.152	0.829
	I feel online classes help me to gain more knowledge	7.561	0.877
Comfortability	I feel comfortable using online learning tools	39.520	0.662
	I feel learning is same in class and at home on the Internet	24.963	0.721
	I find it hard to stick to a study schedule of the online course	8.196	0.725

Support from Teacher	I receive enough support and resources from my teacher	71.616	0.530
	My teacher encourages discussion in an online class	9.444	0.690
	My teacher sets guidelines for effective communication and interaction in an online class	7.124	0.760

Above, Table 2 explains the percentage of variance defined by each item and communality value. Initially, in the questionnaire, we asked five statements related to 'Impact of Online Class,' seven statements related to 'Comfortability,' and six statements that represent 'Support.' EFA was conducted to reduce the number of items that least explains the respective factors. While doing the analysis, it was observed that for the 'Impact' factor, three statements describe 90.06 per cent of the factor; therefore, the researcher excluded it in the study. Here the value of communality, which explains the extent of variance, is considered for extracted factor (if the communality value is less than 0.5, it would be removed from the factor). In the case of 'Comfortability' out of seven items, three items explain 72.679 per cent of the factor with communality value more than 0.5 and in 'Support from teacher' out of seven items, three statements describe 88.184 per cent of the element. After conducting an EFA, researcher conducted a reliability test for selected items of factor. Reliability analysis was undertaken to know the consistency in opinions among scale data. If the Cronbach's alpha value is more than 0.6, then it is considered as reliable data; otherwise, there is a need for improvisation of data either by transformation or by collecting more data. Students' comprehension, mindset and attitude toward online classes are essential aspects for the success of online teaching. It is crucial to create an opportunity for outside interaction between faculty and students to increase the motivation of students to learn. On this behalf, the researcher identifies the perception of students on three critical questions like impact of online class on students, if online class is comfortable to students and whether students get enough support from teachers.

From the results of the descriptive statistics, it explains that students opined that an online class has a significant impact on their learning style, and they agreed that they get support from the teacher in online class like getting good reading material and clarifying their doubts through online tools. However, students do not believe that an online class replaces the traditional face-to-face classroom teaching, and

they feel that online courses are not comfortable when compared to the conventional method of teaching.

Teachers' Perception of Online Class

The other important pillar of online teaching is the teacher. Their interests and skills in handling online classes are essential aspects. How did teachers perceive online classes, whether teachers are capable of handling online classes, these are the questions that arise before implementing it because some of the faculty members may not always have the competency to teach courses online. A cultural background constructs a different perception among teachers. Therefore, the researcher felt that it is not unfair to collect opinions of both the participants, i.e., students and teachers. In addition to demographic information, the survey asked about the teachers' perception of their teaching practices, their general self efficacy in teaching and technology and the professional development they received and expected to win. The items like 'Teaching Practice' 'Training and Development' and 'Efficacy' are collected through five-point Likert scale, ranging from 1 as (strongly disagrees) and 5 as (strongly agree). As this questionnaire was well constructed and verified in the previous research, the researcher directly did the descriptive analysis (Table 3).

From the results of the descriptive statistics, it appears that teachers agreed with their teaching practices, and they are very much confident in the effectiveness of online classes they conducted. However, they are not satisfied with the training and support given by the institution.

Some of the respondents expressed their opinion in the open-ended question, stating that they believe that "online class will increase unemployment or reduce the demand of teachers", "online class failed to fill the emotional attachment between teacher and student", "without providing proper infrastructure facility it is challenging to conduct online class" and they also opined that "it is challenging to conduct an online class for practical subjects." Conclusively, we can say that teachers are not supporting the idea of implementing online classes without proper training and proper infrastructure facilities like network and computers.

Table 3: Descriptive Statistics for Teaching Practice, Efficacy, Training and Support

Descriptive statistics	N	Minimum	Maximum	Mean	Std. Deviation
Teaching practice	20	3.17	4.33	3.60	0.33
Efficacy	20	1.80	5.00	3.40	0.78
Training and support	20	1.00	4.17	2.86	0.72

Reasons for not Conducting or Preferring Online Class

Though, online classes are value-added techniques for the modern education system which has future prospects, many teachers and students do not believe in this aspect or are not comfortable in an online class. Therefore, the survey asked those teachers and students who were not conducting or preferring online classes to specify reasons.

Figure 2 shows that the main reasons for teachers to not conduct online classes are "due to technical issues" and also that the "teachers believed that the traditional method of teaching is a better method for effective teaching". In addition to this, some teachers also opined that they do not feel secure in private online tools like the 'Zoom' app. They also believe that in an online class it is challenging to have an emotional attachment with students and vice versa.

Students' participation is an essential aspect for the successful implementation of online classes in the current education system. Many students believe that an online class has greatly transformed the education system, and they prefer it because of its time and location flexibility and broad knowledge base availability. However, some students believe that online class cannot reach them, and they stated reasons for rejection of online class (Figure 3). The same reasons have been cited in the work done by Choi et al. (2021), Dost

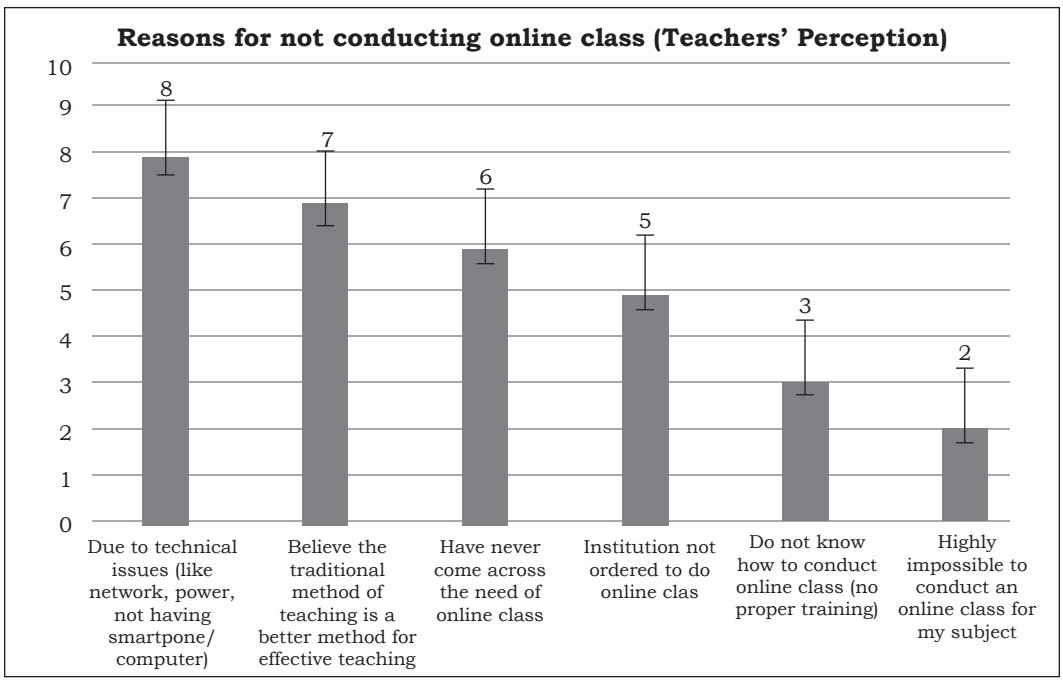

Fig. 2: Reasons for not conducting online class (teachers' perception)

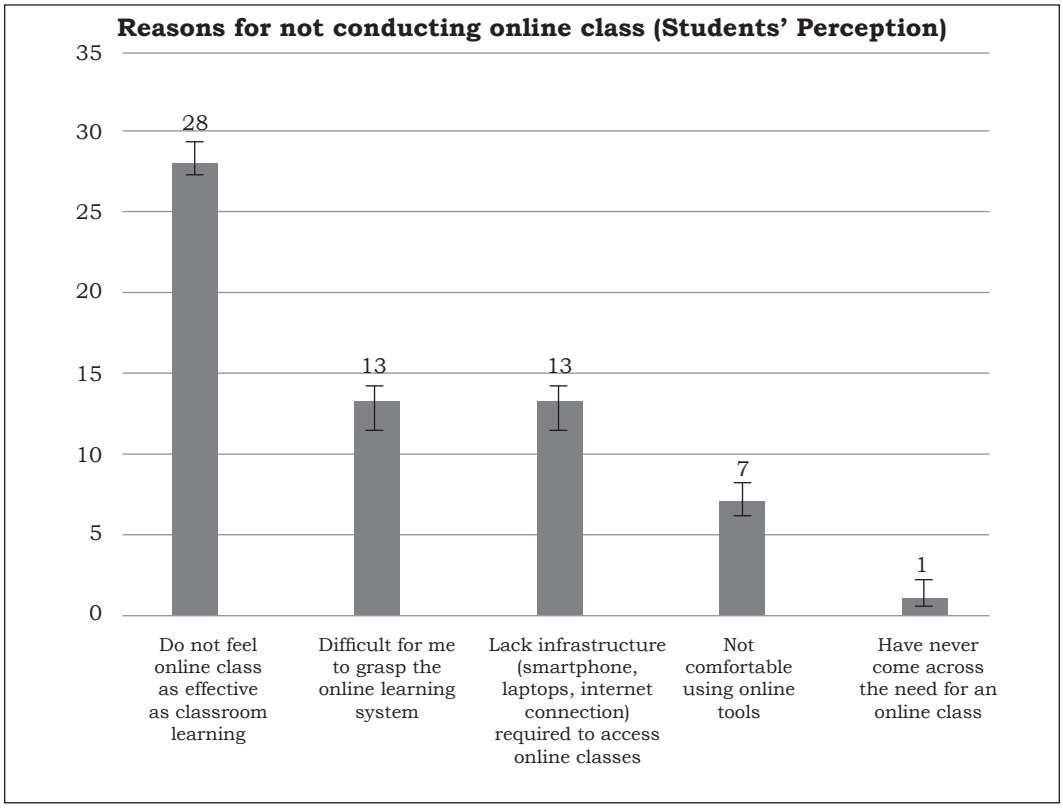

Fig. 3: Reasons for not preferring online class (students' perception)

et al. (2020), Szopiński and Bachnik (2022), Chen et al. (2020) and Bordoloi et al. (2021).

Figure 3 explains the reasons for not taking online classes from the students' perspective. Students opined that online class is not an effective method as classroom learning (82.4 per cent), and they also have the opinion that it is complicated for them to grasp the online learning system. It is observed from both teachers' and students' views that lack of infrastructure for an online class like availability of smartphone or laptop and network issues are the major problem or reasons for the insignificance of online class among respondents. The same reasons for the insignificance of online class among the students and teachers were recorded by Song et al. (2021), Cahyadi (2020), Gu et al. (2021), Biswas et al. (2022) and Huang et al. (2021).

Discussion

The findings allow us to address the two aspects in the study. The first aspect was "opinions of students

on the impact, comfortability and support of teachers in an online course". The results indicated that the student's opinion matters the most in the education system. Our study tested the variables like 'Impact', 'Comfortability' and 'Support' to assess the first aspect in this study. In this study, students opined that an online class had a significant impact on their learning style and they agreed that they get support from the teacher in online class like getting good reading material and clarifying their doubt through online tools. This finding concurs with many previous studies that reported on receiving support from the teacher in online class. For example, Song et al. (2021) reported 79.8 per cent of 203 students displayed that students agreed that they get support from the teacher in online class like getting good reading material and clarifying their doubt through online tools. On the contrary, Cahyadi (2020) concluded that few students opined that an online class did not have significant impact on their learning style, and further they agreed that they did not get support from the teacher in online class like getting good reading material and clarifying their doubt through online tools. In few studies, an online class style is recognised as an effective way of teaching. This discrepancy between online class and classroom teaching suggests that on one hand, more training and support programs are necessary in online class education to facilitate the instructional change while on the other hand, more detailed discussions are necessary to further specify what are actions and what are true student-centred ones.

With regard to the second aspect in this study—"teachers' views on the efficacy, teaching practice and training for an online class", indicated that they do not believe in this aspect of being or not being comfortable in an online class and always have the competency to teach courses online. These findings provide useful information for training programs for teachers. By taking concrete actions, the instructors can improve their performance on "flexibility of online teaching development" and "assessing student needs" for online programmes. Gu et al. (2021) reported 64 percent of 184 teachers reported that they do not believe in this aspect of being or not being comfortable in an online class and always have the competency to teach courses online. On the contrary, Biswas et al. (2022) concluded that they believed in this aspect of being or not being comfortable in an online class and always have the competency to teach courses online.

India has adopted NEP 2020 and is taking concrete steps towards online learning for the betterment of students. The same are highlighted in the studies undertaken by Gupta

(2022). As suggested by Agnihotri (2022), not only students, but even the teachers are required to follow the guidelines laid out in the report of *PRAGYATA: Guidelines for Digital Education*.

Conclusion

Online learning is an exciting new way to learn about almost anything. It has bought a positive impact on the lives of students as well as teachers. The increasing use of technology in the field of learning has improved the quality of education. Both students and teachers have optimistic views about online classes. However, there is always much room for improvement as far as online learning goes. It is evident that online learning has benefits that are more significant as it fills the gap of literacy rate by reaching the rural areas. Still, to effectively implement in a country like India, certain things shall be considered. This includes strengthening infrastructure facilities, improvement in Internet connectivity, development of rural areas, bringing changes in the attitude of students and teachers, etc. One of the most important initiative to strengthen the above aspects is the implementation of NEP (2020) in India.

Recommendation

Schools and other educational institutions are required to provide excellent training and support to both students and teachers regarding the usage of online classes that helps in increasing their comfortability. 'No smartphones or laptop' is one of the major problems of rural students, and network issues also added to the problem for rural teachers and students. One of the major problems faced by students from a rural area is that the teachers need to observe the transition in their roles, i.e., from merely being a transmitter of knowledge to the designer of the educational process. In traditional classroom learning, students are always said to be spoon-fed, but online classes necessitate a learner-centred environment that requires students to be self-motivated and self-directed. Schools and teachers need to put efforts into changing the mindset of the students. To achieve this goal, school or government has to take training and development programs to teachers as well as students regularly. The study also proved that e-learning has a more significant role to play in the future, but it cannot be a replacement to traditional face-to-face classroom learning. A complete transition to online learning is quite tricky. However, we cannot ignore the benefits derived from e-learning. As such, there is a need to understand the obstacles that come in the way of accepting online learning and take corrective measures to overcome it.

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Effectiveness of a Moodle based Life Skills Education (LSE) Module for Prospective Teachers

Jagpreet Kaur*

Abstract

Moodle is a learning management system which is designed to enable the educators to create effective online courses using its free and open source software. In the present study, Moodle was used as a platform to develop an online Life Skills Education (LSE) course. Life skills education focuses on the overall personality development of the child by enabling them to handle any kind of life situation. It also encourages them to face their struggles to achieve their targets. The main aim of the present study is to develop a moodle based life skills education module for prospective teachers and investigate its effectiveness on attitude and awareness of teachers regarding life skills education. The study was conducted following a quasi experimental research design on a cluster sample of 100 prospective teachers. The sample of the study was taken from the intact classes of M.Ed. first and second year students from Department of Education, Punjabi University, Patiala using cluster sampling technique (N=100). Attitude towards life skills education scale and life skills awareness test along with an online course on life skills education using Moodle platform based on the 10 life skills as identified by World Health Organisation were prepared by the investigator to conduct the present study. The data was analysed with the help of analysis of covariance technique. The results revealed that moodle based life skills education module has a significant and positive effect on attitude and awareness of prospective teachers regarding life skills education as compared to traditional method of teaching. Implications of these results are discussed in the context of teacher education.

*Assistant Professor, Department of Education, Punjabi University, Patiala.

Introduction

During the last two decades, there has been rapid advancement in the field of educational technology and online teaching. The era of pandemic further provided more opportunities for the application of new online tools, approaches, frameworks and innovative pedagogies in order to facilitate online teaching and learning.

There has been a significant impact of technology on our lives in terms of our ways of doing things and interacting with others. Certainly, it helps in improving our lives and provides us new opportunities. At the same time, it dominates our lives and leads to wastage of our time as well. It acts as a powerful distractor particularly for the young generation. In a similar vein, the scenario of higher education has also undergone a sea of change with the advent of various types of technological innovations. During the pandemic period, we have witnessed enormous changes in the teaching-learning process. Offline teaching shifted to online teaching and there was no face-to-face contact of the teacher with the students. Teachers taught in a virtual environment and students also learnt in the online mode. The traditional mode of teaching where teachers interact with the students in face-to-face mode will always be the backbone of any education system but can be supplemented by using different innovative pedagogies and interactive online tools. Creating many more such opportunities to learn in online mode and more number of such providers can help the students in today's era of online learning.

Twenty-first century learners are techno-savvy and they like to learn using different types of technologies. Also, the 21st century teachers are also expected to possess digital skills to teach their students using different types of online and interactive tools. Holtham et al. (2012) in a position paper stressed upon the need to design a next-generation learning environment which will be based on semantic web-based technologies and pedagogies of the mid 21st century, rather than non-semantic technologies derived from the end of the 20th century, and pedagogic mindsets derived from the nineteenth century. For this purpose, teachers are expected to continuously learn and update themselves to meet the expectations of 21st century learners. The pandemic situation further gave impetus to the professional development of teachers for building their competence for teaching in the virtual environment.

In a similar vein, technology is an enabler and a valuable tool for executing the life skills programmes as well. Integration of information and communication technology helps in acquiring life skills that aid in the process of development in the present context of ongoing economic and information order. A variety of digital technologies such as internet,

cameras, video and audio-recording tools, different types of computer software and even mobile phones can be effectively used in implementation of life skills programs. Youngsters find it easy to work with these media technologies. They use the technology and media in exciting and creative ways. Present day technologies help youth in connecting though social media communities and expressing themselves along with developing certain technical skills such as being more proficient in using audio and video-recording equipment and better computer literacy. Certain other life skills which can be developed among youngsters through such technology-integrated programmes are soft skills such as communication, self-confidence, decision making and teamwork.

A variety of Learning Management systems (LMSs) and online tools can be used to develop online courses which may supplement the face-to-face teaching. Researches reveal that Moodle is an adequate and complete online platform that can be used for the higher education students. A number of features are available on the Moodle platform such as discussion forums, quizzes, big blue button and assessment, etc. which are user-friendly and can be easily used by the teachers for the purpose of online teaching and assessment.

Over the last decade there has been an increased interest among mental health professionals in the area of life skills. Although the exact nature and descriptions of life skills are likely to differ across social and cultural contexts, an analysis was made and a core set of skills for successful living was identified by World Health Organisation (1997). Accordingly, life skills are defined as abilities for adaptive and positive behaviour that enables individuals to deal effectively with the demands and challenges of everyday life. There are innumerable life skills. Some are specific to certain situations while others are of a generic in nature. Based on various theoretical perspectives, as well as intervention and training in this area across cultures, a core set of ten generic life skills are identified which are basic to every culture and can be used for promotion of psychosocial health in children and adolescents.

The basis of developing module for Life Skills Education (LSE) using Moodle platform is interdisciplinary focusing on the ten core life skills namely problem-solving, critical thinking, creative thinking, decision making, effective communication, interpersonal relationship, self-awareness, empathy, coping with emotions and coping with stress as identified by World Health Organisation (1997). The process of course development followed the design methodology for an online course. Online course is developed in four phases. In the first phase, needs analysis is done followed by designing the course curriculum, course content development and evaluation

which is usually done at the end of the course. Online course includes both the components: course content and the online platform having inbuilt interactive tools. Various ICTs can be integrated with LSE using a variety of online tools in three different ways: i) the learners are provided with opportunities for doing reflective practice; ii) life skills related online learning objects using open source tools that are already available on the internet and; iii) creating interdisciplinary and interactive LSE related learning activities by integrating ICTs.

Review of Related Literature

The overview of the review of related literature indicates that Moodle platform is generally used for delivering course content, course progression plan, grading, creating activities, collecting course feedback and communicating with course participants. Lasić-Lazić et al. (2017) found it to be an effective interactive learning platform by which students high-quality learning can be achieved. However, Hasan (2019) raised certain issues regarding the usability of Moodle platform. It was observed that a large number of students identified nine usability problems on Moodle interface and a large number also identified and suggested nine improvements to the design of Moodle interface. During the COVID-19 pandemic period, Rachmadtullah (2020) indicated that the use of the Moodle based blended-learning model in elementary school education is effective and can be used as a network-based learning solution. In another study by Sharma et al. (2020), it was interesting to note that web-based teaching and traditional teaching, both were effective in improving knowledge of students. Web-based teaching programme designed on Moodle is accepted by the students. Gudkova et al. (2021) observed that Moodle facilitates student-centred learning allowing students to complete tasks anywhere and anytime. Both students and instructors expressed positive opinions towards learning English via Moodle.

In a similar vein, Thaila et al. (2021) confirmed that Moodle/VLE is an effective tool and the easiest device for continuing distance education at South Eastern University in Sri Lanka. In a recent study, Gamage et al. (2022) showed that Moodle is increasingly being used as a platform for adaptive and collaborative learning and used to improve online assessments. In another interesting research, Al-kreimeen and Murad (2022) observed that implementing Moodle technology into teaching had a positive impact in reducing future anxiety and increasing psychological happiness among university students. The researcher reviewed a plethora of researches on effectiveness of Moodle across varied disciplines. However, the researcher could not locate any study in the context of LSE. Moreover, there has been dearth of such studies

in Indian context as well. In the light of inconclusive research evidence, the present research was an endeavor to develop a Moodle based LSE module and to investigate its effectiveness on attitude and awareness of prospective teachers regarding LSE.

Significance of the Study

The higher education landscape has undergone significant change as a result of technological innovations during COVID-19 period. A variety of pedagogical innovations were witnessed in the teaching-learning process during the pandemic period. Now a days, ICTs are important tools for reaching greater numbers of learners as well as facilitating new ways of learning and understanding that will be required to implement the complex solutions. The continued expansion of network technologies, bandwidth, and computer capacity, coupled with increasing user familiarity with the tools, social networking applications, and the acceptance of innovative pedagogical methods in the educational system offer new and exciting possibilities for LSE. In further exploration of the connection between ICTs and LSE it has been observed that there is little research available that demonstrates and confirms the synergies between these areas of practice. Although there is a wealth of research on educational technology, a further step needs to be taken to link ICTs for LSE. Finally, there is a need to devise new measures for learning outcomes in an ICT-supported and connected learning environment, as well as to determine whether educational pedagogies, tools and learning environments are really helping to educate citizens to live peacefully.

The link between ICTs and LSE is being addressed by extensive debates and research which recognise the challenge ICTs bring to the reorientation of LSE to learn to live upto one's full potential. ICTs can help learners explore concepts, engage in problem-based and authentic learning, enhance meta-cognitive skills and present information using multiple media. The review of related literature revealed that most of the studies focussed on the cognitive aspect of use of the Moodle based virtual learning environment. The present study focussed on assessing the effectiveness of Moodle platform on affective aspect of teacher educators in terms of attitude and awareness regarding LSE. Hence, to recognise the alarming need for enhancing awareness of LSE among prospective teachers, the present study focuses on the development of a module for LSE using Moodle platform; and to test the effectiveness of this module on attitude and awareness of prospective teachers towards LSE.

Objectives of the Study

The objective of the paper is to study the impact of a Moodle based module on attitude and awareness of prospective teachers towards LSE.

Method and Procedure

The study was conducted through quasi-experimental method of research to investigate the effect of a module for LSE using Moodle on awareness of prospective teachers regarding LSE. In the present study, two groups, pre-test, post-test, quasi-experimental research design was employed.

Sample

The study followed a quasi-experimental research design on a cluster sample of 100 prospective teachers. The sample of the study was taken from the intact classes of first and second year M.Ed. students from the Department of Education, Punjabi University, Patiala using cluster sampling technique (N=100). Out of the two groups of M.Ed. Students, i.e., M. Ed. first semester students taken as experimental group were taught through Moodle platform as learning management system and M. Ed. third semester students were taken as control group who were taught through traditional method. The two groups in the study are experimental group on which LSE module was introduced using Moodle platform and lecture method was used as method of teaching for the control group.

Research Tools Used

Attitude towards LSE scale: This attitude scale was developed for the purpose of the present study. The final draft of the scale contains 23 items on a five-point scale. The respondents are required to indicate their response to each statement on a 5-point continuum ranging from 'strongly agree' to 'strongly disagree'.

Construction and Standardisation of the Attitude Scale

Initially, a pool of 30 items was prepared for the preliminary draft of attitude towards LSE scale. A sample of 100 M. Ed. students from teacher education colleges affiliated to Punjab; University, Patiala was drawn for the purpose of try-out of the preliminary draft of this scale. The respondents were requested to respond to all the 30 items of the preliminary draft of the scale on a 5-point continuum. Thus, the range of scores on the preliminary draft of attitude towards LSE scale was 30–150. There were 13 positively worded statements and 17 negatively worded statements in total.

Reliability

The relationship between two halves of the scale (r_{hh}) came out to be 0.93. When corrected by applying Spearman-Brown Property formula, the correlation (r_{tt}) turned out to be 0.93, significant at 0.01 level. This indicates that the attitude towards LSE scale may be considered internally consistent and reliable.

Validity

In the present study, content validation of the attitude towards

LSE scale was done while preparing the preliminary draft of the scale and with the help of expert opinion of 5 teacher educators and 5 language experts with regard to the relevance of each item in the scale. Hence, the scale has high content validity.

Awareness of LSE Test: This test was developed by the investigator herself, containing 33 items. Awareness of LSE test is a Yes/No questionnaire. Each question was followed by four options, out of which only one option was correct, while the other three options were distractors. The respondent was awarded one mark if selected the correct option and a score of zero was awarded for every incorrect response.

Construction and Standardisation of the Awareness Test

The preliminary draft of the awareness of LSE test was a Yes/ No questionnaire. There were 38 questions in total and each question was followed by four options, out of which only one option was correct, while the other three options were distracter. Preliminary try-out was done individually to improve and modify the language difficulties and ambiguity of the items. This try-out was done on 100 M. Ed. students of different teacher education colleges affiliated to Punjabi University, Patiala.

Reliability

The relationship between two halves of the scale (r_{hh}) came out to be 0.75. After correction using Spearman-Brown Prophecy formula, the correlation (r_{tt}) turned out to 0.75, significant at 0.01 level. This indicates that the awareness test of LSE scale may be considered internally consistent and reliable.

Validity

The adequacy of all the questions of the test was checked with the available resource material on LSE and allied issues. Secondly, the help of expert opinion of 10 teacher educators and 10 language specialists with regard to the relevance of each question in the test was sought. Hence, content validity of the test was established.

Development of LSE Module using Moodle Platform

The module for LSE using Moodle platform was prepared by the investigator herself. This module was based on the concept and significance of LSE along with the theoretical framework and activities related to ten life skills as identified by WHO (1997). The e-content, resources and the activities pertaining to all these ten life skills were made part of the LSE online course which was delivered using the Moodle platform. Developmental phase of the research design include the developmental process of module for LSE using Moodle platform which was developed on the basis of the 4 quadrants of

SWAYAM, i.e., E-tutorial, E-content, Assessment and Discussion Forum. It includes the steps taken for developing a free online course with the help of different software and applications such as Moodle, Screencast-O-Matic v2.0 and Microsoft PowerPoint presentation.

An introductory class was conducted with the M. Ed. students regarding the objectives and conduct of the study. Further, only experimental group was introduced with the module of LSE using Moodle platform. Students in the experimental group were asked to download the Moodle application from the play store on their mobile phones. All students are provided with their particular 'user name' and 'password' and asked not to share them with others. After that students are instructed all the steps needed to follow to start learning online with the help of smartphone. Students are also instructed the steps to access the course from a laptop.

Conduct of the Study

The study was conducted in three phases.

(i) Pre-experimental Testing: Pre-testing was done with the help of attitude scale and awareness test regarding LSE. Prior to the pre-test, an informal session with the students was carried out, with the purpose of building the rapport and introducing them with the Moodle based LSE module.

(ii) Treatment: The sessions were carried out with the prospective teachers within their respective classes at Department of Education, Punjabi University, Patiala. The module for LSE pertaining to concept and significance of LSE along with the theoretical framework of ten life skills as identified by WHO (1997) was developed in the form of an online course using Moodle platform. This Moodle based LSE module was executed for 10 weeks (approx. 50 working days) on the experimental group of prospective teachers. The major techniques used to impart LSE through Moodle platform included blogs, chats, database activities, glossaries and support systems enabling the functioning in multiple languages, content management along with evaluation. The control group was taught the same content of LSE through traditional method of teaching.

(iii) Post-experimental Testing: Post-experimental testing was done after the completion of the Module for LSE with the help of attitude scale and awareness test regarding LSE on both the groups, i.e., experimental as well as control group.

Results and Discussion

To study the effectiveness of the module for LSE using Moodle platform on attitude and awareness of

prospective teachers regarding LSE, ANCOVA was employed on the post-test awareness scores of prospective teachers keeping pre-test awareness scores as a covariate. The means and SDs of pre-test and post-test awareness of experimental group and control groups are shown in Table 1.

Table 1 presents the means and SDs of the experimental and control group on pre-test and post-test attitude and awareness of LSE scores. In order to see whether module for LSE with using Moodle had any significant effect on attitude and awareness of prospective teachers regarding LSE, ANCOVA was employed on attitude and awareness scores of prospective teachers. Table 2 shows the summary of analysis of covariance.

The perusal of Table 2 shows that F-value, testing the effect of module for LSE with Moodle usage on adjusted mean scores of attitude and awareness of both the experimental group and control group came out to be 25.11 and 84.56, respectively, which are significant at 0.01 level. This indicates that the treatment given to the experimental group has a significant effect on attitude and awareness of prospective teachers regarding LSE. Table 3 shows the results of post-hoc analysis for the adjusted mean attitude and awareness scores of prospective teachers of experimental and control groups along with pre-test and post-test mean scores.

It may be observed from the Table 3 that the calculated t-value testing the significance of mean difference in adjusted attitude and awareness scores of experimental and control groups came out to be 3.69 and 5.62 respectively which are

Table 1: Means and SDs of the Pre-test and Post-test Attitude and Awareness Scores of Prospective Teachers towards LSE

Variable	Group	Experimental Group			Control Group		
		N	***Mean***	***SD***	***N***	***Mean***	***SD***
Attitude towards LSE	Pre-test	50	85.94	12.88	50	82.96	9.57
	Post-test	50	94.42	10.93	50	84.08	8.75
Awareness regarding LSE	Pre-test	50	18.22	5.24	50	16.64	4.74
	Post-test	50	23.28	4.51	50	16.98	4.64

Table 2: Summary of the Results of analysis of Covariance of attitude and Awareness of Prospective Teachers towards LSE

Variable	Source	SS	df	MS	F-Value
Attitude towards LSE	Pretest	4703.553	1	4703.55	93.07**
	Treatment	1269.149	1	1269.15	25.11**
	Error	4902.307	97	50.54	
	Total		99		
Awareness regarding LSE	Pretest	1313.63	1	1313.63	172.33**
	Treatment	644.59	1	644.59	84.56**
	Error	739.43	97	7.62	
	Total	3045.31	99		

**$p \leq 0.01$

significant at 0.01 level. It indicates that there is a significant difference in the adjusted mean attitude and awareness of LSE score of prospective teachers of experimental group and control groups on post-test. Thus, it can be concluded that module for LSE using Moodle platform plays a significant and positive role in enhancing attitude and awareness of prospective teachers regarding LSE as compared to traditional method of teaching. It may be attributed to the fact that online learning fascinates and motivates the techno-savvy 21st century learners of today. They are much interested in the use of various digital devices, new technologies and online courseware for learning as it tends to break the monotony of the traditional classroom. The researcher witnessed the enthusiasm among the prospective teachers in the experimental group for the online courseware. COVID-19 pandemic further gave impetus to online learning among students.

In a similar vein, the researches indicate Moodle to be an effective

Table 3: Mean Attitude and Awareness Scores of Prospective Teachers of Experimental and Control Group and t-value

Variable	Group	N	Pre-test Mean	Post-test Mean	Adjusted Mean	t-value
Attitude towards LSE	Experimental	50	85.94	94.42	92.90	3.69**
	Control	50	82.96	84.08	85.60	
	General Means		84.45	89.25	89.25	

Awareness regarding LSE	Experimental	50	18.22	23.28	22.70	5.62**
	Control	50	16.64	16.98	17.56	
	General Means		17.43	20.13	20.13	

**$p \leq 0.01$

interactive learning platform by which students can achieve high-quality learning (Lasić-Lazić et al., 2017; and Zabolotniaia et al., 2020).

Further, it was observed that Moodle platform helps the learners in better learning, revision and understanding of the course content with the help of online course launched through Moodle platform (Umek et al., 2017; Popovic et al., 2018; Susanti et al., 2019; Dol and Halkude, 2020; Duangjai and Rutaikarn, 2020; and Gudkova et al., 2021). In few recent studies by Gamage et al. (2022) and Sibgatullina et al. (2022), Moodle has been found to effectively improve student performance, satisfaction, and engagement across STEM and distance education courses. Furthermore, Al-kreimeen and Murad (2022) found Moodle based learning to have a positive impact on anxiety and happiness of university students.

However, Al-Hawari et al. (2021) in a survey confirmed the wider acceptance among instructors and students to use an in-house e-learning system named MyGJU as a first point of contact, as opposed to Moodle, for basic e-learning tasks. Also, Rajan and Manyala (2021) indicated that despite Moodle's great potential, majority of the students mainly use it to access repository course materials. It was further suggested that efforts must be focused on bridging this digital divide and orienting the learners for getting the maximum benefit from such e-learning technologies. Taking a step ahead, Dhika et al. (2021) suggested that future researches should focus on the use of Moodle platform for creating blended virtual learning environment.

Implications

The results of the present study have far reaching implications. The results of the present study demonstrated a positive and significant effect of LSE module using Moodle as learning management system (LMS) on attitude and awareness of prospective teachers regarding LSE. The module for LSE using Moodle platform was prepared especially for prospective teachers. These results indicate towards the expanding use of Moodle in the educational process, particularly by employing its interactive learning tools to achieve an effective and interactive learning environment. The study highlighted the effectiveness of Moodle platform for developing a favourable attitude

and enhancing awareness of prospective teachers towards LSE. Hence, it is suggested that Moodle can be successfully integrated into online teaching in order to focus on affective development of prospective teachers. The need of the hour is to make the teacher educators and prospective teachers aware about the concept of LSE that can further kindle the flame among the future generations.

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The Influence of Emerging Technologies on Human Conduct

Krishna Chandra Choudhary* and Narinder Singh Rawat**

Abstract

Not just in India but globally, technology has become the pillar of society. Almost everyone in today's culture spends between three and four hours a day online, whether they are students or full-time employees. Individuals and vocations vary greatly in their dependence on technology. Numerous experts hypothesised that students would be more impacted by the negative impacts of modern technologies on human behaviour than the working population as a whole. According to a recent study, adolescents (those between the ages of 10 to 19) overuse the internet. Adolescents use their phones to play games and play with friends. Mental health practitioners have taken serious note of the disturbing behaviours, psychological disorders, and mental health challenges of the younger generation. Due to their addiction to technology, young people nowadays abuse and overuse online apps built for mobile devices. Numerous studies have shown that internet addiction poses the greatest threat to human life. People from many areas of life may be badly affected by excessive internet use, regardless of age. It muddles the objectives of the next generation. Internet addiction may inhibit personal growth and have detrimental impacts on health and relationships. A person's health and relationships may deteriorate if they spend too much time online.

Introduction

The problematic and obsessive use of technology is referred to as an addiction. Technology abuse has negative repercussions. Both the level of living and the quality of life have grown as a result of the many enhancements brought about by technology.

The proliferation of mobile devices, personal computers, and the internet has simplified academic

*Head, Department of Psychology, S. B. College, Maulabag, Arrah, Bihar.
**Research Scholar, Rajasthan Technical University, Kota, Rajasthan.

responsibilities, allowing us to play our favourite games with friends and family in the comfort of our living rooms and reducing the time and effort required to write and comprehend assignments that previously necessitated a trip to the library.

The quest for comfort may result in psychological captivity or addiction if you have low self-esteem or struggle to cope with the demands of daily life. Ivan Goldberg (1996) coined the term 'internet addiction' to describe obsessive internet use. Young (2008) asserts that 'cyber-sexual and cyber-relational addiction' is on the increase with information overload and dependency on computers and mobile devices for everyday activities.

Additionally, addiction to video games and the usage of electronic gadgets for communication are regarded as mental disorders. The DSM-5, the most recent version of the Diagnostic and Statistical Manual of Mental Disorders, classifies 'gaming' as a life disruption. Damage to your physical health may emerge in a number of ways, including eye strain, head or brain pain, disrupted sleep, etc. Stress, hostility, violence, a sense of inadequacy, and a general lack of ability may all have a bad impact on mental health. This adds to anxiety, irritation, insecurity and depression.

Method

In this study, prevalent data analysis approaches are used. Various academic materials, including papers, internet resources, and print publications, were considered. The study reveals that several perspectives are preferable to a single one when it comes to comprehending the phenomenon of internet addiction in contemporary society. According to the numerous theoretical frameworks at our disposal, internet addiction may be seen from several angles. In its widest sense, research may be said to include almost everything. Following a review of secondary sources, this inquiry employs qualitative and subjective research approaches.

The Internet's Influence on Humans

Technology makes life easier. Following revolutionary approaches, mechanical and electrical technologies make surgeries easier, safer, and less daunting. X-rays, Computed Tomography (CT), Positron Emission Tomography (PET), and Magnetic Resonance Imaging (MRI), transformed diagnosis. Now, microwaves and ovens have replaced the usage of sticks to create fire. Technology reduces the severity of pain. Consider cooking on a burner that produces a great deal of smoke, rubbing stones together to create a fire, or doing minor surgery with a hot blade. Who would choose to feel awful instead of suffering? Children that watch a lot of television are unwilling to play outside, collaborate, or lose. Technology has altered our way of thinking. Mobile phones, laptop computers, and the internet

have simplified academic life by allowing us to write and study a project without visiting the library, increased the excitement of daily life by making communication easier, and allowed us to have fun with friends and family while sitting in our lobby and playing a favourite game without them. People who struggle to interact with people may feel empowered and wealthy by having access to the internet, newspaper, friends, and games in their hands. Virtual identity helps shy people to interact easily. In India, Facebook is becoming a popular venue for romance and breakups. Social media is a lifestyle for many. Like alcoholism, internet addiction provides pleasure and stress alleviation.

Utilisation and Misuse of the Internet in Modern Society

If someone uses the internet extensively, they may develop an addiction. The internet has revolutionised the nature of contemporary communication and education. Internet abuse is simple and cheap. It is possible for technologies to foster either adaptive or maladaptive behaviours. A recent study indicated that excessive internet and mobile app use is linked to technology and social network addiction.

Despite its utility, there are several ways in which the internet may be misused. Internet misuse is a serious concern.

Uses of Internet	Misuses of Internet
Easy communication (Internet brings the world closer)	Intrusion into privacy (hackers can create viruses)
Online shopping (e-commerce)	Posting fake advertisements
Financial transactions (business)	E-mail spamming, piracy and privacy problem (cyber-bullying)
Education	Pranksters
Grabbing information regarding anything	Time wastage and addiction (Several hours on internet without any purpose)
Social networking sites	Negative publicity
Unlimited access to information and real-time updates	Wrong information (Anyone can post anything)
Endless entertainment	Pornography (a breeding ground for illegal activity)

Bridging the cultural gap	The world is becoming dependent
Video conferencing	Virtual world and compromises personal information (family communication worsens)

Dependence on Technology in the Present Day

Addiction is a brain condition characterised by compulsive drug use despite adverse effects. Substance misuse becomes the addict's principal focus. Internet addiction is characterised by compulsive online behaviour that disrupt one's personal and professional relationships. Internet addiction is a mental disease characterised by a compulsive urge to access the internet continually. Behavioural difficulties may manifest as emotional or social disharmony. Psychological and physiological concerns have been connected to the use of social media and mobile devices.

Psychological Perspective and View

From a psychiatric standpoint, 'technology addiction' comprises all types of online reliance. Goldberg coined the term 'internet addiction' in 1995 to characterise obsessive internet use (Goldberg, 1996). The five separate categories were identified (Young, 1998 and 2008).

- Internet-based polling, file sharing, and sex transactions
- Social media addiction is in fact associated with relationship turmoil and instability (visit rooms, interpersonal organisations).
- Internet related gambling, buying, and trading are instances of web-surfing impulses.
- Superfluous investigation, data collection, and database queries
- Computer and mobile device users are trapped by pre-modified games, blogs, messaging and Twitter, among others.

Additional Disorders

Texting addiction is real and should be evaluated alongside other types of computer addiction (Block, 2008). Juhi (name changed), 19-year from Calcutta, was the first case in India, and she was seen at the National Institute of Mental Health and Neurosciences (NIMHANS) on June 18. Despite suffering from aching fingers, a stiff neck, and other symptoms, she continued to text, 'texting addiction'. Text aphrenia is misinterpreting the emotional tone of communication. Texting at an excessive rate is distracting in the office.

The Bio-Psychosocial-Spiritual Model

Addiction is a complicated illness with roots in the body and mind that affects every part of a person's life; thus, it

requires a holistic understanding and treatment strategy that takes into consideration its biological, psychological, social, and spiritual modalities. Our sector requires the expertise and confidence to advocate for the safe use of biopsychosocial-spiritual modalities and new technologies. The use of colour theory in the healing process recognises and respects the intricacies of treatment and the inexpressibility of human experience. The metaphors of the world's religions shed light on the mysteries of the spiritual realm. They are handy for challenging inquiries.

Selfitis Addiction

Self-dependence narcissism, machiavellianism, and psychopathy have all been linked to an increase in 'selfies'. Selfies may be taken for several purposes, including vanity, communication, documentation and recreation (Kim et al., 2016). Selfies may have good effects on the environment and society by drawing attention, improving mood and enhancing self-esteem. The human desire for social status is not reduced by 'not posting selfies'. As a consequence of this addiction, a British teenager who drank 200 shots a day stayed at home for six months, lost 30 pounds, and dropped out of school. Since he was incapable of snapping the perfect selfie, he unsuccessfully tried suicide (Gemma and Kerry, 2014).

Similar to Obsessive-Compulsive Disorder (OCD), but not yet recognised as a clinical illness in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) by the American Psychological Association (APA), the DSM-5 only mentions gaming as a diagnosable illness.

Assessment and Diagnostic Criteria

Due to the absence of internet addiction in DSM-IV, the identification criteria are based on those of other addictions in DSM-IV. Young (1998) states that "confusion of drive control" as described by the DSM-IV, is the most prevalent technique of evaluation owing to its strong association with compulsive gambling and excessive internet use.

Initially, Block (2008) listed four components as critical to the Internal Affairs Division/Project Implementation Unit (IAD/PIU) decision for DSM-V incorporation:

(i) Negative outcomes include arguing, lying, poor academic or professional achievement, social isolation, and exhaustion;

(ii) Excessive internet use is often associated with a loss of time or a disregard for fundamental drives; withdrawal includes feelings of outrage, pressure, and sadness when the Personal Computer (PC) is disabled;

(iii) Tolerance includes the need for better computer equipment, more programming, or longer periods of use; and

(iv) Using the side effect model, clinics have found that patients

with internet addiction exhibit withdrawal, tolerance, and withdrawal (a rejection of reliance attributed to maniacal issue) when the PC is disabled.

Problematic gaming is characterised by a lack of control over gaming, a preference for gaming over other hobbies and interests, and perseverance despite adverse outcomes (WHO, 2016; ICD-11).

Prevalence

Globally, 70 to 90 per cent of individuals aged 13 and over go online at least once every day (Anderson and Jiang, 2018). In 2023, 64.4 per cent of the world's population, or 5.16 billion people, have access to the internet *(Digital 2023: Global Overview Report)*.

Surwase et al. (2017) questioned ND college students between the ages of 17 and 25 and discovered that slightly more males than females were hooked to the internet (35 per cent vs. 35 per cent). Internet addiction affects 83.3 per cent of urban kids and 78.0 per cent of rural students in Mangalore, India, who are of school age (Sowndarya and Pattar, 2018). Compared to urban youth, rural kids were less likely to acquire an online addiction (16.6 per cent), while urban youth were more likely to develop a mild, moderate, or severe reliance on the internet (39.3 per cent), or even an addiction (6 per cent). Bagdey et al. (2018) found that in Nagpur city that 30.69 per cent of inhabitants were mildly hooked to the internet, 26.60 per cent were highly addicted, and 0.226 per cent were seriously addicted, with males comprising a somewhat greater proportion (52.09 percent) of the total. The likelihood of poor mental health among addicted students is double than that of their non-affected colleagues.

The Consequences of Electronics Addiction on Society

It is vital that project participants understand that the implementation unit's emphasis is not on how much time individuals spend online but on the negative impacts of doing so. An employee working late to take international calls is an example of proper internet use, as is a child studying or playing games to improve fine-motor skills or a better sense of judgement, decision-making, etc., during leisure time. In an information-rich culture, people can easily locate what they need, develop global connections, perform in-depth research, and digest new information, all of which lead to a higher sense of autonomy and confidence.

Negative Consequences of Technology Addiction

Discomfort in the body, physical manifestations of illness include 'sore eyes, migraine or headache, disrupted sleep patterns, carpal tunnel syndrome, extreme weariness, reduced immunological function, and the like' as well as 'postural fatigue' which manifests as neck and back problems whereas serious problems

include inactivity, poor nutrition, and obesity, as well as a failure to make efforts to remedy these circumstances. (Jeon, 2005; Young, 2004 and 2008)

Students in secondary schools in South Korea who are significantly hooked to the internet have an abnormally high incidence (37 per cent) of experiencing excessive daytime weariness. The prevalence of a sleeping disorder increased the incidence of wheezing, teeth grinding, and terrifying dreams (Choi et al., 2009). Ahan (name changed) was unable to overcome his drug addiction despite taking medication to treat his addiction and its symptoms. Although he had used sleeping pills, they had no influence on his struggle to fall asleep. He was unable to make ends meet and had to cancel arrangements with friends and family. While working on Ahan's sleep problems, his therapist discovered that his obsessional online talk with his girlfriend was controlling him. Therefore, he never went to bed before two in the morning and in order to stay awake he took his medications at twelve o'clock midnight. Ineffective sleep scheduling hampered his efficiency. Here, finding a mate was more important than adjusting his sleep routine or giving up narcotics.

Psychological Health Hazards

Thus, internet addiction disrupts routines and schedules, which is predicted to 'slow down the speed and process of the primary activity,' resulting in later pressures to complete target-bound tasks, which can cause 'anxiety and irritation; aggression and hostility; the perception of inferior abilities' and, in some cases, guilt. 'Restlessness, bad mood, low self-esteem, and loneliness' are also potential outcomes. This results in difficulties regulating one's thoughts, emotions, and behaviours (observations in personal cases). According to Ferraro et al. (2006), 'the addicted person felt the compulsive want to be connected to the internet again.'

Co-occurrence of Psychological Disorders

Internet addiction is often accompanied by other mental health conditions, such as depression, generalised or social anxiety, and ADD/Attention-Deficit/Hyperactivity Disorder (ADHD).

Chou et al. (2005) observed an association between social isolation, anxiety, and sadness, as well as future internet addiction, in their research of South Korean men. Twenty research were analysed for their links with Problematic Internet Usage (PIU) and mental health problems: 75 per cent of research discovered correlations between PIU and depression; 57 per cent observed a correlation between PIU and anxiety; 100 per cent of research identified associations between PIU and ADHD symptoms; 60 per cent discovered associations between PIU and excessive habitual side effects, and 66 per cent discovered

associations between PIU and a menacing aura or anger. (Carli et al., 2013). According to a study, those with internet addiction exhibit "abnormal obsessive compulsive measures" (Dong et al., 2011).

Relationship and Behaviour Related Problems

Addicts may have 'difficulties in interpersonal relationships, time management, and physical health' and 'withdraw from social activities because of poor tolerance'. Excessive internet use has been associated with an increase in depression and a decline in self-esteem (Jeon, 2005; Young, 2008), both of which have a detrimental effect on connections with friends and family. Substantial danger to interpersonal connection is posed by shifts in parental behaviour, such as reducing the amount of time spent with and emotional attention provided to children. People's 'feelings of isolation, loneliness, or alienation' and complaints about and from their families, increase when they spend more time with their online friends than with their real-life friends. Isolation results in greater time spent online, which may indicate social problems (Wellman and Gulia, 1999; Shuhail and Bergees, 2006). A person may find himself in a never-ending cycle of solitude, which encourages them to use technology more compulsively.

Problems with time management (Brenner and Scherer, 1997), sleep difficulties and academic performance (Kubey et al., 2001) are examples of behavioural concerns that may lead individuals to modify their routines such as missing meals in order to spend more time on the internet (Shuhail and Bergees, 2006). If one loses concentration, one's productivity at work and at school may decrease. The authors highlight that 'internet usage is motivated by non-work' (i.e., leisure) interests and that 'work drive and internet use' have a negative association (Landers and Lounsbury, 2006).

The Cultural and Social Effects of Technology Dependence

According to Bandura (1999), 'behaviour' is the outcome of a two-way interaction between internal human elements, such as cognitive, emotional, and biological events and situations, and the external environment. This applies to all types of addiction and compulsive behaviour, including excessive electronic gadget usage. It is either the individual or their external environment that is deficient.

The structural changes in the prefrontal cortex that have been associated with 'attention problems' may have a biological basis. This makes it more difficult to choose what to prioritise. The brain's reward-oriented regions are also engaged. This chemical imbalance between dopamine and serotonin is associated with a biological pre-disposition. In reaction to addictive behaviours, dopamine is

produced, heightening sensations of pleasure and satisfaction. Alternatively, Problematic Internet Use (PIU) tendency exists.

The main component of the psychological theory known as reinforcement theory is the variable ratio schedule. If you log in often, you will always get a prize. Video game addiction may also be characterised by the need for gamers to always experience something new. However, this does not exclude the potential for addiction in introverts. Their motives might be distinct.

Interpersonal issues include family discontent and recent stressful events (Lam et al., 2009), a lack of social friends, bad relations with instructors and students (Wang et al., 2011), a poor school connection, and drug or alcohol usage (Yen et al., 2009).

Poor self-esteem (Fioravanti et al., 2012; Stieger and Burger, 2010), depression, impulsivity, dissatisfaction with academic accomplishment, being male, and insecure attachment styles or avoidant attachment styles have been associated with IAD (Lin et al., 2011). Therefore, any external or internal factors that lead to anxiety and melancholy are relevant, given that time spent online may temporarily fill the void.

According to Davis's cognitive-behavioural model of Pathological Internet Use (PIU), 'social isolation' is more significant than psychopathology in explaining the behavioural symptoms of PIU. When victims of fraud lack sufficient social support, they may resort to online gaming as a kind of treatment. As shown by the 'fulfilment theory of the web,' this may lead to an unhealthy preoccupation with gaming and trouble in other areas (Kim et al., 2015). When a youngster is exploited by a friend, playing online games, particularly role-playing games, may help them create new connections and regain their self-esteem, reducing the negative effects of the incident (Morahan-Martin, J., and Schumacher, P. (2003)).

Treatment

Pathological drug abusers need therapy since their addiction severely affects not just them but also their loved ones and the community. In a surprising first, a Delhi Public School (DPS) girl informed her friends through Multimedia Messaging Service (MMS) that her boyfriend had dumped her. After becoming the victims of internet trolling, individuals have committed suicide, attempted suicide, and gone into a deep depression (Halder, 2016).

Pharmacological Treatment

The cornerstone of therapy for Internet Addiction Disorder (IAD) consists of interventions and procedures presently utilised to treat substance use disorders (IAD). According to research, two months of therapy with experts recently employed for the treatment of ADHD and OCD, equivalent to 'methylphenidate' improved the

youngsters, and this improvement was closely associated with enhanced attention (Han et al., 2009). Escitalopram (Dell' Osso, Altamura, Hadley, Baker and Hollander, 2007) and bupropion, a dopamine and norepinephrine inhibitor, have also been shown to be useful in the treatment of depression (Han et al., 2010).

Utilising a Psychosocial Approach

Present-day treatment research focuses mostly on psychosocial strategies, whereas pharmacological procedures are seldom examined. Eliminating an issue as soon as it arises is best. In some circumstances, it may be important to refrain from using a computer or accessing the internet (Shaw and Black, 2008). A Hong Kong based directing project (Shek et al., 2009) and a 12 to 15 year old 'starting restraint' programme in Austria, Germany, and Italy have been declared effective. Globally, cognitive-behavioural treatment (CBT) has been proven to be effective (Young, 2008; Du, Jiang, and Vance, 2010). The average eight-session programme is adequate to sustain its advantages for up to six months after completion. Under some circumstances, abstinence from computers and the internet may be required (Shaw and Black, 2008). Both the guiding system in Hong Kong (Shek et al., 2009) and the 'initiated restraint' programme for teenagers aged 12–15 in Austria, Germany, and Italy (Kalke and Rashke, 2004) have been rated effective. Multimodal, school-based group CBT may improve time management skills as well as emotional (regulation), cognitive (clarity of aims and priorities), and behavioural (self-management) competence.

There is an abundance of self-help products, including books and CDs, available online. Here is an uncomplicated, empirically supported strategy that accounts for the phenomenology of technology dependence (Batra, 2014). The reasons for excessive internet usage have been addressed at length before. Considering their interdependence, separate efforts are superfluous. In order to save time on the individually crafted plan, which will include several assessments, analyses, judgements, and goal-setting activities, the following universally applicable programme has been developed. People with strong self-esteem are aware that they have a firm foundation upon which to grow. People's failure to successfully manage their time and energy on their own is often attributed to a lack of 'self-control', which is cultivated via the use of a number of simple approaches for habitual modification. The overuse of technology has a negative impact on society as a whole. Their physical and mental independence, as well as their social and cultural lives, are badly affected.

Cognitive Behavioural Therapy (CBT)

It is considered that an individual's ideas, emotions, and behaviours are interrelated. Emotional states and ideas are capable of influencing one another in both directions.

Dialectical Behaviour Therapy (DBT)

DBT is a talking therapy similar to CBT, but it has been adapted to help individuals with strong emotions that have a detrimental influence on their mental and emotional health. Indicators clearly illustrate the effectiveness of dialectical behaviour therapy and psychological behaviour therapy (Perseius et al., 2007).

Behavioural Therapies (BT)

Adaptation and psychosocial skills training, chance instruction, demonstrating, anxiety reduction and relaxation approaches, self-management strategies, and behaviour practise are common intervention techniques used in behaviour change.

Psychodynamic Therapy (PT)

As part of psychodynamic therapy (PT), patients learn to make connections between key life events and their current emotions in order to make long-lasting adjustments and improvements.

Family Therapy (FT)

Associations with adults, strong family ties, the impression of standardising control, all things considered, exemplary academic performance, participation in elite social gatherings and positive social activities, an optimistic outlook on school, strict confidence, and volunteer groups are all protective factors in family therapy (FT).

Conclusion

Technology has played a crucial role in providing people with new tools to enhance their standard of living. An unhealthy attachment to technology may inhibit innovative problem-solving, personal development, and interpersonal relationships. It has grown into a possibly dangerous means of deflecting attention away from one's own life and that of one's family and friends. In addition, people are increasingly fascinated by and interested in technology. Their over-dependence on and concern with technology are causing addiction. As a result of the independence provided by technology, it has become easier to become reliant on it. Electronic gadget addiction is affecting interpersonal dynamics. Development and technical advancement go hand in hand. It has been included in the technical use methods for online auctions. Addiction to technology impairs thought processes and, ultimately, the goals of information technology and data science. Taking into consideration a number of cognitive and addictive elements increases the user's enjoyment, usefulness, and ease of use attributed to technology.

If a dependence problem arises, it is essential to treat it in its earliest stages. There has been a tremendous overestimation of internet availability and connectivity owing to the quick adoption and growth of the internet throughout the world. The internet has become a fundamental component of our everyday existence. The advent of widespread, cheap and reliable digital communication has opened up vast opportunities for people everywhere. This study's findings on digital and virtual addiction are concerning on many levels, including at the national and individual levels. More than that, however, we need to figure out how to mitigate the technology's unintended consequences.

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Policy Perspectives and Student Teachers' Perceptions towards B.Ed. Programme

Moni Yadav* and Sunita Singh**

Abstract

Teacher education programmes occupy a significant place in the education system, which encompasses teaching skills, pedagogical, theoretical, and practical understanding along with necessary professional skills to the student teachers through a variety of programmes like B.Ed., B.El.Ed., D.El. Ed. and others. Its curriculum includes many foundational and perspectives papers such as sociological, philosophical, and psychological, along with different pedagogical disciplines and liberal arts. These perspectives and foundation papers create a holistic and reflective teacher. The purpose of this study was to explore the perceptions of student teachers toward teacher education programmes and their nature, various aspects and approaches of the teacher education curriculum, which were categorised as perspectives in education, disciplinary and pedagogical understanding, and their engagement with the field—self, community, and school. Through purposive sampling, 47 participants (student teachers) were taken as samples from the second year of the B.Ed. programme. The researcher opted for descriptive survey design. A self developed perception scale was used for the collection of data, and Cronbach's alpha reliability (internal consistency) was measured as 0.841. Percentage analysis was used for data analysis. The study revealed that most of the student teachers are in favour of the curriculum, pedagogy, and engagement with self, school and community. It also demonstrates that this two-year course is well organised in terms of theoretical and practical practices for their professional development and develops them as reflective practitioners.

*Research Scholar, Department of Education (CIE), University of Delhi, New Delhi.
**Assistant Professor, Department of Education (CIE), University of Delhi, New Delhi.

Introduction

Teacher education is essential for the inculcation of new knowledge, the manifestation of global competencies, and the development of different innovative pedagogical methods among student teachers. Like other professions such as engineering, medicine, law, etc., teacher education also requires a very high standard of training for capacity building to attain teaching skills and managerial attributes that promote the teaching competencies of student teachers. So, in the contemporary context, teacher education programmes aim to prepare student teachers with 21st century skills to bridge school education with them. Teacher education is a continuous process in which the pre-service and in-service phases are complementary to each other. Besides this, it is meant to be involved in various community programmes and extension activities along with non-formal education programmes, literacy, and development activities of the society. Therefore, one of the most effective ways to raise education standards in the nation is to strengthen the teacher education programme and take initiatives to leverage it.

For more feasibility in teacher education, the NCTE was established in 1998 and developed a national curriculum framework for teacher education (NCFTE) in 2009. It elaborates on the context, concerns, and vision, underscoring that the teacher education and school education have a symbiotic relationship.

The success of any educational programme depends on the teacher's efficacy, teaching aptitude, attitudes, professional education and training, personality, knowledge, and many other elements. So, one of the most effective ways to raise the standard of teacher education programmes is "renewal of its curriculum, include the most recent techniques in pedagogy, including pedagogy with respect to foundational literacy and numeracy, multi-level teaching and evaluation, teaching children with disabilities, use of educational technology, and learner-centred and collaborative learning" (NEP 2020). Therefore, enhancement of the programme requires sufficient time and space to develop an educational perspective, and understanding of the subject and pedagogy, along with an identity as a teacher. Therefore, the preparation of teachers is an activity that requires a multi-disciplinary perspective and knowledge, the formation of dispositions and values, and the development of practices.

Teachers must be grounded in Indian values, ethos, knowledge, and traditions, while also being well-versed in the latest advances in education and pedagogy. In order to prepare professional and compassionate teachers, the two-year B.Ed. programme has intrinsic accountability for the overall development of the teacher trainees, which includes professional

competencies, pedagogical teaching and learning, reflective teaching, etc., (Khan, 2017). The two-year B.Ed. programme, through different courses such as the conceptual foundations of education, understanding knowledge and discipline, psychological, sociological, and philosophical understandings of education, develops a critical, analytical, and comprehensive understanding of school education and society. Along with this, different perspectives and elective papers, such as gender education and society, assessment for learning, human rights, peace education, etc. enhance the democratising harmonious critical perceptions of pre-service teachers towards various social issues, such as equality, justice, democracy, and gender issues.

This study comprises different policy perspectives, various initiatives taken by the Indian government, and perceptions of student teachers toward a two-year B.Ed. programme. The study intends to explore the proper information for educational planners and administrators for further investigation and information about student-teacher perceptions on the two years teacher education programme.

Policy Perspectives in Teacher Education Programmes

After independence, there were a lot of policies and programmes planned for quality attainment in teacher education. It ensures the highest quality training in content, pedagogy, and practices by moving the teacher education system into multi-disciplinary colleges and universities and by establishing a 4-year integrated degree for all school teachers (NEP 2020). In light of the above backdrop, the purpose of this study was to analyse the various policies, commissions, and committees with reference to the teacher education programme.

The policies are derived for the quality enhancement of the teacher education programme. For the development and strengthening of the teacher education programme, the University Education Commission (1948) observed that there was a need to fulfil the gap between the theory and practicum offered in various teacher-training colleges. The Secondary Education Commission (1952) analysed the problem of teachers and training programmes. The Commission recommended that teachers be the most important factor in educational reconstruction. Their personal qualities, educational qualifications, and professional training play a vital role in shaping the school and community. It has been documented that the professional preparation of teachers has been crucial for the qualitative improvement of education since the 1960s but very few concrete steps have been taken in the last three decades to operationalise these norms.

The Kothari Commission (1964–66) observed that the need for a sound professional teacher

education programme was essential for the qualitative improvement of school education. The Commission recommended on subject orientation and the introduction of integrated courses and professional education and teacher education programmes. The commissions strongly believed that the entire teacher education programme needed to be redesigned to find a better balance between theory and practice and better assessment of performance.

The Chattopadhyaya Committee Report (1983–85) recommended a five-year training programme, which should be started after the completion of Class XII and recommended for the beginning of an effective and qualitative teacher education programme, i.e., a four-year integrated programme. The National Policy on Education (1986) rightly stated, "No people can rise above the levels of its teachers." The policy stresses the upgrading of training schools to the District Institute of Education and Training (DIETs), and training colleges were upgraded into colleges of teacher education (IASEs). There were provisions for research and innovation in IASEs.

The Yashpal Committee Report (1993) on 'Learning Without Burden' noted that "inadequate programmes of teacher preparation led to an unsatisfactory quality of learning in schools." The programme should restructure the content to ensure its relevance to the changing needs of school education. The emphasis in these programmes should be on enabling the trainees to gain the ability for self learning and independent thinking.

The National Commission on Teachers (1985) suggested a minimum two-year B.Ed. programme. The Yash Pal committee (1993), the Justice Verma commission on the vision of teacher education (2012), and the Poonam Batra committee (2014) have also suggested a two-year B.Ed. programme. The National Curriculum Framework for Teacher Education (NCFTE, 2009) also presents a curriculum for two years B.Ed. programme. After the National Council for Teacher Education (NCTE) regulation 2014, B.Ed. programme became two years across India. The National Council for Teacher Education (NCTE) has to start taking suitable measures to make teacher education at various levels responsive to such developments and to quality concerns in the future.

The National Education Policy (2020) "recommended integrity in the teacher education programme by moving teacher education into multi-disciplinary colleges and universities." The policy suggested the closure of a substandard functional teacher education institute through rigorous monitoring and review of the clean-up of the teacher education sector. The policy also creates a connection between education departments at higher education institutions (HEIs) and school complexes. The policy recommended

that by 2030, the minimum degree qualification for teaching will be 4 years integrated B.Ed., the degree that teaches a range of knowledge content and pedagogy along with strong practicum training as student-teaching at local schools. The policy also describes that all B.Ed. programmes will include training in time-tested as well as the most recent techniques in pedagogy, including pedagogy regarding foundational literacy and numeracy, multi-level teaching and evaluation, teaching children with disabilities, teaching children with special interests or talents, use of educational technology, and learner-centred and collaborative learning. It will also appropriately integrate environmental awareness and sensitivity towards its conservation and sustainable development so that environmental education becomes an integral part of school curricula.

The primary focus of the policy planners was to bring about a qualitative improvement in the teacher education system along with a quantitative expansion of the facilities for teacher training, according to the analysis of the recommendations of various commissions, committees, and the Indian education policy.

Recent Government Initiatives to Empower the Teacher Education Programme

The NEP 2020 seeks to totally restructure the teaching profession in order to develop a strong merit-based framework of tenure, remuneration, and promotion that incentivises and honours exceptional teachers. Following are the recent initiatives to leverage the teacher education programme—

- The minimum degree requirement for school teachers is the 4-year integrated B.Ed., which is designed as a multidisciplinary and integrated dual-major bachelor's degree in Education and a specialised field.
- The National Testing Agency will administer appropriate academic and aptitude exams for admission to this degree (NTA).
- By 2022 a set of National Professional Standards for Teachers (NPST) will be created to influence all factors related to managing a teacher's career, such as tenure, attempts at ongoing professional development, promotions, wage increases, and other honours.
- In order to improve the quality of their B.Ed. programme, teachers have to do cutting-edge research in a variety of educational areas.
- At regular intervals, teacher audits or performance reviews will be conducted for performance evaluation.
- Every year, school teachers are required to complete 50 hours of CPD activities, such as workshops or online teacher development programmes.
- School principals must also complete CPD in leadership, school

management, and competency based learning modules.

- Additionally, NCERT would research, identify, and suggest international pedagogical techniques for integration into Indian pedagogical practices through CPD.

All these changing initiatives have been taken by NEP 2020 to hold the conditions of teacher education, deployment, recruitment, and service conditions responsible for encouraging the motivation of the teachers and their teaching quality.

Review of Related Literature

Large number of studies were done on the perceptions of student teachers towards the teacher education programme, and the teaching profession. But teacher education programmes are still a point of concern and a contentious issue among academics and researchers. Supporting the concern of teacher education, Thakur and Chawla (2016) conducted a study, i.e., a comparative study of emotional competence and teacher perceptions of B.Ed. trainees towards the teaching profession and find out the significant differences in the perceptions towards the teaching profession of B.Ed. trainees in terms of their sex, subject, and locality. Anandakumar, TK and Kalaiyarasan (2017) conducted a study on the perception of teacher trainees on 'Quality Training' in the District Institute of Education and Training concept of teacher education. The findings of this study showed that some qualities are lacking in our teacher training institutions. Physical infrastructure, learning materials, course content, administration, and benefits from the institution are present at a highly significant level, rather than the other two qualities like internships and co-curricular activities. Adhikari (2017) concluded in her study that, for preparing teachers, two years duration is ideal. Sharma (2021) discussed policy and regulatory changes to reforms in teacher education in India that have taken place in the last decade. The article focuses on the challenges of expansion and assurance of quality in the school education system and discusses the reform of the curriculum, duration of the teacher education programme, reformulation of the regulatory mechanism, and upgrading the teacher education programme. It was suggested that recent developments are mere omissions and responses to some needs and will further help in understanding how teacher education policy and regulatory decision-making in India are not merely a natural domain of knowledge but rather essentially political and constantly under contestation.

This study will add to the wealth of research already done in the area of teacher education, particularly with regard to how teacher education programmes have changed structurally through time, how long they have been in existence, how innovative and pedagogical they are, etc.

Rationale of the Study

Yet many studies had been conducted on the teacher education programme which focuses on the perceptions of pre-service teachers toward B.Ed. programme, i.e., Adhikari, (2017) on the perception of trainee teachers toward B.Ed. programme in Assam. Bhargava and Pathy (2011) on the Perception of Student Teachers about Teaching Competencies and Pakira and Khan, (2018) regarding the perception of trainee teachers toward two-year B.Ed. programme. All the studies have shown that very few efforts have been made in this region to investigate and examine such an important concern. This study shows the student teachers' perceptions towards the B.Ed. programme that they have undergone in a contemporary setting. In addition to knowledge, curriculum, and pedagogical understanding, the study reveals the perceptions of student teachers about many facets and techniques of the teacher education programme and illustrates the engagement of student teachers with the field—self, community, and school and its consequences for the prospective school teachers. This study will also help the stakeholders to uphold appropriate conduct and implement the necessary changes in relation to curriculum coverage and students' acquisition of professionalism to improve secondary teacher education.

Research Questions

1. What are the perceptions of student teachers towards the two-year B.Ed. programme?
2. What are the perceptions of student teachers towards the nature and perspective of two-year B.Ed. programme?
3. What are the perceptions of student teachers towards discipline curriculum and pedagogy studied in B.Ed. programme?
4. What are the perceptions of student teachers towards engagement with the field—self, community, and school?

Methodology

The objective of the study was to identify the perceptions of the student teachers towards the B.Ed. programme. The present study is quantitative in nature. Table 1 provides the comprehensive understanding of the methodological framework adopted by the researcher.

Table 1: Framework of the Research Design of the Present Study

S. No.	Structure	Description
1.	Type of research design	Descriptive research design
2.	Method of study	Survey method

3.	Research tools	Self developed questionnaire on the perceptions of student teachers towards teachers education programme (Five Point Likert Scale)
4.	Sample size	47 Student teachers (2nd year)
5.	Sampling techniques	Purposive sampling techniques
6.	Statistical techniques used	Percentage analysis
		Descriptive analysis

Analysis and Interpretation of the Data

Primarily, researchers visited the institution with prior permission of the head of the department. Data was also collected through Google Forms. The quantitative data were analysed by using percentage analysis, which was calculated using SPSS software. Data from Table 2 explain the perceptions of student teachers towards the B. Ed. programme on the Likert scale, i.e., strongly agree (SA), agree (A), neutral (N), disagree (DA), and strongly disagree (SDA).

Table 2: Perceptions of Student Teachers towards the B.Ed. Programme

S. No.	Statement related to B.Ed. programme	SA (%)	A (%)	N (%)	DA (%)	SDA (%)
1.	B.Ed. programme has a multidisciplinary approach	38.3	48.9	6.4	2.1	4.3
2.	B.Ed. programme enhances the professional capacities of student teachers	48.9	34	12.8	4.3	0
3.	B.Ed. programme develops the understanding and competencies of effective teaching and learning processes	42.6	46.8	6.4	4.3	0
4.	B.Ed. programme provides opportunities of sharing experiences gained by practicing teachers	31.9	42.6	17	4.3	4.3
5.	B.Ed. the programme develops an understanding of areas such as assessment etc.	21.3	47.4	12.8	4.3	4.3
6.	B.Ed. programme develops skills involved in selecting, developing, and using evaluation tools	31.9	48.9	17	2.1	0

7.	B.Ed. programme helps to acquire knowledge and develop an understanding of various aspects of school management	27.7	53.2	10.6	4.3	4.3
8.	B.Ed. programme develops an understanding and appreciation of the role of the teacher in the prevailing socio-culture and political system in general and the educational system in particular	31.9	51.1	14.9	2.1	0
9.	B.Ed. programme helps to systematise experiences and strengthen professional competencies	27.7	57.4	10.6	2.1	2.1

Table 2 reveals that most of the student teachers agreed with the statement, i.e., the B.Ed. programme has a multidisciplinary approach, enhances the professional capacities of student teachers, develops the understanding and competencies of effective teaching and learning processes, provides opportunities for sharing experiences gained by practicing teachers, develops an understanding of areas such as assessment, etc., develops skills involved in selecting, developing, and using evaluation tools, helps to gain knowledge and develop an understanding of various aspects of school management, helps to develop an understanding and appreciation of the role of the teacher in the prevailing socio-cultural, political system, and the educational systems in particular, and helps to systematise the experiences and strengthen the professional competencies and helps to systematise the experiences and strengthen the professional competencies.

Table 3: Perceptions of Student Teachers towards the Educational Approaches of Teacher Education Programmes

S. No.	Perspective in educational approaches	SA (%)	A (%)	N (%)	DA (%)	SDA (%)
1.	B.Ed. programme engages student teachers with studies on Indian society and education and helps to acquire conceptual tools of sociological analysis	36.2	42.6	14.9	6.4	0
2.	Develop a conceptual understanding about issues of diversity inequality and marginalisation in Indian society	29.8	53.2	12.8	4.3	0

3.	Focus on the aspects of social and emotional development, self and identity, and cognition and learning	27.7	61.7	10.6	0	0
4.	Address the theoretical foundation of school knowledge from a historical, philosophical and sociological perspective	27.7	48.9	14.9	6.4	2.1
5.	Develop an understanding of the cultures. policies and practices	27.7	44.7	19.1	8.5	0

Table 3 shows that the majority of teachers favour the statement, i.e., B.Ed. programme engages student teachers with studies on Indian society and education and helps to acquire conceptual tools of sociological analysis, develop a conceptual understanding of issues of diversity, inequality, and marginalisation in Indian society, and focus on the aspects of social and emotional development, self and identity, and cognition and learning.

Table 3 also reveals that most of the teachers do not agree that, "B.Ed. programme addresses the theoretical foundation of school knowledge from a historical, philosophical, and sociological perspective and develops an understanding of the cultures' policies and practices."

Table 4 reveals the perceptions of student teachers towards curriculum and pedagogy studies in teacher education programmes. It shows that the majority of teachers agreed with the statement that the B.Ed. programme develops a critical understanding of the school curriculum, links school knowledge with community life, and constructs subject knowledge of the pedagogy

Table 4: Perceptions of Student Teachers towards the Curriculum and Pedagogy Studies of Teacher Education Programmes

1.	Curriculum and pedagogy studies	**SA (%)**	**A (%)**	**N (%)**	**DA (%)**	**SDA (%)**
2.	Develop a critical understanding of the school curriculum	31.9	48.9	17	2.1	0
3.	Linking school knowledge with community life	23.4	51.1	19.1	6.4	0
4.	Constructs subject knowledge through pedagogy process	17	55.3	17	6.4	4.3
5.	Design of the programme enables a student to specialise in one subject area	21.3	38.3	14.9	21.3	4.3

process. Table 4 also reveals that 21.3 per cent of student teachers disagree with the statement, i.e., the design of the programme enables a student to specialise in one subject area.

Table 5 demonstrates the perceptions of student teachers towards their engagement with the field—the self, community, and school of teacher education programmes. It can be observed from the table that the majority of student teachers agreed with the statement, i.e., if student teachers engage with the field, it will enhance collaboration with the community, and professional capacity, enabling students to use information and communication technology (ICT), engage students in self-actualisation and enhance the professional capacity of history through the play way method.

Table 5 also reveals that the B.Ed. programme promotes reflective thinking among student teachers and sharpens the student's perception of the concepts involved in educational practices. It can also be illustrated from Table 5 that some student teachers show neutral perceptions towards the statement, "This programme enhances the capacity of student teachers to plan responses to the reality of education."

Table 5: Perceptions of Student Teachers towards their Engagement with the Field— the Self, Communities, and School of Teacher Education Programme

S.No.	Perspecting on engagement with the field— the self, community and school	SA (%)	A (%)	N (%)	D (%)	SDA (%)
1.	Enhance the collaboration with the community	21.3	59.6	14.9	0.3	0
2.	Enhance the professional capacity	34	53.2	4.3	4.3	4.3
3.	Enable students to use the Information and Communication Technology	21.3	55.3	19.1	4.3	0
4.	Engage student with self actualisation	25.5	51.1	12.8	10.6	0
5.	Enhance the professional capacity of history and by play way method	14.9	38.3	40.4	6.4	0
6.	This programme promotes reflective thinking among student teachers	31.9	57.4	6.4	4.3	0
7.	This programme sharpens the students' perceptions towards the concepts involved in educational practices	25.5	68.1	2.1	4.3	0
8.	This programme enhances the capacity of student teachers to formulate responses to the realities of education	23.4	55.3	14.9	2.1	4.3

Findings and Discussion

In this study, researchers looked at how student teachers felt about the perspectives in education, curriculum, and pedagogy studies of the two-year B.Ed. programmes. This research found that—

- Most of the student teachers have constructive opinions towards the teacher education programme.
- Student teachers are in favour of the curriculum and pedagogy, engagement with the self and school and they believe that it is for their professional development, uplifting of their knowledge and understanding in the future.
- Student teachers have a comprehensive understanding of the teacher education programmes as it is multidisciplinary.
- Student teachers agreed that the training quality of prospective teachers will be improved by the two-year B.Ed. programme (Nataraja, 2014), and they understand the ideas of practice and implement theoretical understanding during school education programmes.
- Majority of student teachers comprehend assessment and evaluation tools and techniques and enable them to understand school management and administration.
- Majority of the student teachers understood that the B.Ed. programme built the capacity to understand education in socio-cultural and political domains.
- Student teachers agreed that the two year B.Ed. programme is also responsible for the holistic development of student teachers because it provides opportunities to link with self, community, and school.
- It was also found that the majority of the student teachers agreed in relation to different pedagogical understandings in the B.Ed. programme.

Discussion and Conclusion

Teachers are the backbone of the nation. To construct the strength of the nation, they must be highly proficient for the development of the forthcoming generation. According to the National Policy on Education (1986), pre-service and in-service teacher education are integral parts of a continuous process, and pre-service programmes are the first step in a teacher's professional development. Based on the findings, the study concluded that students have positive perceptions and a liberal approach toward the two-year B.Ed. programme (Hoque, Tarafdar and Laskar, 2020) which integrates all the required domains of teacher education. Additionally, the curriculum covers effective pedagogical methods for teaching basic literacy and numeracy skills, learner-centred and collaborative learning, and multi-level instruction and assessment. It was highlighted

in the study of Hollingsworth (1989) that the foundation of good teaching lies in the content, knowledge, and ability to communicate. The outcomes of the many dimensions made it clear that B.Ed. students had the least favourable experiences with the execution of the curriculum (Khan, 2017) because the nature of teacher education programmes helps to integrate the perceptions of student teachers towards nature and foundational knowledge about the areas of teaching and learning. They also accept that the teacher education is a noble profession that may enable the teacher trainees to develop and enhance teaching competencies (Gupta and Rakwal, 2020). It is concluded that the teachers ought to be knowledgeable about the most recent advancements in their field, and the curriculum of the B.Ed. programme fulfils the norms and objectives of the National Council of Teacher Education (NCTE). Because of this, the Government of India has periodically highlighted the concerns for quality improvement and assimilation of teacher education have been key goals of educational planners since independence. Various viewpoints and elective course papers expose student instructors to multidisciplinary, interdisciplinary, and trans-disciplinary perspectives. To inculcate these issues within it is necessary to receive ongoing training throughout their careers to keep them updated with new knowledge and information in the field of education (Gupta and Rakwal, 2020). Therefore, to conclude this study, it is demonstrated that a two-year B.Ed. programme enhances collaboration with the community, and professional capacity engages students with self actualisation and promotes reflective thinking among student teachers.

Further Suggestions

In view of the results of the present study, the researcher laid down the following educational suggestions—

1. There is a need to organise seminars, workshops and refresher courses for the trainee teachers to improve their perceptions towards the teaching profession along with the improvement of communication, and analytical skills among student teachers.
2. It is also needed to remove the discrepancies in the curriculum of different teacher education programmes undergone in the education system.
3. The security of life after completion of the course of study or after training, proper placement for the trainee teachers is required. There were many students not getting jobs after completing the course or being trained.
4. There is a need to reform the curriculum and its approaches regarding multidisciplinary exposure.
5. It is also needed to re-organise and revisit the teacher education programme to remove drawbacks that are reflected as a hidden curriculum.

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Immediate Effects of Aerobics on Mental Well-being of Primary Resource Teachers in Kerala

Jasmin James*, Augustine George**, Prashobhith K P*** and Jino Sebastian****

Abstract

Mental well-being of primary teachers is an important yardstick to impart quality teaching learning activities to the elementary students. Many studies suggest that teaching is a difficult job with high burn out rates. This is in addition to other COVID-19 related adjustments and responsibilities in their family, society and institution. The study aims to know the immediate effect of aerobics on mental well-being of primary resource teachers. The study was conducted at a state level training programme for Kerala state primary resource teachers group at Munnar, Kerala. Experimental design was used for the study. 80 resource teachers (F=40 and M=40) aged between 26 and 55 from state resource group (SRG) of primary teachers of Kerala were selected for this study. The teachers interested in aerobics were included into experimental group (n=41), and teachers who lack interest or were unfit for physical activity were put in control group (n=39). Both groups were tested to analyse mental well-being using Warwick Edinburg Mental Well-being Scale. Experimental group were made to do moderate intensity aerobic dance immediately after the pre-test and the control group were left alone. Post-test were conducted to find if there is any significant difference in the experimental group following paired sample 't' test and the results demonstrated significant difference at 0.05 level. Experimental group shows increase in their mental well-being score ($p<0.01$), whereas control group didn't show any difference in mental well-being, ($p=0.135$) which implies that aerobics could be a good intervention even in short run to improve the mental well-being among primary teachers.

Associate Professor, Department of Medical Surgical Nursing, TMM College of Nursing, Thiruvalla.
**Associate Professor*, Physical Education, Government Medical College, Kottayam.
***Associate Professor*, Physical Education, Government Brennen College, Dharmadam.
****Associate Professor*, Physical Education, Government Brennen College, Dharmadam.

Introduction

Schools have a major role in promoting children's physical and psychological health and well-being and, the mental health literacy of all key stakeholders, especially teachers, is critical to achieving this goal. Teachers' knowledge and beliefs about psychological problems influence the way they deal with their students' mental health issues (Imran et al. 2022).

Mental well-being is a complex construct and includes both hedonic and eudaimonic perspective. Hedonic perspective means feeling happy about one's life and enjoying experiences that cause happiness. Eudaimonic perspective means living a meaningful life, completing goals, striving to attain self realisation (Tennant et al. 2007).

Review of Related Literature

In a study conducted on 15,641 Brazilian public—school teachers aged between 41–60 years during the COVID-19 pandemic reported that 33.7 per cent were dissatisfied with their work, 58 per cent reported increased body weight, 47.9 per cent did not exercise, 35.8 per cent were part of at least one risk group for COVID-19, 40.5 per cent had some flu-like symptoms during the pandemic and 1.2 per cent tested positive for COVID-19. Regarding mental health problems, 25.9 per cent of teachers self reported formal diagnosis of anxiety and/or depression during the pandemic. In addition, 7.1 per cent of teachers were drinking more alcohol than usual, 33.4 per cent started having sleep problems, 30.4 per cent were using relax/sleep/anxiety/depression medications, 67.1 per cent reported that their quality of life worsened and 43.7 per cent reported having severe fear of COVID-19. It was also found that 82.3 per cent of teachers had at least one mental health problem during the pandemic, such as increased alcohol consumption, sleep problems, use of psychotropic medication, decreased quality of life, and fear of COVID-19. The results of this study reveal the numerous challenges and the extent of the impact of the pandemic on working conditions, lifestyle, and especially on the mental health of teachers (Silva et al. 2021).

In another study conducted in the US on 703 teachers from public and private school found that teachers have had to deal with many of the negative aspects of COVID-19 over the past year. The demands associated with the sudden requirement to teach remotely, and later having to manage hybrid (both in person and online) learning may be having adverse effects on the mental and physical health of teachers. Stress and burn out continue to be high for teachers, with 72 per cent of teachers feeling very or extremely stressed, and 57 per cent feel very or extremely burned out. Many teachers struggled to have a satisfactory work-family balance (37 per cent never or almost never; 20 per cent only has sometimes). Investigators suggested that school

systems must start to deal with the mental and physical health of teachers before a large number of them leave the profession (Kotowski et al. 2022).

These studies point to the fact that mental health of the teachers are at stake. The nature of work of primary teachers is hard and exhaustive. They need to have better mental well-being in order to deliver quality instruction and manage students. They need to adopt an easy, economical and practical intervention programme to enhance their mental health.

A systematic review was done by Marconcin et al. in 2022 to examine the association between physical activity and mental health during the first year of the COVID-19 pandemic. Thirty-one studies were included in this review. Overall, the studies suggested that higher physical activity is associated with higher well-being, quality of life as well as lower depressive symptoms, anxiety, and stress, independently of age. There was no consensus for the optimal physical activity level for mitigating negative mental symptoms, neither for the frequency nor for the type of physical activity. Women were more vulnerable to mental health changes and men were more susceptive to physical activity changes. They concluded that physical activity has been a good and effective choice to mitigate the negative effects of the COVID-19 pandemic on mental health. Public health policies should alert for possibilities to increase physical activity during the stay-at-home order in many countries worldwide (Marconcin et al. 2022).

Brush et al. (2022) studied the effect of 8 weeks of moderate-intensity aerobic exercise (n = 35) or light stretching (n = 31) on sixty-six young adults aged 20 to 23 years (S . D . = 2.39) with major depression. Depressive symptoms were assessed across the intervention to track symptom reduction. Compared to stretching, aerobic exercise resulted in greater symptom reduction (g_s = 0.66). They concluded that aerobic exercise is effective in alleviating depressive symptoms in adults with major depression.

Need for the Study

The studies quoted above are all done in western countries. In Indian context, teachers are considered as second parent to children. Our country also lacks psychological support to teachers. Studies conducted in western countries point out the fact that mental health of teachers is of paramount importance to deliver quality instruction

Primary teachers dealing with elementary school students have high work load. COVID-19 pandemic may also have accelerated the decline in mental health of primary teachers. Shifting from physical mode to online mode and then to hybrid mode and again back to physical mode demands a lot of effort and adaptability.

In this study the effect of 30 minutes of moderate intensity aerobics on mental well-being of primary resource teachers is being studied.

Objectives of the Study

1. To assess the mental well-being score of primary resource teachers.
2. To know the effect of single cycle of aerobics on mental well-being scores.
3. To compare the mental well-being score between experimental and control group.

Sample

Eighty primary resource teachers of general subjects in a government school undergoing state level workshop at Munnar, Kerala were selected for the study. We have chosen resource teachers as it is assumed that they will be more active and resourceful than other teachers. They were in the age group of 26 to 55 years. Purpose of the study was made clear to the participating teachers and their consent was taken.

Tools of Data Collection

Pre-test and post-test were administered through Google form using Warwick Edinburg Mental Well-being Scale (WEMWBS), to assess mental well-being. Google form was used as it is a standardised questionnaire and also as resource teachers are considered competent and mature enough to give correct responses without any help from investigator. The scale consisted of 14 items covering both hedonic and eudaimonic aspects of mental health including positive affect (feelings of optimism, cheerfulness, relaxation), satisfying interpersonal relationships and positive functioning which include energy, clear thinking, self acceptance, personal development, competence and autonomy (Tennant et al. 2007).

Individuals completing the scale are required to tick the box that best describes their experience of each statement over the past two weeks using a 5 point Likert scale (none of the time, rarely, some of the time, often, all of the time). The Likert scale represents a score for each item from 1 to 5 respectively, giving a minimum score of 14 and maximum score of 70. All items are scored positively. The overall score for the WEMWBS is calculated by totaling the scores for each item, with equal weights. A higher WEMWBS score therefore indicates a higher level of mental well-being (Tennant et al 2007).

Method of Data Collection

Based on their interest and fitness to do physical activity, teachers were divided into two equal groups, experimental group (n = 41, F = 21, M = 20), and control group (n = 39, F = 19, M = 20).

Pre-test using Warwick Edinburg Mental Well-being Scale is administered to both experimental and control group and data was obtained, experimental group is given one cycle of thirty minutes of moderate intensity aerobics. Moderate intensity (MI) is the exercise done at an intensity of 50 to 70 per cent of maximum heart rate

(HRmax). The exercise programme included warm up by stretching and joint mobilisation for 5 minutes, 20 minutes of aerobic dance (MI) accompanied by music and warm down for another 5 minutes. Control group were not made to do any activity and they were left alone. Post test was conducted again on both the group using Warwick Edinburg Mental Well-being Scale (WEMWBS). The pre-test and post- test scores of both the groups were statistically analysed and the result were obtained.

Results

The collected data from quantitative research is presented, analysed, reported, and evaluated in a systematic manner. Paired sample 't' test was employed to find out the significant differences from pre-test to post-test scores of mental well-being of experimental and control group.

Table 1: The pre-mean and standard deviation, post-mean and standard deviation of both the group (experimental and control group).

Pre mean and standard deviation for the experimental group was 49.07 ± 8.094 and post mean and standard deviation was 54.37 ± 8.561. For the control group pre mean and standard deviation was 52.36 ± 7.485, post mean and standard deviation was 52.21 ± 7.442.

From Table 2, we see that there is significant difference between (increases in post test scores) pre and post test scores in experimental group ($p = 0.000$), and no significant change in control group scores ($p = 0.135$).

For both male and female, there is a significant increase in post test

Table 1: Descriptive Statistics of Mental Well-being (n = 80)

Statistics	Experimental			Control		
	Age	***Pre***	***Post***	***Age***	***Pre***	***Post***
Mean	41.98	49.07	54.37	39.59	52.36	52.21
Std. Deviation	8.002	8.094	8.561	8.100	7.485	7.442
Skewness	0.247	0.249	0.124	0.014	0.174	0.123
Kurtosis	0.515	0.086	0.990	0.915	0.513	0.550

Table 2: Paired t-test of Experimental and Control Group on Mental Well-being (n = 80)

Experimental group	Pre/Post	Mean	Std. Deviation	Std. Error Mean	Mean difference	t	p-value
Experimental	Pre-test	49.07	8.094	1.264	-5.293	-6.415	0.000
	Post test	54.37	8.561	1.337			
Control	Pre-test	52.36	7.845	1.199	0.154	1.525	0.135
	Post test	52.21	7.442	1.192			

Table 3: Gender Wise Paired t-test of Experimental and Control Group on Mental Well-being (n=80)

Experimental group	Sex	Pre/Post	Mean	Std. Deviation	Std. Error Mean	Mean difference	t	p-value
Experiment	Male	Pre-test	49.70	9.039	2.021	-5.100	-4.327	0.000
		Post test	54.80	9.407	2.103			
	Female	Pre-test	48.48	7.257	1.584	-5.476	-4.631	0.000
		Post test	53.95	7.883	1.720			
Control	Male	Pre-test	52.55	9.339	2.088	0.050	0.326	0.748
		Post test	52.50	9.237	2.065			
	Female	Pre-test	52.16	5.113	1.173	0.263	2.041	0.056
		Post test	51.89	5.163	1.184			

scores in the experimental group while there is no significant change in the control group was noticed for them.

Analysis and Discussion

From the results, it is quite evident that the experimental group has increased their mental well-being scores (MD = 5.293). As we can also note that the control group didn't show significant change between pre and post score of mental well-being (MD = 0.154), we can attribute the cause of increased mental well-being score to aerobics practice.

The present study is in line with the study done by Leire Aperribai et al (2020) where the authors plan to explore how teachers have been affected by the lockdown with respect to their mental health and their relationships in three main fields: work, family, and social relationships, and to know the role of physical activity in the mentioned variables. For that purpose, an online survey was designed to collect quantitative and qualitative data. Results showed that indoor physical activity acts as preventive in lockdown situations, whereas the level of activity does not affect mental health. Also, teachers have experienced higher levels of distress due to the workload generated during the lockdown. In conclusion, to prevent health problems among teachers' in future similar situations, it would be important to facilitate the practice of physical activity at home. They also stated that the COVID-19 pandemic has led teachers to an unpredictable scenario, where the lockdown situation has accelerated the shift from traditional to online educational methods, and relationships have been altered by the avoidance of direct contact with

the others, with implications for their mental health. Physical activity seemed to be a factor that could prevent mental disorders such as anxiety or depression in this peculiar situation (Leire et al. 2020).

Our study further strengthens the findings of the above study that physical activity could enchance the mental well-being and prevents teachers from getting into anxiety or depression. Moreover aerobics can be done in isolation or in groups. This increases its chances of acceptability among individuals.

A study done in the UK by Tomlinson et al. (2022) says that exercise is a recognised element of health care management of mental health conditions. In primary health care, it has been delivered through exercise referral schemes (ERS). They reviewed studies and tried to find the effectiveness of ERS where it was found that patients referred to leisure centres significantly improved their long-term symptoms. They also found that uptake and effectiveness of ERSs for mental health conditions was related to programme content and settings. Existing ERSs could be improved through application of individual tailoring and the provision of more face-to-face consultations, and social support. Further research is required to identify the types of ERSs that are most clinically effective for those with mental ill health.

In the above study, it's clear that exercise or physical activity plays a major role in developing mental health. India lacks exercise referral system (ERS). We mainly use drugs and counseling for mental health issues. We also need to try exercises and physical activity for mental health. As the above study states that the uptake and effectiveness of ERS depends upon the programme content and setting, thus, in our study, the programme content was aerobics accompanied by music. This programme is fascinating, economical, is simple, short and thus can be easily accommodated into the life style of teachers.

Our study has positive implication in school and classroom. Presently students are in stress because of broken families, influence of social media and COVID infused financial distress. It has lead to the use of drugs and increased suicidal tendencies among students. If teachers are mentally healthy, then they can identify vulnerable students early and give effective intervention. Mental health of teachers will reflect on student's health too. Moreover intervention programmes like aerobics are liked by students and have high acceptance rate.

The NEP 2020 also highlights the importance of sports and physical activities. The NEP 2020 emphasises on main streaming physical education at par with other subjects. This study acknowledges the recommendations of NEP 2020 with relation to physical education.

Conclusion

Experimental group has shown significant change in mental well-being score as compared to control group. So it is quite evident that resource teachers, mental well-being improved as a result of a single bout of 30 minutes aerobics. This intervention programme requires just 30 minutes, is cost effective and can easily be adopted in daily lives. It may have a positive impact in classroom and school.

Further research needs to be done to know the effectiveness of aerobics in long run for enhancing mental health benefits. Research is also required to assess the adherence capacity of aerobics as physical activity among teachers and students.

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Study of Scientific Aptitude and Academic Performance among Senior Secondary Science Students of Haryana State

Kusum*

Abstract

The present study was undertaken to analyse the scientific aptitude and academic performance of senior secondary science students of Haryana state with respect to school, gender, stream and coaching. The present study also inspected the influence of scientific aptitude on academic performance of senior secondary science students. Total sample of 400 students was selected at random from twenty government and twenty private schools of Haryana state. The tool used for measuring the level of scientific aptitude was Adolescents' Scientific Aptitude Test (ASAT) developed and standardised by Kusum, Satish Kumar and Sumitra Devi (2021). Academic performance was assessed through marks obtained by senior secondary students in 12th board exam. The result of data analysis concluded that school and coaching significantly influenced the scientific aptitude, but gender and stream does not influence the scientific aptitude. Private school students and students taking coaching have more scientific aptitude. Result also revealed that the school, gender and coaching significantly influenced the academic performance but stream does not influence the academic performance. Significant and positive correlation of between academic performance and scientific aptitude was observed. The result revealed that 28 per cent of academic performance is determined and influenced by scientific aptitude.

**Assistant Professor*, St. Paul College of Education, Rohtak, Haryana.

Introduction

Modern life is occupied with scientific technology so enormously that every citizen has to have knowledge of science for effective living. In order to enjoy materialistic happiness in this world, one must be acquainted with adequate knowledge of science. A man with scientific aptitude can easily make his life more happy and comfortable.

Traxler (1957) defines aptitude as "a condition, combination of characteristics, set of qualities in an individual which is indicative of the probable extent to which he will be able to acquire some knowledge, skills or composite of knowledge, understanding and skills, such as ability to contribute to art or music, mechanical ability, mathematical ability or ability to read and speak a foreign language under suitable training". "Scientific aptitude is a complex of interacting hereditary and environmental determinants producing pre-disposition or ability in science" (Rao, 1994).

Scientific aptitude is a composite of abilities which is developed through learning or it is a specific intellectual ability which enables the individual to comprehend scientific facts, to acquire scientific knowledge and understanding through teaching-learning process (Nataraj and Manjula 2012). There ought to be a high degree of interest amongst the scholars to browse the scientific literature and grasp the concepts innately. Quality of numerical ability and information about scientific facts can be raised through development of scientific aptitude among the scholars (Gao and Hangsing, 2019). The students, undoubtedly, will be able to grasp various concepts of science as per the level of their scientific aptitude. Rao (1990) clears that scientific aptitude superbly guides the students to know, understand, organise, comprehend, analyse and synthesise the scientific concepts in a much better manner.

Academic performance or academic achievement is the extent to which a student, teacher or institution has attained their short or long-term goals (Steinmayr et al. 2014).

Academic performance of a student is the ability of the student to study and remember the facts and being able to communicate his knowledge orally or in written form in an exam. Educational researchers have investigated various factors that affect the success in learning. One of these factors is scientific aptitude. Developing scientific aptitude amongst our children should be the major aim of science teaching and education.

Rationale of the Study

The investigation entitled, 'Study of Academic Performance of Senior Secondary Students in relation to their Scientific Aptitude, Interest and Metacognitive Skills', has big importance in shaping the nation's future. By analysing the above mentioned independent variables in students who had chosen science at senior secondary level without having

scientific aptitude, scientific interest and metacognitive skills, we can predict the chances of their success or failure as a professional and accordingly they can be suggested to continue higher study in science subject or switch to other subject/ stream/career. The justification of a research project lies on its contribution in predicting students' performance during studies and entire life ahead. The level of student's scientific aptitude, scientific interest and metacognitive skills, determines the academic performance of the students. That is why the investigator was inspired to study the mentioned variables. The results of this research would be beneficial to educational institutions to develop good quality human resource for developing countries. In addition, this research will revolutionise the field of educational guidance and counseling.

Statement of the Problem

Study of scientific aptitude and academic performance among senior secondary science students of Haryana state

Objectives

1. To study scientific aptitude of senior secondary science students with respect to school, gender, stream and coaching.
2. To study academic performance of senior secondary science students with respect to school, gender, stream and coaching.
3. To observe the influence of scientific aptitude of senior secondary science students on academic performance.

Null Hypothesis

1. There is no significant difference in scientific aptitude of senior secondary science students with respect to school, gender, stream, coaching.
2. There is no significant difference in academic performance of senior secondary science students with respect to school, gender, stream, coaching.
3. There is no influence of scientific aptitude of senior secondary science students on academic performance.

Delimitation of the Study

Four hundred students of Class XII from science stream enroled in Board of School Education Haryana was the sample of the study and scientific aptitude, academic performance, school, gender, stream and coaching were taken as variables.

Research Methodology

The investigator has adopted descriptive survey method for the conduction of his study.

The sample of 400 science students studying in Class XII was selected using multistage random sampling technique. Twenty government and twenty private schools affiliated to Board of School Education Haryana and 10 students from each selected school were selected randomly so as

Sample Design

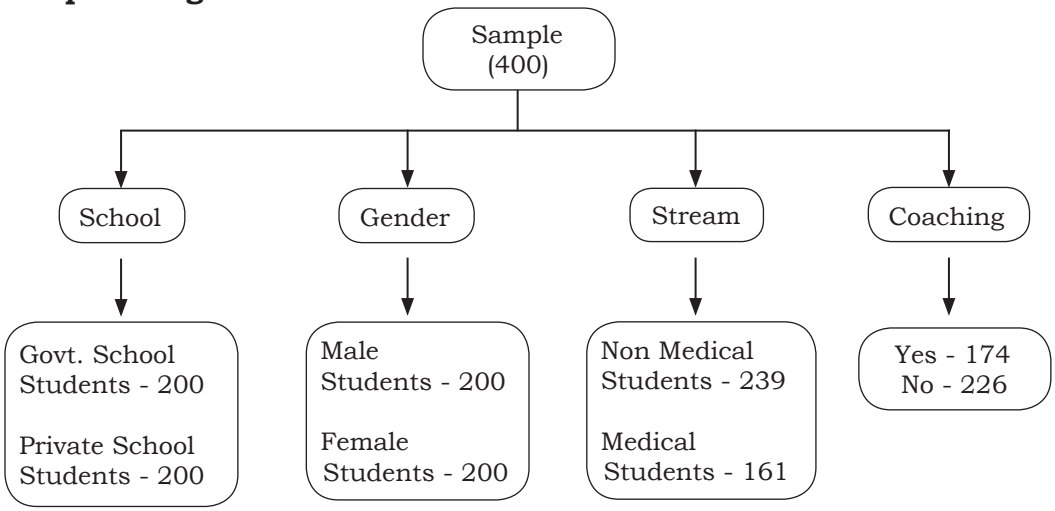

Fig. 1: Distribution of sample

to make a total data collection of 400 students.

Tool Used

1. Adolescents' Scientific Aptitude Test developed and standardised by Kusum, Satish Kumar and Sumitra Devi (2021) was used to study the scientific aptitude of senior secondary science students.
2. Academic performance was determined on the basis of marks obtained by senior secondary science students in Class XII board exam.

Analysis and Interpretation of Data

Statistics like mean, standard deviation and t-test was employed to ascertain the significance of difference of scores of scientific aptitude and academic performance with respect to school, gender, stream and coaching. Relationship between scientific aptitude and academic performance was studied by computing the Pearson's Product Moment Coefficient of Correlation (r).

To Study Scientific Aptitude of Senior Secondary Science Students with respect to School, Gender, Stream and Coaching

Study of Scientific Aptitude of Senior Secondary Science Students with respect to School

It is revealed from Table 1 that mean scores of scientific aptitude of government and private school students are 26.12 and 31.43 with S.D's 7.41 and 9.29 respectively. The computed t-value of 6.320 for the scores of scientific aptitude of government and private school students is found significant at both the level of significance, i.e., 0.05 and 0.01. Therefore, null hypothesis—

Table 1: Differences in Scientific Aptitude of Government and Private School Students

Variable	School	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Government	200	26.12	7.41	0.000	6.320	0.05 and 0.01 Significant
	Private	200	31.43	9.29			

N = 400, df = 398

'There is no significant difference in scientific aptitude of senior secondary science students with respect to school' is rejected. So, it is stated that there exists a significant difference in scientific aptitude of government and private school students. Higher mean score value of private school students shows better scientific aptitude of students studying in private school than the students studying in government school.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Gender

It is revealed from Table 2 that mean scores of scientific aptitude of male and female students are 29.19 and 28.35 with S.D's 9.31 and 8.27 respectively. The computed t-value of 0.954 for the scores of scientific aptitude of male and female students is not found significant at both the level of significance, i.e., 0.05 and 0.01. Therefore, null hypothesis — 'There is no significant difference in scientific aptitude of senior secondary science students with respect to gender' is accepted. It shows that there is no significant difference in scientific aptitude of male and female students.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Stream

It is revealed from Table 3 that mean scores of scientific aptitude of non-medical and medical students are 29.38 and 27.86 with S.D's 8.65 and 8.98 respectively. The computed t-value of 1.695 for the scores of scientific aptitude of non-medical and medical is not found significant. Therefore, null hypothesis—'There is no significant difference in scientific aptitude of senior secondary science students with respect to stream' is accepted. It shows that there is no significant difference in scientific

Table 2: Differences in Scientific Aptitude of Male and Female Students

Variable	Gender	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Male	200	29.19	9.31	0.341	0.954	0.05 and 0.01 Not Significant
	Female	200	28.35	8.27			

N = 400, df = 398

Table 3: Differences in Scientific Aptitude of Non-medical and Medical Students

Variable	Stream	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Non-Medical	239	29.38	8.65	0.091	1.695	0.05 and 0.01 Not Significant
	Medical	161	27.86	8.98			

N = 400, df = 398

aptitude of non-medical and medical students.

Study of Scientific Aptitude of Senior Secondary Science Students with respect to Coaching

It is revealed from Table 4 that mean scores of scientific aptitude of students taking coaching and not taking coaching are 30.28 and 27.61 with S.D's 8.42 and 8.93, respectively. The computed t-value for the scores of scientific aptitude of students taking coaching and not taking coaching is 3.033 and is significant. Therefore, null hypothesis—'There is no significant difference in scientific aptitude of senior secondary science students with respect to coaching' is rejected. So, it is stated that there exists a significant difference in scientific aptitude of students taking coaching and not taking coaching. Higher mean score value of students taking coaching shows better scientific aptitude of students taking coaching than the students not taking coaching.

Comparative Analysis of Scientific Aptitude with respect to School, Gender, Stream and Coaching

Comparison of t-value

It is illustrated in Figure 2, that there is a significant difference in scientific aptitude of senior secondary students with respect to school (government and private) and coaching (taking coaching and not taking coaching), but there is no significant difference with respect to gender (male and female) and stream (non-medical and medical).

Comparative analysis of Mean Score of Scientific Aptitude

It is illustrated in Figure 3, that the mean score of private schools students and students taking coaching is significantly higher than the mean score of government schools students and students not taking coaching, which shows that the scientific aptitude of private schools students

Table 4: Differences in Scientific Aptitude of Students Taking Coaching and Not Taking Coaching

Variable	Coaching	N	Mean	S.D.	p-value	t-value	Level of Significance
Scientific Aptitude	Yes	174	30.28	8.42	0.003	3.033	0.05 and 0.01 Significant
	No	226	27.61	8.93			

N = 400, df = 398

and students taking coaching is better than their counterparts. But there is no significant mean difference in scientific aptitude of male and female students and non medical and medical students.

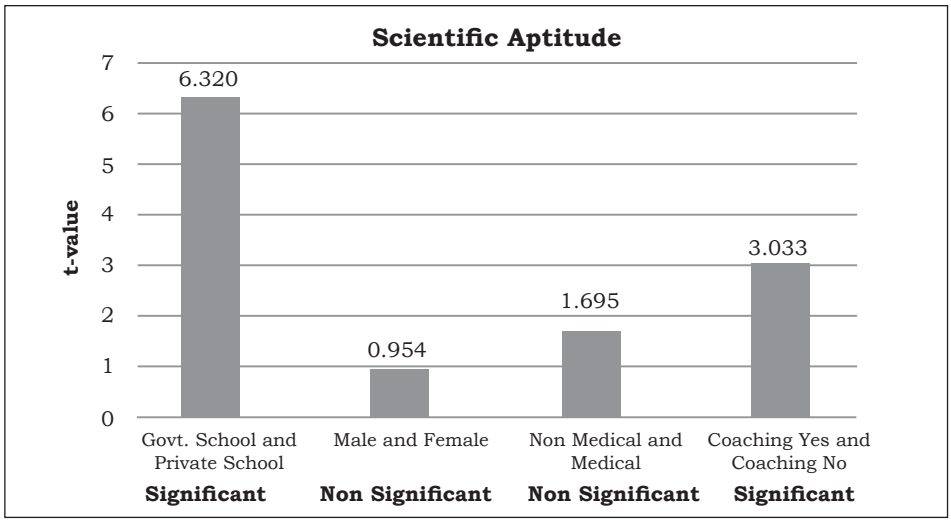

Fig. 2: Showing comparison of t-value of scientific aptitude with respect to school, gender, stream and coaching

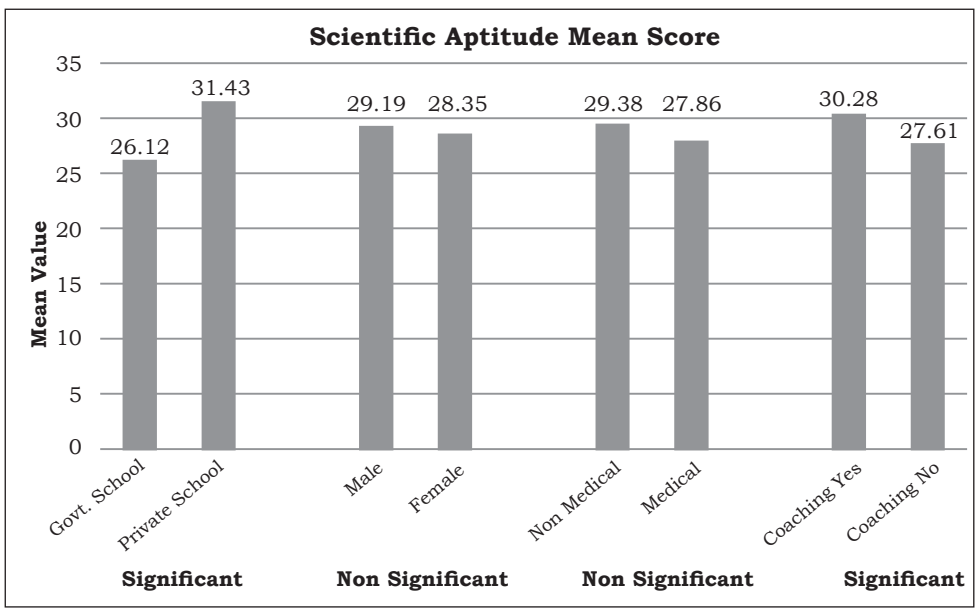

Fig. 3: Comparative analysis of mean score of scientific aptitude of government and private school students, male and female students, non-medical and medical students and students taking and not taking coaching

To Study Academic Performance of Senior Secondary Science Students with respect to School, Gender, Stream and Coaching

Study of Academic Performance of Senior Secondary Science Students with respect to School

It is revealed from Table 5 that mean scores of academic performance of government and private school students are 363.53 and 388.92 with S.D's 56.33 and 58.59, respectively. The computed t-value (4.419) for the scores of academic performance of government and private school students is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to school' is rejected. So, it is stated that there exists a significant difference in academic performance of government and private school students. Higher mean score value of private school students shows better academic performance of students studying in private school than the students studying in government school.

Study of Academic Performance of Senior Secondary Science Students with respect to Gender

It is revealed from Table 6 that mean scores of academic performance of male and female students are 359.59 and 392.86 with S.D's 60.04 and 52.62, respectively. The computed t-value (5.895) for the scores of academic performance of male and female students is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to gender' is rejected. It shows that there exists a significant difference

Table 5: Differences in Academic Performance of Government and Private School Students

Variable	School	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Government	200	363.53	56.33	4.419	0.05 and 0.01 Significant
	Private	200	388.92	58.59		

N = 400, df = 398

Table 6: Differences in Academic Performance of Male and Female Students

Variable	Gender	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Male	200	359.59	60.04	5.895	0.05 and 0.01 Significant
	Female	200	392.86	52.62		

N = 400, df = 398

in academic performance of male and female students. Higher mean score of female students shows better academic performance of female students than male students.

Study of Academic Performance of Senior Secondary Science Students with respect to Stream

It is revealed from Table 7 that mean scores of academic performance of non-medical and medical students are 376.44 and 375.90 with S.D's 60.69 and 56.03, respectively. The computed t-value (0.090) for the scores of academic performance of non-medical and medical students is not significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to stream' is accepted. It shows that there is no significant difference in academic performance of non medical and medical students.

Study of Academic Performance of Senior Secondary Science Students with respect to Coaching

It is revealed from Table 8 that mean scores of academic performance of students taking coaching and not taking coaching are 398.95 and 358.72 with S.D's 44.14 and 62.64 respectively. The computed t-value (7.529) for the scores of academic performance of students taking coaching and not taking coaching is found significant. Therefore, null hypothesis—'There is no significant difference in academic performance of senior secondary science students with respect to coaching' is rejected. It shows that there exists a significant

Table 7: Differences in Academic Performance of Non-Medical and Medical Students

Variable	Stream	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Non Medical	239	376.44	60.69	0.090	0.05 and 0.01 Not Significant
	Medical	161	375.90	56.03		

N = 400, df = 398

Table 8: Differences in Academic Performance of Students Taking Coaching and Not Taking Coaching

Variable	Coaching	N	Mean	S.D.	t-value	Level of Significance
Academic Performance	Yes	174	398.95	44.14	7.529	0.05 and 0.01 Significant
	No	226	358.72	62.64		

N = 400, df = 398

difference in academic performance of students taking coaching and not taking coaching. Higher mean score of students taking coaching shows better academic performance than the students not taking coaching.

Comparative analysis of Academic Performance with respect to School, Gender, Stream and Coaching

Comparison of t-value

It is illustrated in Figure 4 that there is a significant difference in academic performance of senior secondary students with respect to school (government and private), gender (male and female) and coaching (taking coaching and not taking coaching), but there is no significant difference with respect to stream (non medical and medical).

Comparative Analysis of Mean Score of Academic Performance

It is illustrated in Figure 5 that the mean score of private schools students, female students and students taking coaching is significantly higher than the mean score of government schools students, male students and students not taking coaching, which shows that the academic performance of private school students, female students and students taking coaching is better than their counterparts. But there is no significant mean difference in

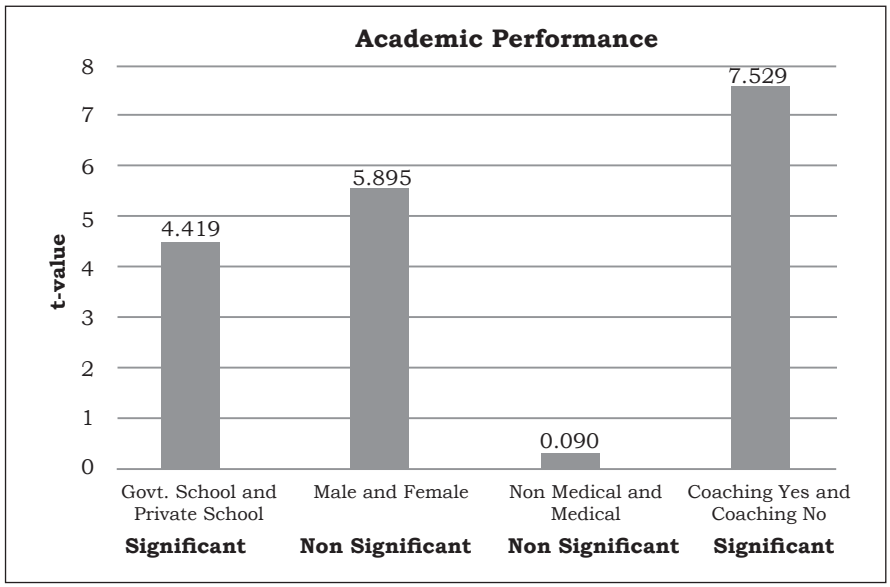

Fig. 4: Showing comparison of t-value of academic performance with respect to school, gender, stream and coaching

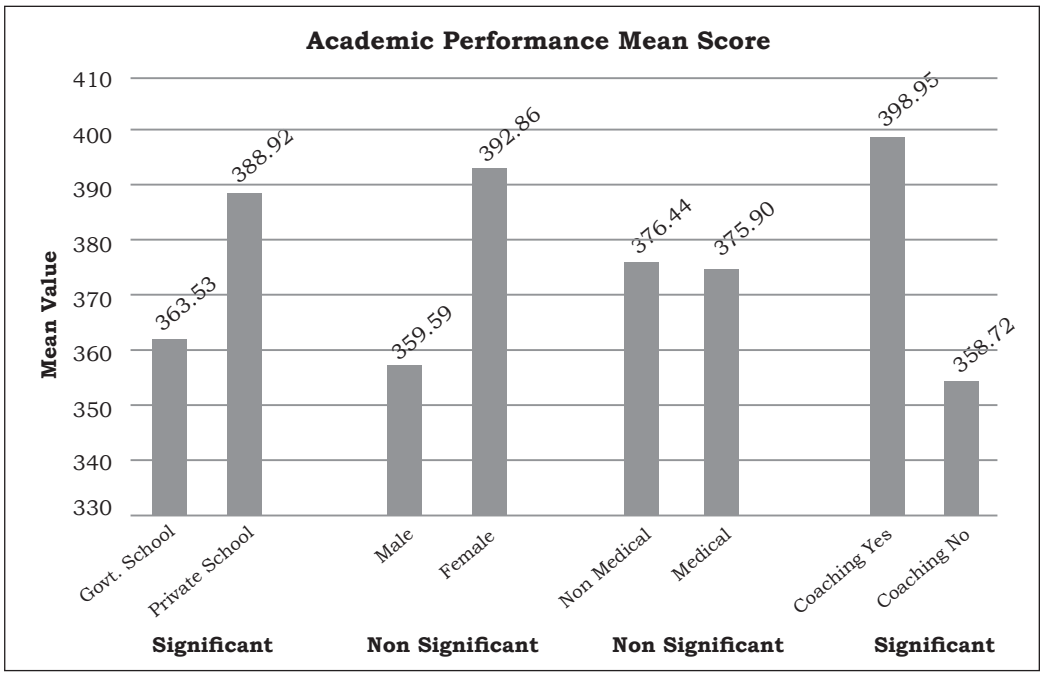

Fig. 5: Comparative analysis of mean score of academic performance of government and private school students, male and female students, non-medical and medical students and students taking and not taking coaching

academic performance of non-medical and medical students.

To observe the influence of Scientific Aptitude of Senior Secondary Science Students on Academic Performance

It is depicted from Table 9 that computed value of coefficient of correlation between academic performance and scientific aptitude is 0.524. Computed (r) value is found greater than table (df 398) value at both 0.05 and 0.01 level of significance, so correlation (r) value is significant at both levels of significance. It shows that academic performance and scientific aptitude have positive and significant relationship with each other which indicates that increase in scientific aptitude leads to increase in academic performance. F value is also significant. Value of R Square (0.275) indicates that scientific aptitude explains 28 per cent of variability of academic performance that is 28 per cent of academic performance is influenced and determined by scientific aptitude. Therefore, null hypothesis—'There is no influence of scientific aptitude of senior secondary science students on academic performance' is rejected.

Table 9: Relationship Between Academic Performance and Scientific Aptitude

Variables	N	Mean	S.D.	Correlation Coefficient (R)	R Square	Percentage contribution	F	Level of Significance
Academic Performance	400	376.22	58.79	0.524	0.275	28%	151.036	0.05 and 0.01 Significant
Scientific Aptitude	400	28.77	8.80					

N = 400, df = 398

It is concluded that scientific aptitude is a powerful determinant of academic performance of senior secondary science students.

Findings

- Scientific aptitude of students studying in private school was found better than the students studying in government school.
- There is no significant difference in scientific aptitude of male and female students.
- There is no significant difference in scientific aptitude of non-medical and medical students.
- Scientific aptitude of students taking coaching was found better than the students not taking coaching.
- Academic performance of students studying in private school was found better than the students studying in government school.
- Academic performance of female students was found better than the male students.
- It was found that there is no significant difference in academic performance of non medical and medical students.
- Academic performance of students taking coaching was found better than the students not taking coaching.
- In this study it was also found that 28 per cent of academic performance is influenced and determined by scientific aptitude and it is interpreted that scientific aptitude is the powerful determinant of academic performance of senior secondary science students.

Discussion

The present study is an attempt to examine the differences in scientific aptitude of government and private school students, male and female students, non-medical and medical students and students taking coaching and not taking coaching.

Significant difference in scientific aptitude of government and private school students was found. Scientific

aptitude of students studying in private school was found better than the students studying in government school. Jai Parkash and Hooda (2019) also reported that scientific aptitude of private secondary school science instructor was more than government secondary school science instructure. In current study, it was found that there is no significant difference in scientific aptitude of male and female students. No difference in scientific aptitude of male and female students can be explained by analysis of the biological capacities of human brain, which is same for male and females of human. Kaur (2013) also reported no important distinction between the male and female students with respect to scientific aptitude. The no difference in scientific aptitude on the basis of stream (medical or non-medical) can be explained because stream could not affect the scientific aptitude once it had been preferred by the students because both non-medical and medical streams are discipline of science. Scientific aptitude of students taking coaching was found significantly higher than the students not taking coaching. Florko et al. (2010) reported that the coaching increased the aptitude test score.

Academic performance of students studying in private school was found significantly higher than the students studying in government school. The findings of the present study were in concordance with previous studies. Wangoo and Khan (1991) also reported that the students from public and private schools differ in academic achievement due to their social and economic status. Academic performance of female students was found higher than the male students. Nayar and Visweswaran (1966) reported the same finding that there was significant distinction in the achievements of urban male and female students of Class X. Vijayalaxmi and Natesan (1992) reported a significant gender distinction in academic achievement and female students were better in academic achievement as compared to male students. Kalaivani (2018) reported higher mean score of female students as compared to the male students in their scholastic achievement. In current investigation it was found that there is no significant difference in academic performance of non-medical and medical students. The no difference in academic performance on the basis of stream (medical or non-medical) can be explained because both non-medical and medical streams are discipline of science and students choose the science stream because of their interest in science or we can say interest of the student in their subject influence the academic performance instead of streams. Academic performance of students taking coaching was found better than the students not taking coaching. Gafoor et al., (2007) reported the similar results that there was an important distinction in achievement in science of students belonging to

coaching and non-coaching teams. According to Mitchell et al., (2016) academic coaching has been found to be effective in enhancing student success. Robinson and Gahagan (2010) reported improvement in students' academic success using a coaching framework of self assessment, reflection, and goal setting.

It was found that there is a significant and positive relationship between academic performance and scientific aptitude. Significant influence of scientific aptitude on academic performance was found. The positive relationship was also reported by most of the previous studies. Rao (1990) investigated 'The relationship among scientific attitude, scientific aptitude and achievement in Biology of secondary students'. Aptitude, attitude and achievement were found to be considerably correlated with each other. Kumar (2013) reported that there was a big correlation in scientific aptitude and educational accomplishment. Leo Stanly (2016) also reported a moderate positive relationship between scientific aptitude and the level of performance in science. Mehna (1986) suggested that scientific knowledge and aptitude is the most important factor for determining the students' performance in science subjects. It was also found that 28 per cent of academic performance is influenced and determined by scientific aptitude and it is interpreted that scientific aptitude is the most significant predictor of academic performance of senior secondary science students. Gao and Hangsing (2019) conducted a study on scientific aptitude and academic achievement of tribal students. Their finding showed that different dimensions of scientific aptitude like reasoning, numerical ability and scientific vocabulary shows moderate direct correlation with accomplishment in science.

Conclusion

It was concluded that scientific aptitude of students studying in private school and students taking coaching was better than their counterparts. But no significant difference in scientific aptitude was found with respect to gender and stream.

The conclusion of the study indicated that academic performance of students studying in private school, female students and students taking coaching was found better than their counterpart. But there was no significant difference in academic performance of non-medical and medical students.

The study concluded the significant and positive relationship between academic performance and scientific aptitude. It is interpreted that scientific aptitude is the most significant influencer of academic performance of senior secondary science students.

Educational Implications

Findings of this research may help in understanding the scientific aptitude of a student and accordingly can be guided to adopt a profession related to the field of science. Achievement in science of a child largely depends upon his aptitude in science. Therefore, in order to develop scientific aptitude in students' right from the beginnings, care must be taken by parents and teachers to identify the aptitude of students in an early age. Teacher should use drill and practice to fix up the science concepts for better learning.

As government school students were found to have low scientific aptitude, the associated reasons and problems should be explored to improve the scientific aptitude of government school students. School authorities, parents and teachers ought to help and encourage government school students. In present study, students who have taken coaching scores high in both scientific aptitude test and Class XII board exam. Parents and teachers should identify the students' special and personalised need of coaching.

As boys were found academically weak, the associated reasons and problems should be explored to improve academic performance of boys. Teachers and parents can make efforts to recognise the troubles which were liable for low academic achievement and then corrective actions should be undertaken to get better academic performance.

Scientific aptitude plays an important role in the academic performance of the students. Identification of aptitude at an early stage will help in utilising the potentials of students. Counseling by aptitude testing and interactive grouping can be more effective than personal characteristics of the students, for improving aptitude capabilities.

This research will suggest that in order to encourage more students in science, intervention need to be designed that focus not only on the academic performance of the students but also on how to make science related occupations more interesting for the senior secondary students. This type of intervention should start early in the academic careers for these students.

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Type of Parenting as a Moderator of Stress and Youth Problems in Adolescents

Poonam Punia* and Nikita Chaudhary**

Abstract

This study was conducted to examine: (a) the effect of single parenting on the stress level and problems of adolescent students and (b) the relationship between stress and problems of adolescent students. A sample of 120 adolescents was taken by following multistage random sampling. Data was collected using the Youth Problem Inventory made by Dr M Verma and the Student Stress Scale by Dr Zaki Akhtar. Analysis has been done using statistical techniques like mean, t-test, correlation, regression, and ANOVA. The results found that the stress level in dual parenting adolescent students was significantly high compared to single parenting adolescent students. However, an insignificant difference was observed in the level of problems for both categories of adolescents. Further, family problems, social problems, personal problems, and oversensitivity have shown a moderate positive correlation with stress levels, while school or college problems have shown a small positive correlation with stress levels. Further, single parenting has been found to have a significant moderating effect on the relationship between family problems and the stress level of adolescent students. The study highlights the importance of spreading awareness among teachers, parents, and society about the problems of single parenting children and counselling single parents and their children.

*Assistant Professor, Institute of Teacher Training and Research, BPSMV, Khanpur Kalan, Sonepat.
**Research Scholar, Institute of Teacher Training and Research, BPSMV, Khanpur Kalan, Sonepat.

Introduction

Family is considered as the basic element of society. It is a primary social group consisting of parents and their offspring that works as a social institution for nurturing primary schooling and early socialisation of their children. A family is a group of people who live together and share common histories, emotions, and intimacy. Parents make their children learn basic life skills and provide a good home environment for their better growth and development. They also shape the attitude and behaviour of children. Zahedani et al. (2016) mentioned that parents play an important role in identifying their children's talents. They transmit values to their children through instructions, selective reinforcement, and their behaviour. Bonci (n.d.) reported that parental involvement had influenced the student's academic success positively. Other than parental involvement, home and family environment strongly impact students' educational achievement. Parental control was closely found to be responsible for children's anxiety (McLeod, Wood, and Weisz, 2007) and they may develop psycho-social problems if they face more complex problems during childhood (Christensen and Lynge, 2003). Hence, a close and healthy association between parents and children is vital.

Parenting style includes all those activities and practices that parents use to rear their child to adjust to his environment and society and make their child a better part of that society. Parental avoidance has a negative impact on emotional intelligence (Bhatia, 2012).

Noor and Rosli (n.d.) asserted that authoritative parenting was the most frequent type of parenting style among Muslim fathers. In contrast, authoritarian parenting was the more common type of parenting style among mothers. Mensah and Kuranchie (2013) found that parenting style influences the social development of students. They also revealed that students had shown pro-social behaviour in the case of authoritative parenting, while authoritarian parenting resulted in anti-social behaviour. Family structure is defined by the roles, instructions, authority and hierarchies.

Family is a social institution and the structure of a family is affected by the separation or death of parents (Usakli, 2013). Generally, two individuals stay together and get married to provide proper care and stability to their offspring. Sometimes this normal family structure gets distorted because of some reasons listed below—

(i) Marital Separation: It is a state when married partners separate from each other out of their will or because of a court order, i.e., legal separation.

(ii) Divorce: It is the termination or cancellation of marriage between

a couple as per the rules of a particular country or state due to different reasons. Divorce has long-term consequences on children, parents, and society (Anderson, 2014).

(iii) Out of wedlock pregnancy: It is a state when a female is not married and becomes pregnant.

(iv) Death: Death of one parent, either mother or father, is also a reason through which a normally structured family becomes distorted.

(v) Single parent adoption: It is a situation in which a single parent, either male or female, adopts a child. That single parent can be divorced, unmarried or single for any other reason.

So, due to these reasons, if one of the parents gets separated from the family, then all the responsibilities of the child/children is on the single parent. A single parent has to perform the role of both parents. During or after the separation of parents, a child may suffer from different kinds of problems regardless of the reason for the separation of their parents. Single parenting may impose a lot of negative impacts on single parenting children. These negative impacts affect the child according to the age and gender of that single parenting child. They face problems like psychological problems, low self esteem, adjustment problems, insecurity, delinquency, social problems, the feeling of rejection, etc.

Review of Literature

Single parenting may negatively influence academic performance (Abudu and Fuscini, 2013). Compas and Williams (1990) compared stress, copying and adjustment levels in single and dual parenting families and observed no differences. Salami and Alawode highlighted the importance of counselling single parents and their children. Savage (1980) observed that many elementary school children (about 40 per cent of those who come from single parent families) were found to have low achievement. According to Katz, Dunham, and Zimmerman (1997), the social control theory emphasises that people may start acting in deviant ways because of the thrill that people experience. When social control becomes ineffective in any situation, such as in a single parent home, the child starts acting in deviant behaviour. According to a study conducted by Krein and Beller (1988), the damaging effect of living with a single parent increase with the duration of time spent in such a family. This effect was more profound for preschool children and boys. So, from the above discussion, it is clear that single parenting creates problems for children growing up in society.

Generally, stress is defined as a kind of psychological and physiological pressure that someone feels during his life due to lack of balance between expectations and reality. Stress can be positive,

which is necessary for a person to get motivated and achieve or gain something and bring out the best in him. However, stress can have a negative impact and may result in threatening his well-being and make him face social, physical, emotional, and organisational problems. The study conducted by Abdulghani et al. (2011) reflected that physical problems are associated with high stress levels among students. Stress affects the personality, physical strength and general health of the human beings. It may be because of poor civic facilities, unwanted changes in life, frustration, racial, caste and religious conflicts, technological changes and career changes. Stress can lead to various problems like a physical illness and emotional illness that arise due to mishandling of critical changes in somebody's life. Stress makes children anxious, emotionally weak, depressed, lonely, and judgemental and fills their mind with negative thoughts. Arun and Chavan (2009) revealed that students who received less support from family and had academic problems had more suicidal ideations and perceived their lives as burdens. Stress may lead to maladaptive behaviour among students (Huli, 2014). So, there is a close relationship between family environment and stress level. Parents and school training are significant stress factors (Kumari, Vidyapith, and Bansal, n.d.).

Significance of Study

Adolescents have a lot of physical, mental, and intellectual potential, but they also face a lot of problems and challenges at this age. They may experience problems related to physical development, mental development, and emotional development. Further, this problem gets multiplied in the case of adolescents. All these issues and problems make adolescence a period of stress and storm. In the case of single parenting families, adolescents become more vulnerable to such problems. After reviewing related literature and looking at the importance of family in influencing one's life, the investigators decided to conduct a study on the effect of single parenting on the stress level of adolescent students and other related problems.

The present research study focuses on understanding stress level, and youth problems among adolescents in relation to the type of parenting type and gender. Further, correlation and moderation analyses were performed to understand the relationship between stress and the problems of youth. ANOVA and multiple analyses were used to study the effect of parenting type on the stress level and other related problems.

Method

Research Design and Sample

In this study, a detailed field survey was conducted on 120 adolescent

students (16–18 years old) in the Sonepat district of Haryana. By adopting a multistage random sampling method, 60 adolescent students were taken from single parenting families while 60 were taken from dual-parenting families.

Research Instruments and Procedures

In the present research, stress and related problems were considered dependent variables, while parenting type and gender were considered independent variables. Data collection was performed using the Youth Problem Inventory prepared by Dr. Verma and the Student Stress Scale prepared by Dr. Zaki Akhtar. The Youth Problem Inventory is comprised of 80 statements based on family problems (Area-A), school/college problems (Area-B), social problems (Area-C), personal problems, and oversensitivity (Area-D). Student Stress Scale is comprised of 51 items based on major types of stress prevalent in adolescents.

Analysis and Interpretation of Data

Based on the results shown in Table 1, it can be observed that the mean level of stress was significantly less in single parenting adolescent students (150.0) than in dual parenting adolescent students (162.3). Dual parenting adolescents were more stressed. This finding is quite different from the expected results. Moreover, it was observed that both groups are experiencing low to moderate levels of stress. Further, boys and girls did not differ in their level of stress except in the case of single parenting adolescents, where boys were found to have significantly high-stress levels.

In reference to the problems of adolescent students, Table 2 results showed no significant difference in

Table 1: Comparison of Level of Stress (N=120)

Sr. No.	Variables	Type of Students	No. of Students	Mean	t-value	Result (0.05)
1.	Level of Stress	Single Parenting Adolescent Girls	30	140.7	3.68	Significant
		Single Parenting Adolescent Boys	30	159.4		
2.	Level of Stress	Dual Parenting Adolescent Girls	30	159.2	1.05	Not significant
		Dual Parenting Adolescent Boys	30	165.4		
3.	Level of Stress	Single Parenting Adolescent Girls	30	140.7	3.50	Significant
		Dual Parenting Adolescent Girls	30	159.2		

4.	Level of Stress	Single Parenting Adolescent Boys	30	159.4	1.05	Not Significant
		Dual Parenting Adolescent Boys	30	165.4		
5.	Level of Stress	Single Parenting Adolescent Students	60	150.0	3.00	Significant
		Dual Parenting Adolescent Students	60	162.3		

the level of problems across gender and groups. Further, boys and girls were found to experience the same type of problems.

Correlation analysis indicated that the correlation coefficients between areas A, C, D, youth problems and stress scores were significant and positive at 0.05 level of significance. It means family problems, social problems, personal problems, and oversensitivity lead to an increase in stress level among adolescents. However, the correlation

Table 2: Comparison of Level of Problems (N=120)

S. No.	Variables	Type of Students	No. of Students	Mean	t-value	Result (0.05)
1.	Level of Problem	Single Parenting Adolescent Girls	30	41.3	1.87	Not significant
		Single Parenting Adolescent Boys	30	50.4		
2.	Level of Problem	Dual Parenting Adolescent Girls	30	46.9	0.45	Not significant
		Dual Parenting Adolescent Boys	30	44.5		
3.	Level of Problem	Single Parenting Adolescent Girls	60	41.3	0.98	Not significant
		Dual Parenting Adolescent Girls	60	46.9		
4.	Level of Problem	Single Parenting Adolescent Boys	60	50.4	1.34	Not significant
		Dual Parenting Adolescent Boys	60	44.5		
5.	Level of Problem	Single Parenting Adolescent Students	60	45.85	0.03	Not significant
		Dual Parenting Adolescent Students	60	45.71		

Table 3: Correlation Coefficient Between Stress Level and Youth Problems

Correlation Coefficient	Area A (Family Problems)	Area B (School / College Problems)	Area C (Social Problems)	Area D (Personal Problems and Over Sensitivity)	Youth Problem
Stress Score	0.29**	0.10	0.25**	0.25**	0.28**
**Correlation is significant at the 0.01 level (2-tailed).					

coefficient of area B and stress level was 0.10 (insignificant), which means that school/college problems of the students had a small positive correlation with stress level, which did not reach statistical significance.

Multiple regression analysis was carried out to determine the contribution of parenting type and youth problems to the stress level. The model summary given in Table 4, indicated that the value of the adjusted R square came out to be 0.157, indicating that this regression model explains 15.7 per cent of the variance in the stress scores of adolescents. Further, the ANOVA summary in Table 5 showed that the F value (5.42) is significant at 0.05 level of significance. Hence, it can be inferred that this multiple regression model is significant.

The value of beta under standardised coefficient indicated that parenting type and family problems significantly contribute to the stress level among adolescents. Hence, out of different problems faced by the adolescents, only family problems were found to have a predictor effect on the stress level of adolescents.

After multiple regression, moderation analysis was carried out

Table 4: Regression Analysis Summary on Correlates of Stress Level Among Adolescents

Regression Analysis	Analysis of Variance					
R2 .192	**Source**	**SS**	**Df**	**Ms**	**F**	**Sig.**
R2.192	Regression	12184.607	5	2436.92	5.420	0.000*
Adjusted R2.157	Residual	51257.184	114	449.624		
SE 21.20	Total	63441.792	119			
a. Dependent Variable: Stress level b. Predictors: (Constant), Parenting Type, Area A, Area B, Area D, Area C						

Table 5: Coefficient Table of Stress Level, Youth Problems and Parenting Type

	Unstandardised Coefficients		Standardised Coefficients		
Variable Description	**B**	**SE**	**Beta**	**T**	**Significance**
(Constant)	121.867	7.798		15.628	0.000
Parenting Type	11.303	3.905	0.246	2.895	0.005
Area A	0.690	0.308	0.232	2.240	0.027
Area B	0.724	0.466	0.184	-1.555	0.123
Area C	1.636	1.308	0.144	1.250	0.214
Area D	0.452	0.340	0.157	1.329	0.186

Table 6: Model Summary for Moderation Analysis

R	R-sq	MSE	F	df1	df2	p
0.4329	0.1874	444.4332	8.99159	3.000	116.0000	0.0000

Table 7: Coefficient Table

Coefficient	se	t	p	LLCI	ULCI	
Constant	96.5382	14.8384	6.5060	0.0000	67.1488	125.9276
Area A	2.4100	0.7882	3.0577	0.0028	0.8489	3.9712
Parenting Type	29.7029	9.3763	3.1679	0.0020	11.1320	48.2738
Interaction	-1.0198	0.4971	-2.0516	0.0425	-2.0044	0.0353
Interaction=Area A*Parenting Type						

Table 8: Conditional Effect of the Family Problems on the Values of Moderator

Parenting type	Effect	SE	t	p	LLCI	ULCI
Single parenting	1.3902	0.3531	3.9367	0.0001	0.6908	2.0897
Dual parenting	0.3704 0.3498	1.0587	0.2919	0.3225	1.0633	

to understand the role of parenting type as a mediator between family problems and stress level by using PROCESS macros in SPSS given by Andrew F. Hayes. The mediation model summary given in Table 6 indicated that parenting type significantly moderates (F= 8.92, p= 0.00) the relationship between family problems and stress. The moderation process showed that the effect of the moderator (parenting type), controlling for family problems, was significant, b = 29.7029, t = 3.16, p = 0.0020. Analyses revealed that controlling for the moderator, family problems was also a significant predictor of students' stress, b = 2.41, t = 3.05, p = 0.0028. The interaction term between parenting type and family problems (b= –1.019, t = –2.05, p = 0.042) was statistically significant, and R square change (R2 change = 0.0295, F = 4.208, p = 0.042) was also found significant, which suggested that moderation was significant. Conditional analysis revealed that only single parenting type acted as a significant mediator (b = –1.39, t = –3.93, p = 0.0001); however, the effect of the mediator became insignificant for dual parenting type (b = 0.3704, t= –1.0587, p= 0.2919).

Discussion

The stress level was high among dual parenting adolescents as compared to single parenting adolescents. Although, this finding of the study could not be compared due to the lack of literature in this area. However, Cicchetti et al. (1993) found adaptive outcomes and resilience in the case of maltreated children. This suggests that the rough phase of life faced by single parenting adolescents has made them more resilient and adaptive, so they now experience lesser stress. The problems faced were higher among single parenting adolescents than that dual parenting adolescents. However, the difference in the problems faced was statistically insignificant. These results are consistent with Compas and William (1990) who found no difference between children in single and dual parent families in terms of emotional/behavioural problems and stressful events.

Adolescents' stress is significantly correlated with family problems, social problems, and personal problems. However, school/college related problems do not create stress for them. Out of four types of problems adolescents face, family related problems significantly predicted their stress. The results of moderator analysis revealed the significant moderating role of single parenting on the relationship between family problems and stress level among adolescents. It means family problems can lead to more stress when adolescents belong to single parent families. Aminian, Sabunchi, Madadi, Sharifi, and Amini, (2015) found that mental health and educational attainment is adversely affected in the absence of any parent. Hence,

the family can act as a buffer against problems or contribute to their stress if it does not work well. It suggests that single parenting influences stress among adolescents. This may be due to lack of a support system and other basic amenities required to live a happy life. Further, Abudu and Fuscini (2013) supported the findings, wherein they recommended that single parent children should be given more attention to enable them to cope and adjust to an academic environment.

Conclusions

In this research, the effect of parenting type on stress and other related problems of adolescent students was studied. Results suggest that problems of adolescent students related to family, society, school or college, personal and oversensitivity may affect their stress level. According to the results, family problems, school or college problems, social problems, personal problems, and over-sensitivity are positively correlated with stress levels. This implies that stress level is associated with these problems and will increase with the increase in problems. The study also demonstrated the role of single parenting in the relationship between family problems and stress levels. It means that in the case of single parenting, family problems cause stress.

The study has implications for teachers and parents as they can prepare remedial plans especially to reduce stress levels, as most adolescents are experiencing low to moderate levels of stress. Results also highlight the importance of spreading awareness among teachers, parents, and society about the problems of single parenting children and counselling single parents and their children. Programmes and policies may be framed to encourage single parents to stay involved with their children. Further, the curriculum may include specific strategies to reduce stress among adolescents and train them in problem-solving abilities. Hence, in many ways present study is beneficial to teachers, teacher educators, administrators, and policymakers.

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Development and Standardisation of Adolescent at Risk Screening Scale (ARSS)

Sukanya Biswas* and Poonam Sharma**

Abstract

With the dearth of adolescent at risk measurement scales in India and the need for the same in the context of the rising popularity of at risk adolescent programmes, a culture-specific scale to screen at risk adolescents is imperative. With this background, the current study aimed to develop and standardise a scale to screen at risk adolescents in India. The objectives were to— (i) construct a comprehensive scale for screening at risk adolescents; (ii) select and test the measurability of items in the at risk adolescent's scale and; (iii) test the reliability and validity of the scale. The study was predominantly following the scale design. It was conducted in three main stages—scale development, field testing of the scale and standardisation. A total of 100 adolescents from Grades VII–X, belonging to different backgrounds, participated in the study. The age group of the adolescents ranged from 13–16 years. Convenience sampling was followed. The items were developed after an extensive literature review. Face and content validation was established. Item analysis, correlation and reliability tests were used. The reliability of the test-retest was 0.892 and the Guttman Split Half Coefficient was 0.867, all indicating high reliability.

**Research Scholar*, Amity University, Mumbai.
***Assistant Professor*, Amity Institute of Behavioural and Allied Sciences (AIBAS), Mumbai.

Introduction

For many decades, the risky behaviour displayed by adolescents in modern society has been a major concern. Adolescence is a milestone in human growth and development as a turbulent period of transition from childhood to adulthood characterised by coexisting changes. It is a critical period of life in which a great deal of biological, psychological, and social changes occur and spans the ages of 10–19 years. Early identification and focused interventions are regarded as critical for assisting troublesome young children and their families, as well as for communities and service providers who are responsible for the healthy development of children.

Adolescents and children have the potential to be valuable national assets. Prevention of adolescent-risky behaviour is crucial for a variety of reasons. One is that participating in risky behaviour may pave the way for further risky behaviour, increasing the possibility of self injury, victimisation by others, and other undesirable effects. (Ellickson, Tucker and Klein, 2003; Shader, 2003). Another reason is that engaging in even one type of risky behaviour consistently can jeopardise progress toward positive educational goals, such as graduating high school on time and can increase the likelihood of developing social, behavioural, physical, and mental health problems later in life. For practitioners, funders, and policymakers interested in achievable goals to avoid adolescent risky behaviour, excessive drinking in adolescence is connected with negative health effects in adulthood such as alcoholism (D'Amico, Ellickson, Collins, Martino, and Klein, 2005). Adolescent drug use has been associated with increased rates of cognitive impairments, isolation, theft, and aggressive behaviour. Illicit drug use, in general, has been demonstrated to increase the chance of hazardous sexual behaviour, delinquency, criminality, and drug dependence, as well as the risk of injury and death from motor vehicle accidents (National Institute on Drug Abuse, 2006). Aggression and delinquency have been linked to poorer levels of educational attainment as well as greater levels of mental health, substance abuse, and economic problems (Colman, Murray, Abbott, Maughan, Kuh, Croudace, et al., 2009). Youth who engage in risky sexual behaviour are at risk of contracting sexually transmitted diseases, having an unwanted pregnancy, and becoming a teen parent. Furthermore, participating in several risky behaviours increases the chance of negative effects.

Reliable assessment instruments are required to appropriately assess adolescents. Self report measures are one of the most appropriate assessment procedures for assessing risk behaviours in particular (Brener, Billy and Grady, 2003), allowing for the estimation of cognitive and emotional aspects which are difficult to access through external evaluation.

This will facilitate in obtaining a lot of information with a minimal investment of time, and expressing themselves through scores that facilitate the interpretation of the results without the need for inferences, and introducing appropriate psychometric properties (Fernández-Ballesteros, 2007).

Objectives of the Study

The following are the objectives of the study.

1. To standardise At Risk Adolescent Screening Scale (ARSS)
   a. Establishing the reliability
   b. Establishing the validity
2. To develop a manual for the ARSS

Scale Development

The process of construction and standardisation of the instrument was performed on a three-phase cycle. In the first phase, an in-depth literature review and survey were conducted to generate relevant items on the challenges faced by parents of adolescents and what according to the parents are the challenges faced by the adolescents to gather the at risk behaviour of adolescents. In the second phase, the first pool of items was reviewed by test-making experts and administered to a pilot sample to assess the clarity, intelligibility, and appropriateness of each of the items. In the third phase, the items selected in the earlier phase were administered to a sample of adolescents, to assess their predictive validity and reliability, using item analysis. For the confirmation of the samples for the phases, convenience sampling was carried out, given that the administration of the instruments was conducted only in those establishments where both the permission of the authorities and the consent of the parents were obtained.

For the administration of the instruments, authorisation to Ethic Committee Board was asked for. The Board assessed whether the study met the protection of the personal information of the participants, the privacy of the data collected, and its use only for academic and scientific purposes. Once the confirmation of compliance with the ethics committee board was granted, permission was asked from the school authorities where the study was carried out. To obtain consent for the participation of adolescents, their parents or guardians were contacted by a notice setting out the reasons, importance, and consequences of their children's participation in the study, so that they could express their disagreement (or refuse permission) if they wanted (passive consent method). Thus, adolescents who did not have permission were excluded. The administration of the instruments was carried out via Google form where consent from parents and their adolescents were taken, briefing them about the study and informing them about the confidentiality that would be maintained. The responses were kept confidential by generating a unique code for each adolescent. For example, for our study, the unique identification code will be generated

by combining class, division and roll no (7A1).

Phase 1: Item Pool Development Method

To obtain the first pool of items two qualitative procedures were carried out: (i) a review of recent literature on adolescents' risky behaviours and (ii) conducting a survey questionnaire with parents of adolescents to obtain the necessary material to construct the items and to later write them. Based on the data obtained in this phase, the first pool of items was made up, on which the questionnaire was built.

Sample

It consisted of 100 parents of adolescents of both sexes within the age range of 13 to 16 years, studying in Classes VII, VIII, IX and X standard from a school in Pune. The sample of the study was collected through the method of purposive and convenience.

Instrument

A survey questionnaire was conducted to investigate the risky behaviour of adolescents. This technique was thought to generate items relevant to the variables in the scale. The parents had to respond to the following open questions: (a) What can be the various challenges parents of adolescent children can experience? and (b) What can be the various challenges which an adolescent can face?

Procedure

Participants were the parents of adolescents between the age ranges of 13 to 16 years. To obtain permission from the school prior contact was made by taking an appointment with the Principal of the school. Permission was granted by the school after discussing the nature of the study, the time required and assurance of complete confidentiality. Before actually conducting this study a short prior contact was made with the respective participants and the objective was explained to the participants. Then instructions were given to the participants regarding filling up of questionnaires. After completion of the questionnaires, scoring and tabulation of the data, it was subject to statistical analysis.

Data Analysis

An analysis of the data gathered from the survey was carried out. A detailed analysis revealed that parents identified 8 distinct challenges which parents of adolescent children can experience (behavioural issues, lack of skill set, addiction—social media, phone, substance, emotional issues, academic issues, mental health concerns, parent-child relationship, peer pressure). Also for the various challenges which an adolescent can face, parents identified eleven distinct challenges (peer pressure, behavioural issues, lack of skill set, addiction—social media, phone, substance, emotional issues, academic issues, mental health concerns, puberty, hormonal and

physical changes, social pressure, parent-child communication or relationship, identity crisis).

Results

After reviewing relevant literature 18 areas—stress, anxiety, depression, body image issue, self concept, suicidal ideation, aggression, drugs, internet, gaming, truancy, delinquency, sex, bullying, parent-child relation, peer relation, social withdrawal, academic achievement) of adolescent risky behaviour was considered which was clubbed under four dimensions as suggested by the guide which helped form the question items for the scale. A hundred and one statements were prepared which were later reduced to 77 items after scrutiny by the experts. The scale was modified in the light of cultural context and reviews obtained from language experts, research experts, academicians and field experts in the field of adolescent development. Some conventional guidelines were considered when writing the items: (a) the items should be consistent with the purpose of the test, (b) excessively long items should be avoided, (c) complex and ambiguous sentences should be avoided, (d) statements with double negatives should be avoided, (e) extreme expressions (e.g., never, always, all) should be avoided, and (f) language should be used that is appropriate for the maturity and education level of the target population (Osterlind, 1990). The total item retained after this step is 62 items.

Phase 2: Content Validity

In this phase, the opinions of experts were to prove whether the items written were a representative sample of the construct of which some inference was made.

Experts Judgement

The goal of this study was to establish a consensus among the judges on the degree of congruence between the questionnaire items and the specific descriptions of each domain that the instrument purports to measure.

Method

The items written in the earlier stage were reviewed by expert judges to evaluate their semantic clarity and grammatical correctness, appropriateness to the comprehension level of the target population, and each item's congruence with the construct measured.

Participants

The panel of five experts with good experience in their relevant field were evaluated to determine the content validity of the scale. These experts were contacted individually. They evaluated the items for their cultural relevance, readability, suitability for 5 point rating scale, representation of positive or negative items and the domain to which they belong. The experts were requested to record their agreement or disagreement on any of the items of the scale. They were also requested to suggest the change in the items which they don't find feasible.

Instrument

To establish a consensus about the degree of congruence between items and specific descriptions of the content domain, the experts received a form having scoring criteria where, 1 = Not Acceptable (major modifications needed), 2 = Below Expectations (some modifications needed), 3 = Meets Expectations (no modifications needed but could be improved with minor changes), 4 = Exceeds Expectations (no modifications needed). Also the psychometric assessment of how well the items were written, by considering relevance, syntactic and semantic clarity, and how proper they were for the intended adolescent population (Osterlind, 1990). A space was also offered where the judges could give feedback that may be useful for the investigation.

Data Analysis

Agreement between examiners was estimated using the intraclass correlation coefficient (ICC). This ratio is considered more proper than the Pearson correlation coefficient because the latter shows the strength of the linear association between both assessments but not the agreement between judges.

Results

The choice for categorisation of each item was noted and the frequency of choice was calculated. Following the rule suggested by Polit and Beck (2006) that when there are five or less than five evaluators, the items agreed to by all the judges are to be considered, the items on which there was the consensus of five experts and above were retained as such and even if they suggested some change, it was inserted. Thus, the present form of scale has 0.5 as the content validity coefficient. A few other suggestions related to the wording of some items were also considered. Their opinions and suggestions were incorporated to make the content more relevant. It was at this stage that the negative items were included as per the expert's suggestion.

Phase 3: Reliability and Item Analysis (Internal Consistency)

Method

To further refine the item pool and to offer a preliminary analysis of the potential structure of the questionnaire, item analysis was used to examine the items within each of the broad domains. Its internal consistency and predictive validity for at risk adolescents were analysed.

Sample

The scale was administered individually to 100 English speaking adolescents who belonged to Grades 7–10 and age range between 13–16 years. Convenience sampling was used. The table below presents the socio-demographic details of the respondents. The female representation was slightly higher (6 per cent) than male representation. As students from Grade X were higher in participation, those from the mid-adolescence phase formed the majority. These adolescents were from different backgrounds.

Table 1: Descriptive Demographic Details of the Sample

Particulars	Category	Frequency	Percentage (%)
Gender	Male	47	47
	Female	53	53
Family	Nuclear	86	86
	Joint	14	14
Age	13	15	15
	14	16	16
	15	47	47
	16	22	22
Grade	7	12	12
	8	14	14
	9	13	13
	10	61	61
Sibling	0	27	27
	1	69	69
	2	4	4
Socio-economic Status	Upper Middle	22	22
	Middle	51	51
	Lower Middle	27	27
Location	Urban	82	82
	Semi-urban	18	18
	Rural	0	0

Instrument

The Adolescent at Risk Screening Scale (ARSS) has been developed to screen at-risk adolescents (between the approximate ages of 13–16). It has 63 items and screens out at-risk adolescents across four domains, i.e, academic, psychological, social, emotional and behavioural. The ARSS is a Likert five-point Summated Rating Scale. This scale can be kept confidential by generating a unique code for the children. For example, in our study, the unique identification code will be generated by combining class, division and roll no (7A1).

Procedure

The questionnaires were administered through Google Forms. Efforts were taken to seek the cooperation of students and the voluntary nature of their participation was emphasised. The researcher, who was one of the authors of this study, offered detailed instructions about how to complete the questionnaires and students had the opportunity to ask questions.

Data Analysis

SPSS was used.

Result

Item Analysis

After the pilot study the next step in the standardisation of a scale is to find out the value of each item, which forms the basis for item selection. The individual scores of all 100 respondents were arranged in descending order from the highest to the lowest score. The top 25 per cent of the subjects with the highest scores and the bottom 25 per cent of the subjects with the lowest scores, served as criterion groups, and were sorted out for item selection. The 't' value for all 63 items has been calculated with the help of formula suggested by Allen Edwards (1957). Items with a 't' value equal to or greater than 1.75 (Edward. L. Allen, 1957) were accepted and those with a 't' value below 1.75 were rejected. For 63 items out of 74, the value was found equal to or greater than 1.75. Altogether 11 items were dropped. Some items with a correlation of less than 0.2 were retained due to the content covered by the items. Even though these items correlated with the total scores at a less-than-optimal level, these items correlated moderately with at risk subscale scores. Therefore, 63 items were retained in the standardisation of Adolescent at Risk Screening Scale (ARSS). Questionnaire items were deleted or revised if they were: identified by respondents as difficult to understand; or considered by the researcher to have poor face validity. New items were added accordingly and some items were rewritten in the remaining scales so that items reflected the underlying construct more closely or to simplify the language.

Table 2: Item Reduction and Wordings Changed in Adolescent at Risk Screening Scale

S. No.	Description of item	't' Value
Academics		
1	I make good use of time when it comes to studies.	0.316
2.	I don't like going to school.	0.292
3.	Doing well in school is important to me.	0.581
4.	I enjoy studying.	0.398
5.	I only study before the exams.	0.427
6.	It is important to me to do well in school.	0.084
7.	I need other people to tell me to study- my parents, friends, teacher, etc.	0.196
8	I memorise things, even though I don't understand them.	0.411
9.	Doing well in school is important to my family.	0.377
10.	This year my grades have worsen than last year.	0.408

• School is a waste of time. (changed) • I study because I'm interested in learning. (changed) • I need other people to encourage me to study—my parents, friends, teacher, etc. (changed) • My academic performance depends on the efforts I make. (changed) • I make good use of the time I invest in studying. (changed) • Doing well in school is important to me. (changed) • Doing well in school is important to my friends and family. (changed)		
Psychological		
1.	I worry about things.	0.532
2.	I feel nervous.	0.520
3.	I have thoughts of bad things happening in my life.	0.662
4.	I believe bad things happen to people like me.	0.535
5.	I find difficult to concentrate or relax.	0.626
6.	I have purposely hurt myself without wanting to die, such as cutting, scraping, or burning.	0.489
7.	I lose my temper.	0.643
8.	I feel tired/fatigued or low in energy.	0.681
9.	I feel worthless.	0.600
10.	I have concerns or questions about the size or shape of my body, or my physical appearance.	0.480
• I feel irritable, lose my temper, feel pissed off easily. (modified) • Feeling tired, feeling fatigued, low in energy, hard to get motivated, have to push to get things done, want to rest or lie down a lot. (modified) • Feeling of worthlessness, hopelessness, letting people down, not being a good person. (modified) • I often worry about or fear about something. (deleted) • I would like to get counselling about something that is bothering me. (deleted)		
Social		
1.	It is difficult for me to make friends.	0.597
2.	It is difficult for me to disagree with another person's point of view.	0.247
3.	I find myself worrying that I won't know what to say in social interaction.	0.649

4.	I find it difficult to initiate conversation with strangers.	0.530
5.	I have a difficulty talking to new people.	0.645
6.	I am good at entering new situations and meeting people for the first time.	0.517
7.	I feel comfortable while performing in front of an audience.	0.433
8.	When mixing in a group, I find myself worrying I will be ignored.	0.503
9.	I worry about expressing myself in case I appear awkward.	0.413
10	I know at least one person with whom I can talk to about problems.	0.351
• I find it difficult to disagree with another's point of view. (changed) • I am unsure whether to greet someone I know only slightly. (changed) • I feel comfortable while acting, performance or speaking in front of an audience. (changed) • Initiating conversation with strangers. (changed)		
Internet and Gaming		
1.	I would rather spend time online than do things around the house.	0.450
2.	My performance in school suffers because of the amount of time I spend online.	0.443
3.	People close to me are concerned about the amount of time I spend on my smartphone or computer.	0.485
4.	I am concerned about missing out on things online when not checking my smartphone.	0.308
5.	I get irritated when people interrupt me while I am using my computer or smartphone.	0.505
6.	I feel anxious when I do not have my smartphone with me.	0.542
7.	I prefer staying home and using the internet than going out with friends.	0.249
8.	I neglect other important activities (e.g., school, work, sports) to play online games.	0.557
9.	Has online gaming taken the place of any hobbies or sports you used to enjoy?	0.440
10.	I get very angry when someone or something interrupts a game.	0.547
• I am bothered when people interrupt me while I am using my computer or smartphone. (changed) • I would rather stay home and use the internet than go out with friends. (changed)		

• Have you neglected other important activities (e.g., school, work, sports) to play games? (changed) • Has gaming taken the place of any hobbies or sports you used to enjoy? (changed)		
Delinquency		
1	Argue or fight with either of your parents.	0.437
2.	Hit someone with the intention of hurting them.	0.322
3.	Steal something from a store without paying for it.	0.309
4.	Bullied people on social media platform? (Count instagram, facebook, chat rooms texting, etc.)	0.511
5.	Sneak money from an adult's wallet, purse, or other place.	0.357
6.	Cheated in the examination.	0.587
7.	Forged signature on school forms, marksheets, etc.	0.341
8.	Used abusive language with others.	0.709
9.	Involved in physical fight where I or someone else has got hurt.	0.497
10.	When I get angry I do violent things.	0.511
• During the past 30 days, how many times were you in a physical fight? (deleted) • During the past 30 days, did you bully anyone in person or electronically? (Count instagram, facebook, chat rooms texting, etc.) (deleted)		
Substance Use		
1.	I don't think it will be difficult for me to get cigarettes if I want.	0.355
2.	If given a chance I can try smoking.	0.388
3.	My close friends have tried cigarettes.	0.402
4.	My close friends have tried drugs.	
5.	I think use of cigarette/alcohol makes young people look cool.	0.284
6.	I have tried alcoholic drinks or cigarettes.	0.395
7.	None of my friends have tried drugs.	
• I think smoking cigarette makes young people look cool or fit in. (changed) • Have you ever tried cigarette smoking, even one or two puffs? (deleted) • Have you ever tried to use chewing tobacco, snuff or dip, etc? (deleted) • Any substance or drug addiction. (deleted)		
Sex		
1.	I would like to have sex to see what it is like.	0.581
2.	I believe youths who have never been involved in sexual intercourse before marriage are old-fashioned.	0.570

3.	My friends have had sex.	0.486
4.	I have read erotic books or watched pornography.	0.546
5.	I believe a sexual encounter that lasts only once is all right.	0.631
6.	It is good to have sex before marriage to see whether one is physically compatible or not.	0.509
7.	One can have sex before marriage if they are in love.	0.475
8.	I have received information about how to avoid getting sexually transmitted diseases.	0.581

- Most of my friends think that you can have sex before marriage if you are in love. (changed)
- I have received information on abstinence ('how to say no to sex'). (deleted)
- I have received information about how to avoid getting pregnant/getting HIV/AIDS, or getting sexually transmitted diseases. (changed)

Internal Consistency

For this purpose reliability was estimated by administering it to 100 adolescents on one occasion. It was estimated to determine how well the items will yield the same results. We computed the correlation between each item. One item was indicated as not applicable by the majority of adolescents. Hence this item was deleted.

Reliability

The reliability of the At-Risk Scale was estimated through the split-half method of reliability and the test-retest method.

a) Split-half reliability: The scale was administered to 100 adolescents selected randomly. The collected data was divided into two halves (on an odd-even basis). The correlation coefficient (for full scale) between two halves of the test was found as 0.867 which is significant at 0.01 level. The area-wise reliability coefficient of the scale was also worked out which is given in Table 3 below—

Table 3: Area wise reliability of scale (split-half reliability)

Reliability Coefficient	Psycho-logical	Social	Academic	Emotion and Behavioural			
				Sex	Delinquency	Substance Addiction	Online Addiction
r	0.867	0.704	0.770	0.532	0.822	0.539	0.838

**significant* at 0.01 level

b) Test-retest reliability: The scale was administered to 100 adolescents selected randomly. After two weeks the scale was again administered to the same subjects. Then coefficient of correlation computed between the first and second tests was found to be 0.892 (for full scale) which is significant at 0.01 level. The area-wise reliability coefficient was also computed through this method of scale which is given in Table 4 below—

Table 4: Area wise reliability of scale (test-retest reliability)

Reliability Coefficient	Psycho-logical	Social	Academic	Emotion and Behavioural			
				Sex	Delinquency	Substance Addiction	Online Addiction
r	0.892	0.956	0.977	0.956	0.976	0.806	0.923

**significant* at 0.01 level

Thus, the final form of the scale was found to be reliable.

Discussion

The purpose of the present study was to develop and validate test items to assess At Risk Adolescent Screening Scale (ARSS). The 63 final items screen the levels of risk and present acceptable psychometric properties. Every item analysis showed evidence of content validity and internal consistency. The questionnaire has allowed discrimination between adolescents with high and low levels of risk. Likewise, adolescents with higher scores perceived greater risk, while adolescents with lower scores perceived not at risk. The scale is suitable for both individual and group administration. Today, adolescents are at risk for various reasons which are a major concern. It needs immediate attention from the family, community, school administration, managing committee and the system as a whole. This tool can be an important instrument in screening at risk adolescents. The scale is a resource to study, research or survey the adolescents who are at risk and to prepare and plan for the interventions. It can be useful for teachers, parents, psychologists, counselors, and educationists in their specific area of work, to understand adolescent risky behaviour and plan at various levels namely at social, family, school administration, etc. This scale can be used to facilitate referral and screening procedures for adolescents at risk to refer them to the appropriate resources, programmes and services. By making it possible to identify at risk adolescents, this scale can help strengthen the foundations of targeted prevention approaches by focusing resources on a specific clientele and by recommending appropriate interventions by assessing the level of risk (low/moderate/

high) and developing tailored intervention plans. It is increasingly accepted that the identification of adolescents presenting risk factors and the assessment of their risk levels are key aspects of an effective prevention initiative. However, there are challenges associated with the use of this scale, including the risk of stigmatisation of an already vulnerable clientele and errors in interpreting results. For practitioners using this scale, it is important to ensure that the programme's objectives and implementation criteria are compatible with those of the tool selected.

However, caution should be exercised in generalising the present findings because of the non-representativeness of the sample. Although adolescent students from both public and private schools were included, explicit consideration was not given to the student's socio-economic status, a variable that should be considered in future studies. Furthermore, the evaluation of the usefulness and scope of the scale developed is proposed for future experimental studies, particularly pre-post studies to assess the efficacy of the interventions. This questionnaire could be used to evaluate the effectiveness of educational programmes to promote well-being in adolescents. Achieving voluntary change in adolescents may be difficult when considering thus parents and caretakers can be psycho-education and their involvement can be benefitting the intervention.

Conclusion

At Risk Adolescent Screening Scale (ARSS) is easy to use in educational settings to accurately identify students with academic, psychological, social, emotional and behavioural risks. The degree of risk continuum developed by this tool helps distinguish between children based on their degree of risk; the greater the overall risk score, the greater the likelihood of future problems. This continuum helps define three major sub-groups based on the degree of risk (low, moderate and high) for determining intervention duration and intensity. When used in schools, this tool promotes the success of adolescents at risk and addresses them by identifying them early and allowing for quick corrective action.

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Development and Validation of Science Self Efficacy Scale (SSES) for Secondary School Students

SHIVANI*

Abstract

The research study was taken to develop a suitable and reliable scale for measuring self efficacy belief in science subject among secondary school students. In this research study, a collection of 55 items were constructed to develop the 'Science Self Efficacy Scale' (SSES) based on the literature review related to discussion with experts. The items were arranged into five dimensions of science self efficacy, namely, 'self confidence', 'self regulation', 'self concept', 'perceived science efficacy' and 'outcome expectancy'. These items were graded on five point Likert scale. The process of validation was accomplished with 300 students of 14–15 years age group, studying science as a subject, and selected randomly from Government schools of Haryana, India. The process of item analysis was done by calculating t-values. Fourteen items of the scale were dropped, and finally, 41 items were kept. The calculated value of Cronbach's alpha came out to be 0.86 and for the split-half method, it was 0.76. The construct validity of the scale was determined by calculating the co-efficient of correlation between the scores of this scale and the score obtained by using 'Self Efficacy Scale' (SES) by Singh and Narain, 2014. The percentile norms for the scale were obtained after validating the normality score by Q-Q plot. The result suggests that SSES may be a helpful tool for future research to assess self belief in persons, particularly in science subject. The SSES scale is relevant to students, psychologists and school teachers. This tool can be used for evaluation and understanding of self efficacy level in science, thereby helping them in planning and implementing different kinds of strategies for enhancing their self efficacy level.

**Assistant Professor*, N.C. College of Education, Israna, Panipat, Haryana.

Introduction

Adolescence is a crucial and immense phase in the development and socialisation of an individual that nurtures a person for future challenges. It is also considered an important phase where an adolescent spends remarkable time in the school environment. The favourable school environment and instructions may lead to the establishment of good relations with peers, teachers and the community.

It also helps in the development of managerial and leadership skills among students (Dunn 1998; Moos, 1979). In the words of Roeser, Midgley, and Urdan, 1996, students who got desired opportunities to learn in a school environment exhibit proper adjustment, emotional development and academic excellence (Church, Elliot, and Gable, 2001). Bandura (1994) hypothesises that in cooperative and holistic learning environment students feel satisfied and pleasant as they work in togetherness. In addition to this, various teaching-learning activities like slide shows, visual and virtual mode of learning, outdoor and indoor activities and the use of other online and hands-on resources along with the conventional method of teaching makes learning more creative and stimulating (NCERT, 2019).

Science education at the school level is acclaimed for developing scientific values like scientific temper, rationality, reasoning, problem solving, etc. But there are barriers in the science education system and the major barriers include attitudinal, architectural, administrative and divergent socio-economic status (UNESCO, 2010). Therefore, there is a need to amend the confidence and attitude of student from rote learning to experimental or practical learning approach towards science subject and giving ample freedom to teacher and students to bring reform in science curriculum by discovering new areas of science (NEP, 2020). The problem-solving instructions and blended learning (Chung and Ro, 2004; Abdelraheem, 2014) showed a marked effect on children's creativity and self efficacy as well. Various research studies (Alt, 2015 and Goldstein, 2016) determine that problem and project-based learning method leads to a more positive constructive learning environment that promotes active participation and motivation thereby, reducing fear, leading to increased self efficacy and making learning more enjoyable.

Conceptual Framework

The inception of self efficacy can be outlined back to the social cognitive theories of learning. It emerged amongst 1940s and 1980s (Heider, Rotter, Seligman, Weiner, Bandura and Skinner as cited in Flammer, 2001). Heider (1958) proposed attribution by considering that individuals look for a rational justification after the occurrence of an event or behaviour and called it 'situational attribution' or 'external

attribution'. If the motive of behavioural outcome was ascribed to various environmental aspects and come from the individual, it was 'personal attribution' or 'internal attribution'. The individual having secondary or external attribution got a lower control level. In the words of Bandura (1999), self efficacy is a belief about one's ability to perform behaviours or accomplish a behavioural approach. Danehower (1988) further illustrated that efficacy beliefs lead to better performance. Bandura (1997) in his book '*Self efficacy: The Exercise of Control'* emphasised that self efficacy functions with various socio-cognitive factors in human success and accomplishment.

After carrying out a comprehensive literature review and discussion with the expertise of the field, it has been observed that enhancing self efficacy belief is a continuous process and an important variable affecting a child's development in science subject and many tools were given for measuring self efficacy. Thorough observing and investigating varied available tools for evaluating the self efficacy level of learners, it was perceived that very few tools are reliable in the Indian context. If an instrument were to be developed to assess the feeling of self efficacy in the science subject, then remedial or intervention actions can be implemented to bring reform in pedagogical strategies and classroom learning environment. Therefore, it was decided by the investigator to develop and standardise a Science Self Efficacy Scale (SSES) meant exclusively for students in the subject of science.

Methodology

The procedure of scale development and validation was done in five fundamental stages namely: scale conceptualisation, scale construction, item scoring, final tryout, item analysis and selection of item, reliability and validity of the scale. The process of scale validation is shown in Figure 1.

Scale Conceptualisation (Defining various elements)
Scale Construction
Item Scoring, Tryout and Review the Scale
Final Tryout, Item Analysis and Item Selection
Tool Validation and Norms

Fig.1: Process of tool construction and standardisation

Science Self Efficacy: Conceptual Framework

Self efficacy is also called personal efficacy. It is defined as individualised faith in personal abilities for desired results. Bandura (1994) believed that with high self efficacy one takes the difficult task as a challenge. Such people recover from setbacks and challenges easily. Science self efficacy helps to determine individualised faith in personal abilities for the production of the desired achievement in science. People take the difficult tasks as a challenge and

try to find the solutions to problems scientifically, with patience, without losing their self confidence and recovering themselves from setbacks if they are unable to find solutions. They recover easily and take interest in doing science practically.

This scale was constructed to assess the self efficacy of Class IX students in science subject. Finally, five components or elements were selected for test construction. These five elements were 'self confidence', 'self regulation', 'science self concept', 'perceived science efficacy' and 'outcome expectancy'. Each element is briefly discussed below:

(i) **Self Confidence:** Self confidence is how one feels about oneself and one's abilities (Greenacre, Tung and Chapman, 2014). The defining characteristics of self confidence are mastering particular activities; trusting in one's ability to achieve goals, achieving goals through hard work and overcoming any doubts and obstacles positively, accepting difficult challenges and continuing work in the face of setbacks or failure and taking it as a part of everyday life.

(ii) **Self Regulation:** Self regulation is the ability to develop, execute and assess the expected behaviour to achieve goals (Winne, 2021). The behavioural characteristics associated with it include goal setting, interest, self motivation, cooperation, help seeking, ignoring distraction, focussing and maintaining attention on set goals, curiosity and enthusiasm to do new or goal-directed activities and judging the effectiveness of the plan.

(iii) **Self Concept:** Self concept is an individual's belief about themself as to how they think, evaluate or perceive themself and how others think about themself (Schwarzer and Warner, 2013). It is the concept of oneness. The characteristics of self concept are self image (what you see for yourself), self esteem (self worth in the eyes of others), recognition, ideal self and competitiveness (Elliot, 1984; Gecas, 1982).

(iv) **Perceived Science Efficacy:** It is faith in an individual's perceived abilities for successful performance of behaviour which leads to the development of a specific result or outcome. The defining characteristics associated with it are perceived capability in doing science practicals, skills in doing practicals effectively and efficiently and goal attainment (Croker, Andersson, Lush, Prince and Gomez, 2010).

(v) **Outcome Expectancy:** It refers to faith that one's efforts will lead to the attainment of desired results or goals (Cook and Artino, 2016). The behavioural characteristics include an individual's performance, ability, systematic effort, self determination and organisation.

Description of Science Self Efficacy Scale

This scale was prepared to assess the self efficacy of Class IX students in the subject of science. The science self efficacy scale included 55 items categorised into five elements, namely self confidence, self regulation, self concept, perceived science efficacy and outcome expectancy. Table 1 shows the items, composed of different elements of science self efficacy.

The scale contains 28 positive and 27 negative statements or items and details are specified in Table 2.

Item Scoring

The responses for positive items ranged from 'strongly agree to strongly disagree' and the pattern of scoring was from 5 to 1 respectively; whereas, for negatively keyed items reverse scoring patterns were followed. The responses for negative items ranged from 'strongly agree to strongly disagree' and the pattern of scoring was from 1 to 5 respectively. The item scoring details are given in Table 3.

Construction and Standardisation

(i) Preliminary draft: The review of related literature in self efficacy

Table 1: Items Distribution in Five Elements of Science Self Efficacy Scale

S. No.	Elements	Number of Items	Question Number of Items
1.	Self Confidence	13	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
2.	Self Regulation	17	14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
3.	Self Concept	12	31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42
4.	Perceived Science Efficacy	05	43, 44, 45, 46, 47
5.	Outcome Expectancy	08	48, 49, 50, 51, 52, 53, 54, 55

Table 2: Positive and Negative Items of Science Self Efficacy Scale

Nature of Items	Question Number of Items	Total
Positive	1, 3, 5, 7, 8, 11.12, 14, 16, 17, 19, 24, 25, 29, 30, 33, 34, 36, 37, 41, 42, 44, 45, 47, 48, 49, 50, 53	28
Negative	2, 4, 6, 9, 10, 13, 15, 18, 20, 21, 22, 23, 26, 27, 28, 31, 32, 35, 38, 39, 40, 43, 46, 51, 52, 54, 55	27

Table 3: Pattern of Scoring for Positive and Negative Items

Items	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive Items	5	4	3	2	1
Negative items	1	2	3	4	5

and science self efficacy was referred for scale development. Initially, items related to different elements of science self efficacy were outlined. The opinion or characteristics associated with the Science Self Efficacy Scale were summarised on five point Likert Scale (Likert, 1932). The front page contains basic information about students and further instructions like the purpose of the scale and how to answer the items were also briefly written in it. In the preliminary draft, sixty statements of the Science Self Efficacy Scale were constructed. The scale was sent to experts from education, psychology and science education for their views regarding the relevance of elements, ability to understand content and items covering constructs. Based on experts' remarks, a few items were amended and consented items were finalised for scale. Further, screening of language was done by Hindi and English language experts. At last, the primary scale retained fifty-five items.

(ii) Pilot study: Pilot study was conducted on fifty students of Class IX. After administration of the test, modifications to ambiguous items were sought keeping in view the understanding problems, language suitability, doubts and repeated statements.

(iii) Try out: After modifying the items of the test, administration of scale was implemented on 300 sample students of Class IX. The students were instructed to finish the test as soon as possible without any time constraints. After data collection, items of statements were analysed.

(iv) Item analysis and item selection: Analysis of items is a technique to assess the scale items qualitatively as well as quantitatively. Qualitative analysis is done based on the content and structure of items. Quantitative analysis is done by calculating item difficulty and item discrimination. After administrating the preliminary draft of the scale, containing 28 positive items and 27 negative items, the process of item analysis was done. A response sheet of 300 students was arranged in ascending order for item analysis. Upper 27 per cent and lower 27 per cent responses were selected for analysis of items (Kelley, 1939). The item discriminating value was calculated by applying the 't'-test. The table value of 't' was 2.67 at the 0.01 significance level. Therefore, items having a higher calculated value, or equal to the table value of 't' test, were retained whereas others were discarded. The obtained t-values are given in Table 4.

In Table 4, it was experienced that 't' value for 14 items had poor discriminative power. These 14 items have 't' values lesser than 2.67. Therefore, total 14 items having serial number 6, 10, 21, 22, 26, 27, 28, 32, 33, 35, 38, 39, 43 and 53, which were not according to the required 't' value,

were dropped. A total of 41 items were retained out of 55 items.

(v) Reliability: The scale's reliability was measured by the application of Cronbach's alpha and split-half method. Cronbach alpha assesses the internal reliability of scale. Table 4 showed the Cronbach

Table 4: Item Analysis of Science Self Efficacy Scale

Item Number	t-value	Cronbach's Alpha if Item Deleted	Result	Item number	t-value	Cronbach's Alpha if Item Deleted	Result Significant at 0.01 level
1	5.658	0.793	Selected	29	7.874	0.790	Selected
2	5.786	0.793	Selected	30	5.407	0.792	Selected
3	3.327	0.798	Selected	31	40.784	0.794	Selected
4	7.554	0.790	Selected	32	0.060	0.806	Rejected
5	3.360	0.797	Selected	33	2.393	0.799	Rejected
6	1.945	0.808	Rejected	34	5.396	0.793	Selected
7	5.638	0.793	Selected	35	1.657	0.808	Rejected
8	4.019	0.796	Selected	36	5.738	0.793	Selected
9	4.992	0.793	Selected	37	3.577	0.796	Selected
10	0.506	0.806	Rejected	38	2.180	0.800	Rejected
11	5.084	0.793	Selected	39	0.248	0.806	Rejected
12	5.276	0.793	Selected	40	7.507	0.789	Selected
13	3.232	0.811	Selected	41	5.606	0.793	Selected
14	4.909	0.794	Selected	42	7.187	0.792	Selected
15	7.859	0.790	Selected	43	1.368	0.808	Rejected
16	4.954	0.796	Selected	44	4.675	0.794	Selected
17	4.696	0.794	Selected	45	3.590	0.796	Selected
18	6.600	0.791	Selected	46	3.132	0.798	Selected
19	3.717	0.795	Selected	47	7.538	0.790	Selected
20	3.503	0.798	Selected	48	5.787	0.793	Selected
21	2.383	0.799	Rejected	49	4.866	0.793	Selected
22	2.166	0.801	Rejected	50	5.158	0.794	Selected
23	6.791	0.791	Selected	51	4.354	0.796	Selected
24	8.310	0.789	Selected	52	8.562	0.789	Selected
25	4.945	0.795	Selected	53	0.880	0.802	Rejected
26	1.682	0.801	Rejected	54	5.502	0.814	Selected
27	2.537	0.810	Rejected	55	6.874	0.791	Selected
28	1.547	0.807	Rejected	—	—	—	—

alpha value and it was 0.86 after eliminating poor items from the scale, which is rationally high for reliability. Split-half method is another way to judge the reliability of the scale. The value of split-half method of the present was 0.76 (Nunnally, 1978) which is reliable. Therefore, these two methods of reliability measurement give the indicator of good reliability of SSES. Table 4 indicates the different measures of reliability calculated for SSES.

(vi) Validity: Validity of the Science Self Efficacy Scale was determined by establishing content validity, face validity and construct validity. For determining content and face validity the initial draft of the Science Self Efficacy Scale was given to experts, as mentioned earlier, chosen from various fields. Based on comments received from various experts, out of 60, 5 items were dropped and few items were amended and approved items were retained in the scale. In addition to this, screening of language for this scale was done by English and Hindi language experts. At last, commonly approved 55 statements were retained. Construct validity of Science Self Efficacy Scale was established by calculating the co-efficient of co-relation between the total scores of Science Self Efficacy Scale and scores of its five different elements. The value of co-efficient of co-relation between different constructs of Science Self Efficacy Scale varies from 0.68 to 0.90 and the level of significance was 0.01. The coefficient of correlation/ Pearson correlation is given at Table 5.

From Table 5 of the inter-correlation matrix, it is evident that the items under different constructs of the Science Self Efficacy Scale are inter-correlated.

(vii) Norms: Norm is the median or average of the present achievement of a given group in a given test. It is used to compare data. As science self efficacy was standardised on three hundred

Table 5: Inter-correlation Matrix between Various Constructs of Science Self Efficacy

Elements	Self Confidence	Self Regulation	Self Concept	Perceived Science Efficacy	Outcome Expectancy	Total Scores
Self Confidence	1	0.655**	0.545**	0.483**	0.496**	0.824**
Self Regulation	0.655**	1	0.649**	0.546**	0.641**	0.908**
Self –Concept	0.545**	0.649**	1	0.479**	0.509**	0.797**

Perceived Science Efficacy	0.483**	0.546**	0.479**	1	0.480**	0.685**
Outcome Expectancy	0.496**	0.641**	0.509**	0.480**	1	0.754**
Total Scores	0.824**	0.908**	0.797**	0.685**	0.754**	1

** Significant at the 0.01 level

students of Class IX, the test norms were established by testing the data for normality by using the 'Shapiro-Wilk Test' and 'Q-Q plot' shown in Figure 2.

The value of 'Shapiro-Wilk Test' was found to be 0.36, higher than 0.05, showing that there was a normal distribution of sampled data. The percentile norms were arranged based on scores of the science Self efficacy scale obtained from three hundred subjects. The scores of Science Self Efficacy Scale ranged from 92 to 167. The interpretations were grouped into five categories, i.e., very good, good, average, poor, and very poor. A detailed explanation of

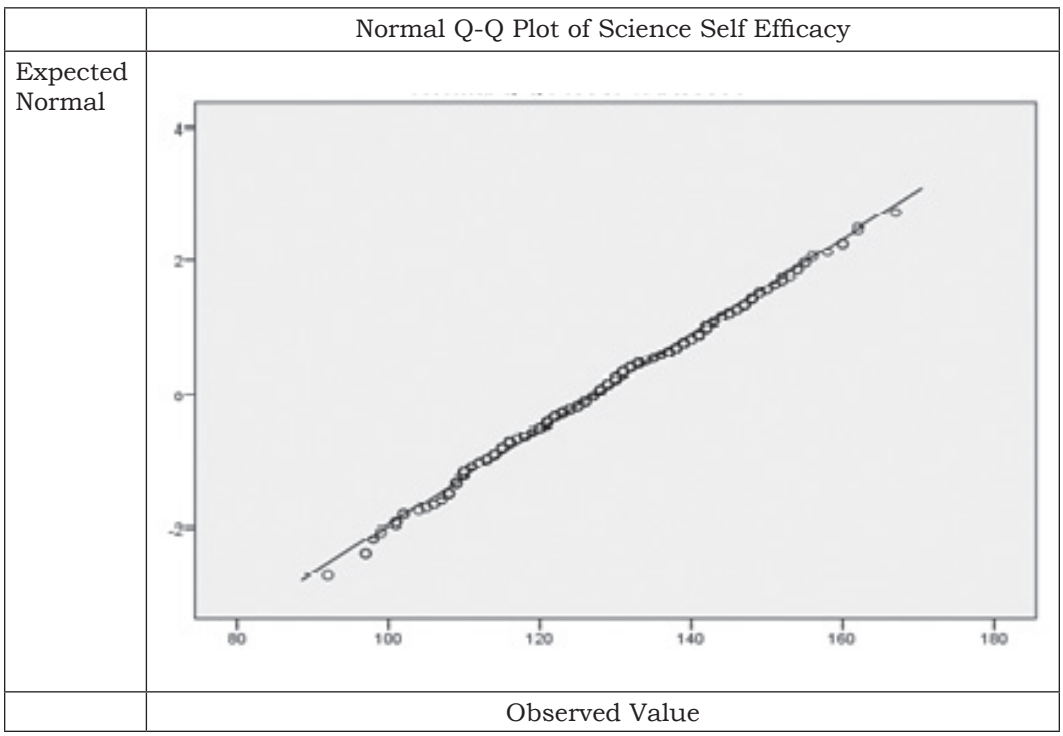

Fig. 2: Q-Q Plot Showing the Normal Distribution of Sampled Data

Table 6: Percentile Norms for Science Self Efficacy and their Interpretation

Percentile	Scores of Science Self Efficacy	Quantitative Interpretation	Qualitative Interpretation
95th	151.00	146 and above	Very good
90th	146.00		
80th	140.80	136 to 145	Good
75th	138.00		
70th	135.00	120 to 135	Average
60th	130.00		
50th	127.00		
40th	123.40		
30th	120.00		
25th	117.25	110 to 117	Poor
20th	115.00		
10th	109.00	109 and below	Very poor

norms for science self efficacy is given in Table 6.

Description Regarding Final Science Self Efficacy Scale (SSES)

The Science Self Efficacy Scale (SSES) was designed to assess the self efficacy of students in science subject. The scale contains 41 items, and these items were arranged into five sub elements: self confidence, self regulation, self concept, perceived science efficacy and outcome expectancy. The respondents were supposed to respond against five categories against each items, i.e., very good, good, average, poor, and very poor. The final Science Self Efficacy Scale items are given in Table 7.

Discussion

The findings of the present study reveal that SSES is a reliable and valid tool for assessing self efficacy in science subject. The SSES includes both positive and negative items and has been developed in both English and Hindi languages. The statistical analysis reveals that the scale is reliable and valid and would be an effective tool in assessing self belief of students who generally find difficulty in understanding and application of scientific concepts. The construct validity of the scale was assessed with a standardised general Self Efficacy Scale (SES) given by Singh and Narain (2014). Regardless of the above limitation, the results of the study reveal that SSES may be a valuable tool to assess science self efficacy among students.

Table 7: Description of Final Science Self Efficacy Scale

S.N.	कथन/Statements
1.	मुझे वैज्ञानिक समस्याओं का समाधान करना पसंद है। I like to solve scientific problems.
2.	विज्ञान के प्रयोगों के असफल होने पर मैं अपना धैर्य खो देता/देती हूँ। I lose my patience whenever I fail in science experiments.
3.	मैं मुश्किल वैज्ञानिक कार्यों को आसानी से करने में सक्षम हूँ। I am capable of doing difficult scientific tasks easily.
4.	मैं कड़ी मेहनत करने पर भी असफल होता/होती हूँ। I am unable to get success despite doing hard work.
5.	मैं वैज्ञानिक चुनौतियों का सहजता से सामना कर सकता/सकती हूँ। I can face scientific challenges with ease.
6.	जब तक मुझे सफलता नहीं मिलती तब तक में बारम्बार प्रयास करता/करती हूँ। I keep on trying again and again until I succeed.
7.	मैं स्वयं अधिकतर वैज्ञानिक शंकाओं का समाधान करने के समर्थ हूँ। I find myself capable of solving most of the scientific doubts at my own.
8.	जब चीजें मेरे नियत्रंण में न हो तो मैं आसानी से निराश हो जाता/जाती हूँ। I usually get frustrated whenever the things are not under my control.
9.	मैं निष्कर्ष निकालने और प्रयोग के बाद परिणामों की व्याख्या करने में सक्षम हूँ। I am capable of drawing conclusions and interpreting results after experimentation.
10.	मैं चीजों को बारिकी से देखता/देखती हूँ। I observe things minutely.
11.	मैं प्रयोग करने में अच्छा/अच्छी नही हूँ। I am not good at experimentation.
12.	मुझे लगता है कि वैज्ञानिक अध्ययन और वैज्ञानिक अविष्कार लक्ष्य निर्धारित करते है। I feel that scientific studies or inventions are target/goal oriented.
13.	मैं विज्ञान विषय से सम्बंधित प्रयोगों को करने में रूचि खो चुका/चुकी हूँ। I have lost interest in doing science experiments.
14.	मैं निरंतर स्वयं को लक्ष्य प्राप्ति के लिए प्रोत्साहित करता/करती हूँ। I consistently encourage myself in achieving the set goals.
15.	मैं अपनी परियोजना के काम के दौरान अपनी प्रगति पर निगरानी रखता/रखती हूँ। I keep on monitoring my progress during my project work
16.	मैं वैज्ञानिक समस्याओं पर ध्यान देने में असमर्थ हूँ। I am unable to pay attention on scientific problems.
17.	मुझे स्वयं विज्ञान प्रयोगशाला में प्रयोग करना पसंद है। I like to perform experiments in science laboratory on my own.
18.	कई बार दिया स्वपन (दिन के सपने) मेरे कार्य करने में रूकावट पैदा करते हैं। Frequent day-dreaming disturbs my working.
19.	मैं विज्ञान के क्षेत्र में नए विकास को जानने के लिए हमेशा उत्सुक नहीं रहता/रहती हूँ। I am not always curious to know new developments in science field.
20.	मैं अपने निर्धारित लक्ष्य के लिए अपनी प्रगति पर नजर रखता/रखती हूँ। I, keep tracking my progress for set goals.
21.	मैं वैज्ञानिक समस्याओं के हल के लिए दूसरों की मदद लेने में झिझक महसूस नहीं करता/करती हूँ। I do not hesitate in seeking help from others to solve scientific problems in hand.

22.	मैं खुद को कठिन और जटिल समस्याओं को पता करने के लिए प्रेरित करता/करती हूँ। I keep on motivating myself to solve the difficult and complex scientific problems.
23.	मैं वैज्ञानिक परियोजनाओं से संबंधित मुश्किल हालात से निपटने में प्रोत्साहित महसूस करता/करती हूँ। I feel motivated in handling difficult situations related to science project.
24.	मैं अक्सर विज्ञान की परीक्षा के दौरान चिंतित रहता/रहती हूँ। I often feel worried during science tests.
25.	प्रयोग करते समय ए में अपनी गहातियों से सीखता/सीखती हूँ। While doing experiments, I tend to learn from my mistakes.
26.	जब मुझे मुश्किल काम करने को कहा जाता है, तो में और अधिक दृढ बन जाता/जाती हूँ। Whenever I am asked to do difficult tasks, I become more determined.
27.	मैं अपने दोस्तों के सुझावों को सकारात्मक रूप से होता/लेती हूँ। I take my friend's suggestions positively.
28.	अंतिम परिक्षा के प्रदर्शन में मैं खुद को दुर्भाग्यपूर्ण मानता/मानती हूँ। I consider myself unlucky in the performance of final exam.
29.	मैं अपनी क्षमताओं पर विश्वास करके अपने जीवन में सब कुछ प्राप्त कर सकता/सकती हूँ। I can achieve everything in my life by believing in my own abilities.
30.	मैं निरंतर प्रयास के साथ हर मुश्किल काम पूरा कर सकता/सकती हूँ। I can complete every difficult task with continuous effort.
31.	में आमतौर पर वैज्ञानिक अवधारणाओं को अधिक आसानी से सीखता/सीखती हूँ। I usually learn scientific concepts more easily.
32.	विज्ञान के सिद्धांत को समझने के लिए क्षेत्रीय यात्रा एवं सर्वेक्षण बहुत उपयोगी है। Field visits/surveys are very useful in understanding the science principles.
33.	मैं अपने आप को कुछ प्रयोग कुशलता से करने में असमर्थ पाता/पाती हूँ। I find myself unable to perform some experiments skillfully.
34.	यदि मैं विज्ञान से जुड़ी समस्या में फंस जाता/जाती हूं तो लगातार प्रयत्न करने पर समाधान ढूंढ लेता/होती हूँ। When I am confronted with science related problems, I find solutions through consistent effort.
35.	मेरा पूरा प्रयास विज्ञान गृहकार्य को सफलतापूर्वक पूरा करने में मेरी मदद करता है। My whole hearted efforts help me in finishing science homework successfully.
36.	यदि मैं वैज्ञानिक क्रियाकलापों को सुनियोजित ढंग से करूँ तो सफलता प्राप्त कर सकता/सकती हूँ। I can get success if I do my scientific activities through a well-planned way.
37.	मैं विज्ञान कार्य में साथी की आलोचना के बावजूद दृढ़ रहता/रहती हूँ। I remain determined to undertake scientific work despite the criticism from fellows.
38.	किसी नकारात्मक टिप्पणी से मैं और विचलित हो जाता/जाती हूँ। I get disturbed with negative comments.
39.	मैं अपने वाक्य पर ध्यान केंद्रित करने में सक्षम नहीं हूँ। I am unable to focus my attention on my goal.
40.	मुझे विज्ञान प्रदर्शनी और प्रश्नोत्तरी में भाग लेना अच्छा नहीं लगता है। I don't like to participate in science exhibitions and quiz, etc.
41.	मैं अक्सर विज्ञान के याद किए हुए तथ्यों को भूल जाता हूँ। I often forget the learned concepts of science.

If their self efficacy level is assessed at the initial level and proper interventions are adopted, it may increase their self belief and confidence to handle any problematic situation related to science.

Conclusion

The literature review in the science education area showed that there is a dearth of scales or tools to assess students' science self efficacy. Hence SSES was developed by the researcher after following a subsequent procedure for standardisation. The SSES can be used in several ways, because it is a simple tool to conduct and assess self belief or Self efficacy along with its five sub-elements. The research study was completed on a sample of 300 school students. The tool was prepared with the aim to develop science self efficacy of school students. Total 41 items were included in the final scale and were tested for their content, face and construct validity. Like other scales, it has certain limitations that need to be considered before its use. This tool does not contain culture-specific content and can be used across the national boundaries after determining its reliability and validity. It is an effective tool for evaluating the student's self efficacy level in science so that remedial intervention programme can be induced to make science learning more valuable and practical.

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Physico-mathematical Conceptual Difficulties

A Barrier to Learning 'Motion' in Physics among Higher Secondary Students in Kerala

Shyma Usman Abdulla* and Mumthas N S**

Abstract

Physics is a difficult school discipline due to the difficulty faced by the students in integrating the concepts of mathematics and physics (Mwangala and Shumba, 2016). This study provides insights into higher secondary students' difficulties when solving physics problems involving the application of mathematical concepts. The data required for the investigation was gathered using 'Physico-mathematical Conceptual Test' with 70 multiple choice questions based on select basic concepts from 'Motion'. The test was conducted on 880 higher secondary students who were sampled using stratified sampling technique from various districts of Kerala. The study showed that the extent of physico-mathematical conceptual difficulties in total and in the sub-categories, viz., 'creating or identifying the formula', 'extracting information from diagrams or graphs', 'creating schematic diagrams or graphs' and 'application of mathematics', are moderate. The extent of each category of difficulty in the respective topics was also studied to rank them.

Introduction

"The dominating feature of the contemporary world is the intense cultivation of Science on a large scale, and its application to meet the country's requirements" (Ministry of Science and Technology, Government of India, 1958). The production of better citizens who have imbibed the value of the spirit of scientific inquiry

*Research Scholar, Farook Training College, Research Centre in Education, Kozhikode, Kerala.
**Associate Professor, Farook Training College, Research Centre in Education, Kozhikode, Kerala.

to opt better standards in living is not possible without science education.

In India, through the efforts of National Council of Educational Research and Training (NCERT), Science has been made a compulsory subject throughout the school stage. The Secondary Education Commission (1952–53) had also recommended that every secondary school pupil should study general science as a compulsory subject, so that the learner gains basic quantum of scientific knowledge as a part of his general education (Ministry of Education, Government of India, 1953).

Science had been arbitrarily split into different 'streams' when the amount of information had started to increase beyond the limits where it could be considered as a single subject. But education being a comprehensive and coordinated process have to be correlated to various streams and transacted to attain the aim of 'unification of knowledge'.

There is the need of deliberate effort to be laden to integrate various disciplines and to teach them as a synthetic whole. The shift of dissemination of unified, integrated and meaningful knowledge to the limelight was the result of the child's psychological build-up which wants to receive learning experiences in an integrated manner. An example would be that of mathematics and physics. In reality, one of the most extensive applications of mathematics is in physics (Embeywa 1985; Redish, 2005). The bond between these two streams of science is a very strong one (Hutchings, 1973). In fact, some topics in physics appear exactly the way they are in mathematics (Munene, 2014). Mathematics is a principal tool of physics (Greene, 1969). So, it is clear that learning physics requires mathematical knowledge (Ataide and Greca, 2013; Bing, 2008; Redish, 2005; Vinitsky-Pinsky and Galili, 2014).

Physics is considered to be a particularly difficult school discipline due to the difficulty faced by the students in integrating the concepts of mathematics and physics (Mwangala and Shumba, 2016; Pietrocola, 2008; Tuminaro, 2004; Vinitsky-Pinsky and Galili, 2014;). This difficulty can also be observed among students in doing an appropriate calculation and also in interpreting the results of a physics problem (Tuminaro and Redish, 2007).

So, it is important to investigate the extent of difficulties of students to identify, combine and apply physics and mathematical concepts, here after, known as 'Physico-mathematical Conceptual Difficulties (PMCDs)', to make the transaction of the content and reproduction of the comprehended knowledge effectively. PMCD occur either in one or more categories, viz., 'creating or identifying the formula', 'extracting information from diagrams or graphs', 'creating schematic diagrams or graphs' and 'application of mathematics'. This study provides insights into higher

secondary students' PMCDs in handling concepts under the topic 'Motion' in physics.

Research Questions

The following are the research questions of the study.

1. What is the extent of Conceptual Difficulty (CD) in 'Motion' among higher secondary students?
2. What is the relative position of Physico-mathematical Concepts based on the extent of Conceptual Difficulty (CD) among higher secondary students?
3. What is the extent of Physico-mathematical Conceptual Difficulties (PMCDs) among higher secondary students?
4. What is the relative position of concepts from 'motion' based on the extent of Physico-mathematical Conceptual Difficulties (PMCDs) among higher secondary students?
5. What is the extent of Physico-mathematical Conceptual Difficulty (PMCD) among higher secondary students in
   (a) creating or identifying the formula?
   (b) extracting information from diagrams or graphs?
   (c) creating schematic diagrams or graphs?
   (d) application of mathematics?
6. What is the relative position of concepts from 'Motion' based on the extent of Physico-mathematical Conceptual Difficulty (PMCD) among higher secondary students in—
   (a) creating or identifying the formula?
   (b) extracting information from diagrams or graphs?
   (c) creating schematic diagrams or graphs?
   (d) application of mathematics?

Methodology

Method and Sample

Survey method was conducted on a sample of 880 higher secondary school students from Kerala who have opted science as their main stream (Male: 420, Female: 460; Rural: 597, Urban: 283; Government: 482; Aided: 233, Unaided: 165) using stratified sampling technique.

Tool

The tool used for the study is 'Physico-mathematical Conceptual Test'. The test consists of 78 multiple choice questions based on the basic concepts from 'Motion' at higher secondary level viz., 'Distance', 'Displacement', 'Speed', 'Velocity', 'Acceleration', 'II Equation of Motion', 'III Equation of Motion', 'Newton's Second Law of Motion' and 'Law of Conservation of Momentum'. The test contains two items from each concept for measuring the extent of CD (i.e., total 18 items to measure CD) and each category of PMCD viz., 'Creating or Identifying the Formula', 'Extracting Information

from Diagrams or Graphs', 'Creating Schematic Diagrams or Graphs' and 'Application of Mathematics' (i.e., total 60 items to measure PMCD).

A brief description of CD and the four categories of PMCDs based on which the test was prepared is given below.

Concept

This category refers to the difficulty in identifying, retrieving, recalling, recognising and selecting the correct Physico-mathematical Concepts from the given cues. It also includes the difficulty in differentiating or distinguishing one concept from another.

Example: Total length of the path travelled by a moving body is—

(i) Distance

(ii) Velocity

(iii) Displacement

(iv) Speed

Creating or Identifying the Formula

This category refers to the difficulty in creating, identifying, generating, modifying, rearranging and relating the appropriate formula and equations based on Physico-mathematical reasoning that would best represent the situation provided.

Example: Orbit of an artificial satellite at distance 42260 km from earth is circular. It completes one revolution around the earth in 24 hrs. Its speed will be—

(i) $\left[\frac{3.14 \times 42260}{2 \times 24}\right] m/s$

(ii) $\left[\frac{2 \times 3.14 \times 42260}{24}\right] m/s$

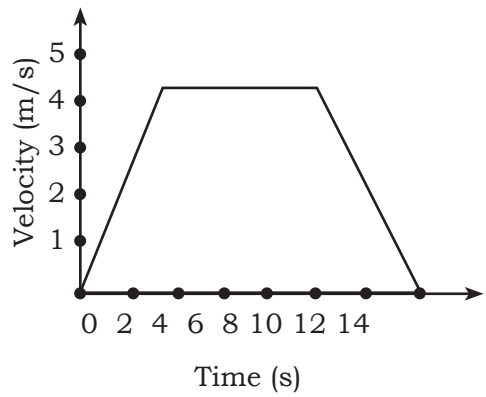
(iii) $\left[\frac{3.14 \times 42260}{2 \times 24}\right] km/hr$

(iv) $\left[\frac{2 \times 3.14 \times 42260}{24}\right] km/hr$

Extracting Information from Diagrams or Graphs

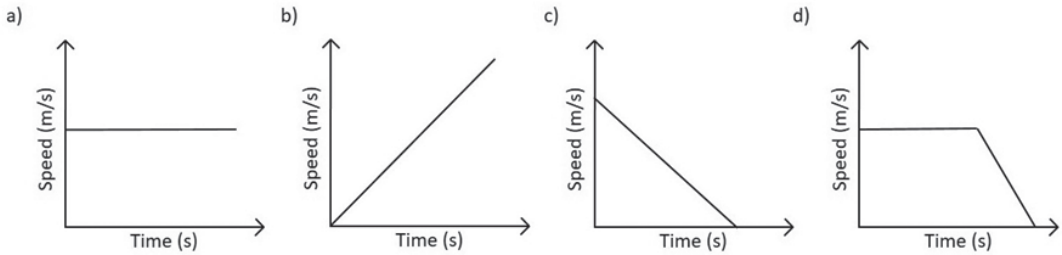
This category refers to the difficulty in decoding and extracting the correct Physico-mathematical information from the pictorial representations like schematic diagrams and graphs.

Example: Study the given graph and calculate the distance travelled by the body in first 8 seconds of the journey graphically.



Creating Schematic Diagrams or Graphs

This category implies the reverse to that of the previous difficulty discussed. This refers to the difficulty in creating; generating, designing and reconstructing the appropriate schematic diagrams or graphs that



would best represent and explain the given physico-mathematical concept.

Example: Which of the following graphs show increasing speed with time?

Application of Mathematics

This category refers to the difficulty in applying and understanding operations in mathematics so as to produce the result and solve the physics problems completely without leaving the calculations half-way.

Example: A car starting from rest moves with a uniform acceleration of 2m/for 5 min. The final velocity of the car will be—

(i) 2.5m/s (ii) 10m/s
(iii) 7m/s (iv) 600m/s

One mark is assigned for every correct response and zero for every incorrect response. The maximum mark obtainable on the test is 78.

The reliability of the test was ensured using split half method (r = 0.81). Face validity, content validity and criterion related validity (r = 0.65) of the test were also established.

Statistical Technique

Percentage analysis of responses of students obtained through the test was used for satisfying the objectives of the study.

Data Analysis and Interpretation

Data Preparation for Analysis

As the tool 'Physico-mathematical Conceptual Test' was prepared by setting two items in each concept under CD and the remaining four categories of PMCDs, viz., creating or identifying the formula, extracting information from diagrams or graphs, creating schematic diagrams or graphs and application of mathematics, the investigator has taken the mean of the obtained scores in the two items as the 'Average Score' for the respective difficulty.

Extent of CD

The 'Average Score' obtained in conceptual items is subtracted from the maximum obtainable average score to get the 'Index of Conceptual Difficulty' in that corresponding concept. The Indices of CD in all the concepts are summed up to obtain the 'Total Index of CD in Motion'. It is

then converted to percentage to get 'Percentage Score of CD in Motion'.

Extent of PMCDs

The 'Average Score' obtained in each concept under various categories of PMCDs is subtracted from the 'Average Score' obtainable on the corresponding conceptual item to get the 'Index of PMCDs' under each category of difficulty in that concept. Only the 'Index of PMCDs' of the students who have the average score of conceptual understanding greater or equal to the average score in Physico-mathematical conceptual understanding is considered for further analysis. In each category of difficulties, the sample may vary. The 'Indices of PMCDs' of all the concepts are summed up to obtain the 'Total Index of PMCDs'. It is then converted to percentage to get 'Percentage Score of PMCDs'.

Extent of CD in Motion

The cumulative percentage frequency curve of CD in physics is given as Figure 1.

Figure 1 implies that among the higher secondary students, half of them are having 50 per cent or more CD in motion. This explains that half of the higher secondary students possess a low level of conceptual understanding in motion.

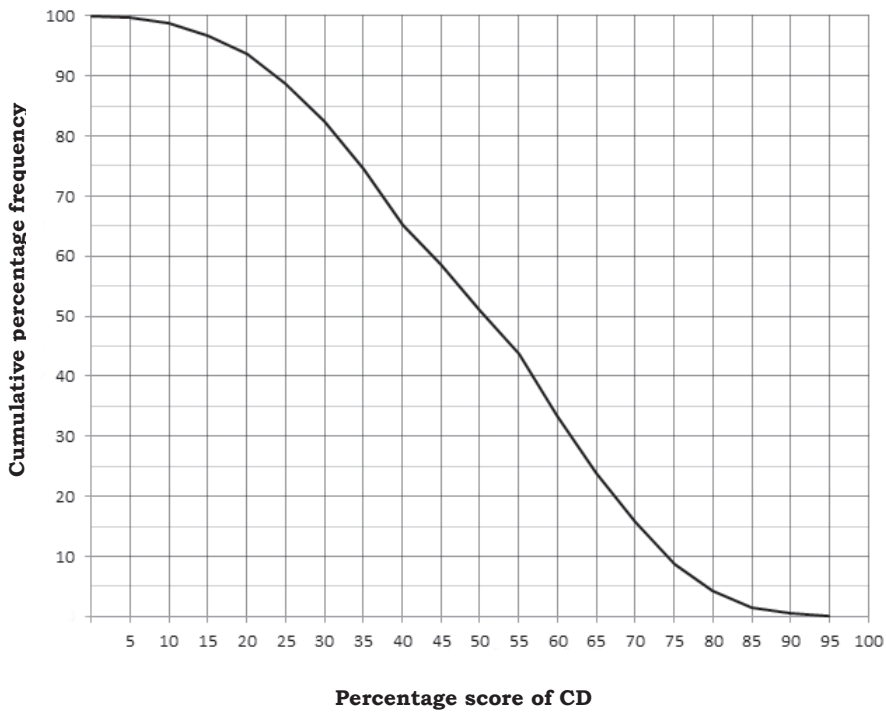


Fig. 1: Cumulative percentage frequency curve of CD in physics

Table 1: Mean Percentage Scores of CD in each Select Physico-mathematical Concepts

S. No.	Physico-mathematical concepts	Mean percentage score of CD
1.	III Equation of Motion	73.86
2.	II Equation of Motion	54.20
3.	Law of Conservation of Momentum	53.64
4.	Velocity	52.39
5.	Speed	48.75
6.	Newton's Second Law of Motion	48.01
7.	Distance	42.78
8.	Acceleration	41.48
9.	Displacement	27.95

Ranking of Concepts based on the Extent of CD

The concepts were ranked and listed based on their extent of CD among higher secondary students in Table 1. For analysing the extent of CD in each concept, the investigator has set the following criteria for interpretation. The CD is said to be high if the percentage score is greater than 50; it is moderate if the percentage score lies between 30 and 50; it is low when the percentage score is less than 30.

From Table 1, it is clear that even though the students are from the science stream, they possess high level of CD in the topics 'III Equation of Motion', 'II Equation of Motion', 'Law of Conservation of Momentum' and 'Velocity'; moderate level of CD in the topics 'Speed', 'Newton's Second Law of Motion', 'Distance' and 'Acceleration'; low level of CD in the topic 'Displacement'.

Extent of PMCDs

For interpretation of extent of PMCDs, the criteria set by the investigators is that the PMCDs is said to be high if the percentage score is greater than 30; it is moderate if the percentage score lies between 10 and 30; it is low when the percentage score is less than 10.

The cumulative percentage frequency curve of PMCDs is given as Figure 2. Figure 2 reveals that half of the higher secondary science students are having nearly 25 per cent or more PMCDs. In other words, even though the students are having conceptual understanding, half of them possess only a moderate level of Physico-mathematical Conceptual Understanding.

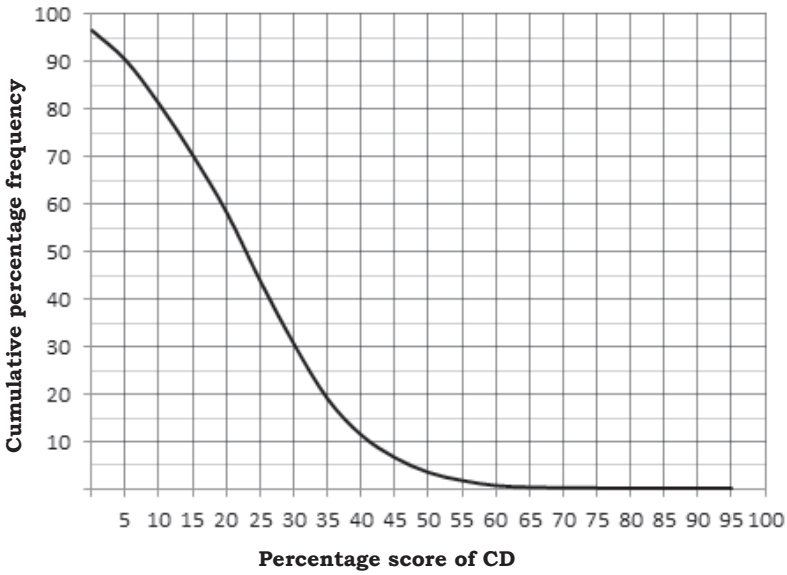


Fig. 2: Cumulative percentage frequency curve of PMCDs

Ranking of Concepts based on the Extent of PMCDs

The concepts were ranked and listed based on their extent of PMCDs among higher secondary students in Table 2.

From Table 2, it is clear that the students possess high level of PMCDs in the topics 'Displacement' and 'Acceleration'; moderate level of PMCDs in the topics 'II Equation of Motion', 'Velocity', 'Distance', 'Newton's Second Law of Motion', 'Law of Conservation of Momentum' and 'Speed'; low level of PMCDs in the topic 'III Equation of Motion'.

Table 2: Mean Percentage Scores of PMCDs in each Concepts

S. No.	Physico-mathematical concepts	Mean percentage score of PMCDs
1.	Displacement	35.34
2.	Acceleration	31.77
3.	II Equation of Motion	29.23
4.	Velocity	25.51
5.	Distance	23.35
6.	Newton's Second Law of Motion	22.78
7.	Law of Conservation of Momentum	22.22
8.	Speed	15.37
9.	III Equation of Motion	2.63

Extent of various Categories of PMCDs

Creating or Identifying the Formula

Extent of Difficulty in Creating or Identifying the Formula

The cumulative percentage frequency curve of difficulty in creating or identifying the formula is given as Figure 3.

Figure 3 implies that half of the students are having 25 per cent or more difficulty in creating or identifying the formula. This shows that even though the students are having conceptual understanding, half of them possess only a moderate level of understanding in creating or identifying the formula.

Ranking of Concepts based on the Extent of Difficulty in Creating or Identifying the Formula

The concepts were ranked and listed based on their extent of difficulty in creating or identifying the formula in Table 3.

From Table 3, it is clear that the students possess high level of difficulty in creating or identifying the formula in the topics 'Displacement', 'Newton's Second Law of Motion'

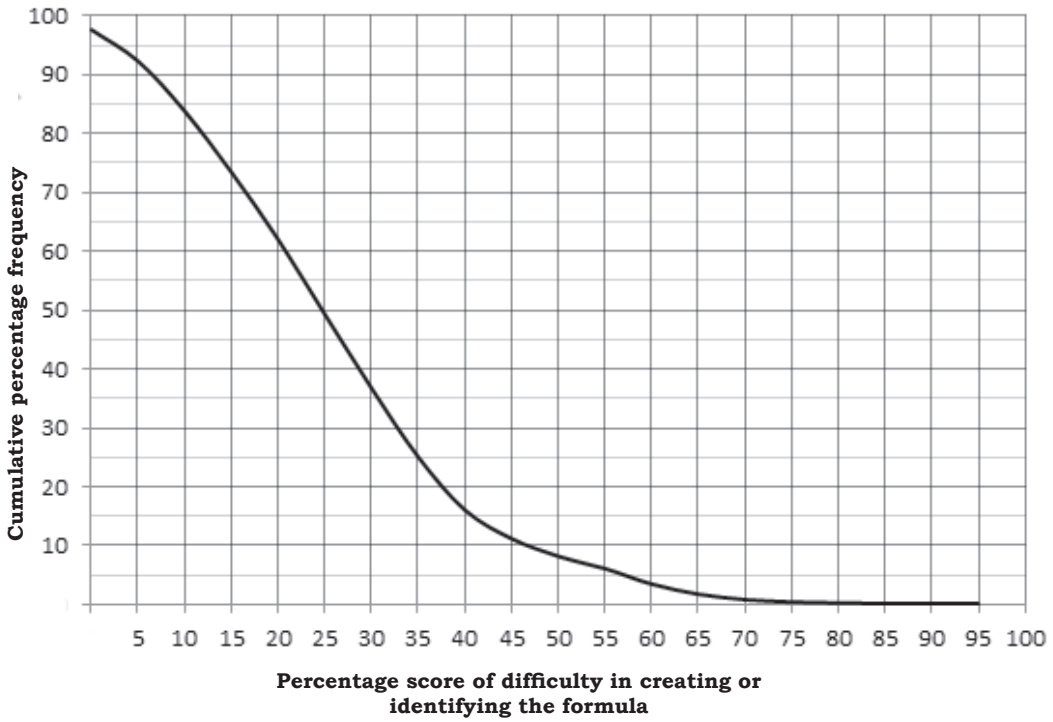


Fig. 3: Cumulative percentage frequency curve of difficulty in creating or identifying the formula

Table 3: Mean Percentage Scores of Difficulty in Creating or Identifying the Formula in Each Concepts

S. No.	Physico-mathematical Concepts	Mean percentage score of difficulty in creating or identifying the formula
1.	Displacement	44.30
2.	Newton's Second Law of Motion	36.40
3.	Velocity	34.09
4.	Acceleration	27.32
5.	Distance	27.19
6.	II Equation of Motion	22.99
7.	Law of Conservation of Momentum	18.86
8.	Speed	13.41
9.	III Equation of Motion	4.01

and 'Velocity'; moderate level of difficulty in creating or identifying the formula in the topics 'Acceleration', 'Distance', 'II Equation of Motion', 'Law of Conservation of Momentum' and 'Speed'; low level of difficulty in creating or identifying the formula in the topic 'III Equation of Motion'.

Extracting Information from Diagrams or Graphs

Extent of Difficulty in Extracting Information from Diagrams or Graphs. The cumulative percentage frequency curve of difficulty in extracting information from diagrams or graphs is given as Figure 4.

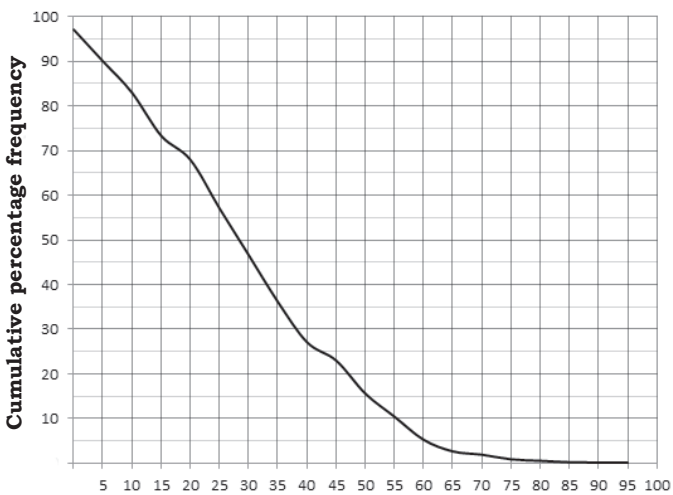


Fig. 4: Cumulative percentage frequency curve of difficulty in extracting information from diagrams or graphs

Figure 4 shows that half of the students are having 28 per cent or more difficulty in extracting information from diagrams or graphs. This implies that even though the students are having conceptual understanding, half of them possess only a moderate level of understanding in extracting information from diagrams or graphs.

Ranking of Concepts based on the Extent of Difficulty in Extracting Information from Diagrams or Graphs

The concepts were ranked and listed based on their extent of difficulty in extracting information from diagrams or graphs in Table 4.

From Table 4, it is clear that the students possess high level of difficulty in extracting information from diagrams or graphs in the topics 'Acceleration' and 'Displacement' and moderate level of difficulty in extracting information from diagrams or graphs in the topics, 'Distance', 'Speed', 'Newton's Second Law of Motion' and 'Velocity'.

Creating Schematic Diagrams or Graphs

Extent of Difficulty in Creating Schematic Diagrams or Graphs

The cumulative percentage frequency curve of difficulty in creating schematic diagrams or graphs is given as Figure 5.

Figure 5 shows that half of the students are having 22 per cent or more difficulty in creating schematic diagrams or graphs. This explains that even though the students are having conceptual understanding, half of them possess only a moderate level of understanding in creating schematic diagrams or graphs.

Ranking of Concepts based on the Extent of Difficulty in Creating Schematic Diagrams or Graphs

The select concepts were ranked and listed based on their extent of difficulty in creating schematic diagrams or graphs in Table 5.

Table 4: Mean Percentage Scores of Difficulty in Extracting Information from Diagrams or Graphs in Each Concepts

S. No.	Physico-mathematical Concepts	Mean percentage score of difficulty in extracting information from diagrams or graphs
1.	Acceleration	35.96
2.	Displacement	35.59
3.	Distance	29.32
4.	Speed	26.27
5.	Newton's Second Law of Motion	23.66
6.	Velocity	20.62

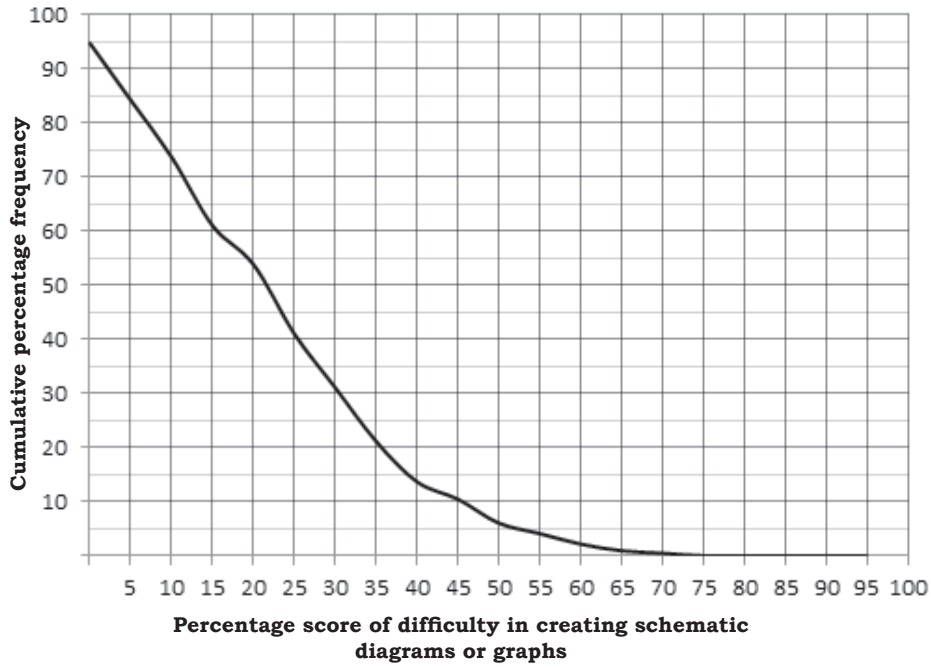


Fig. 5: Cumulative percentage frequency curve of difficulty in creating schematic diagrams or graphs

Table 5: Mean Percentage Scores of Difficulty in Creating Schematic Diagrams or Graphs in Each Concepts

S. No.	Physico-mathematical concepts	Mean percentage score of difficulty in creating schematic diagrams or graphs
1.	Velocity	29.73
2.	Displacement	29.66
3.	Newton's Second Law of Motion	26.81
4.	Acceleration	25.89
5.	Distance	20.48
6.	Speed	3.13

From Table 5, it is clear that the students possess high level of difficulty in creating schematic diagrams or graphs in the topics 'Velocity' and 'Displacement'; moderate level of difficulty in creating schematic diagrams or graphs in the topics 'Newton's Second Law of

Motion', 'Acceleration' and 'Distance'; low level of difficulty in creating schematic diagrams or graphs in the topic 'Speed'.

Application of Mathematics

Extent of Difficulty in Application of Mathematics

The cumulative percentage frequency curve of difficulty in application of mathematics is given as Figure 6. Figure 6 reveals that half of the students are having 24 per cent or more difficulty in application of mathematics. This shows that even though the students are having conceptual understanding, half of them possess only a moderate level of understanding in application of mathematics.

Ranking of Concepts based on the Extent of Difficulty in Application of Mathematics

The concepts were ranked and listed based on their extent of difficulty in application of mathematics in Table 6.

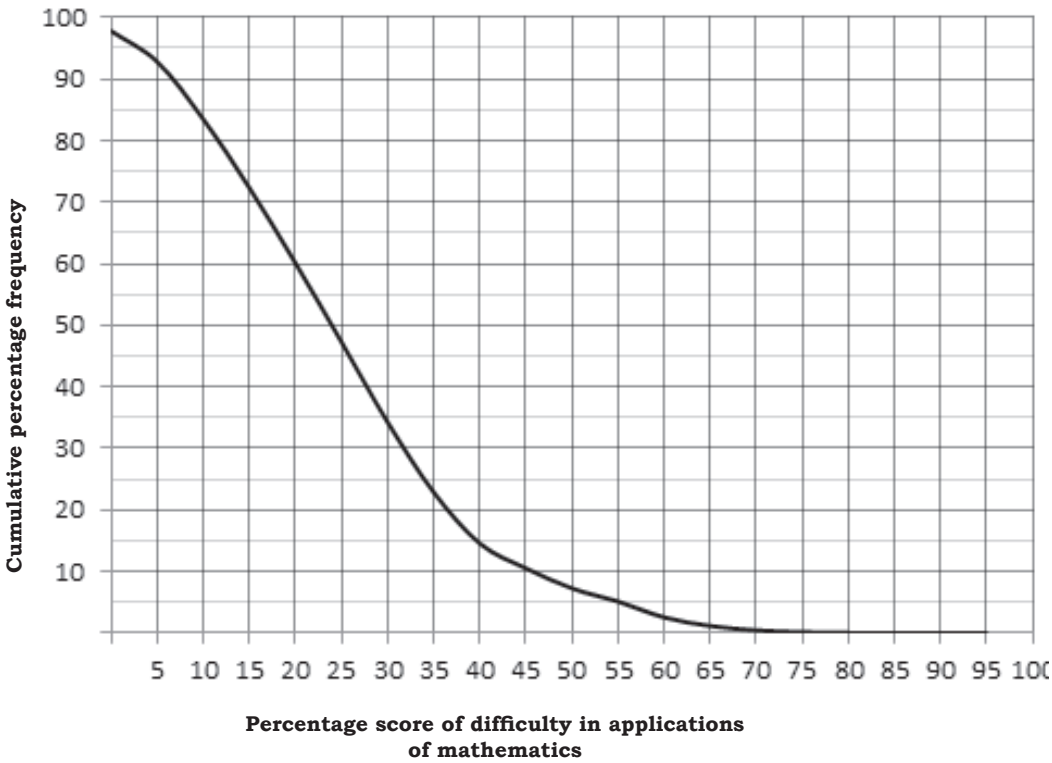


Fig. 6: Cumulative percentage frequency curve of difficulty in application of mathematics

Table 6: Mean Percentage Scores of Difficulty in Application of Mathematics in Each Concepts

S. No.	Physico-mathematical Concepts	Mean percentage score of difficulty in application of mathematics
1.	Acceleration	41.02
2.	Displacement	35.21
3.	II Equation of Motion	34.51
4.	Speed	29.90
5.	Law of Conservation of Momentum	25.60
6.	Distance	22.63
7.	Velocity	21.11
8.	Newton's Second Law of Motion	10.11
9.	III Equation of Motion	2.34

From Table 6, it is clear that the students possess high level of difficulty in application of mathematics in the topics 'Acceleration', 'Displacement', 'II Equation of Motion' and 'Speed'; moderate level of difficulty in application of mathematics in the topics 'Law of Conservation of Momentum', 'Distance', 'Velocity' and 'Newton's Second Law of Motion'; low level of difficulty in application of mathematics in the topic 'III Equation of Motion'.

Results

The above findings help us to understand that among the higher secondary science students, the extent of Conceptual Difficulty in 'Motion' is high whereas, the extent of Physico-mathematical Conceptual Difficulties in total and in the categories, viz., Creating or Identifying the Formula, Extracting Information from Diagrams or Graphs, Creating Schematic Diagrams or Graphs and Application of Mathematics, are moderate.

The difficulty faced by students for each concept differs from category to category. The ranking of concepts based on the extent of CD, PMCDs and its categories is given as Table 7.

Table 7 : Ranking of Concepts Based on the Extent of Difficulty in Each Category

Conceptual difficulty	Physico-mathematical conceptual difficulties	Difficulties in creating or identifying the formula	Difficulties in extracting information from diagrams or graphs	Difficulties in creating schematic diagrams or graphs	Difficulties in application of mathematics
III Equation of Motion	Displacement	Displacement	Acceleration	Velocity	Acceleration
II Equation of Motion	Acceleration	Newton's Second Law of Motion	Displacement	Displacement	Displacement
Law of Conservation of Momentum	II Equation of Motion	Velocity	Distance	Newton's Second Law of Motion	II Equation of Motion
Velocity	Velocity	Acceleration	Speed	Acceleration	Speed
Speed	Distance	Distance	Newton's Second Law of Motion	Distance	Law of Conservation of Momentum
Newton's Second Law of Motion	Newton's Second Law of Motion	II Equation of Motion	Velocity	Speed	Distance
Distance	Law of Conservation of Momentum	Law of Conservation of Momentum			Velocity
Acceleration	Speed	Speed			Newton's Second Law of Motion
Displacement	III Equation of Motion	III Equation of Motion			III Equation of Motion

Discussion

It is quite pathetic that the students who had encountered with the basic concepts of 'Motion' in their high school Physics, does not possess the basic level of conceptual understanding in those topics even in their higher secondary stage. Even if the higher secondary science stream students with conceptual understanding are taken into consideration, the Physico-mathematical conceptual understanding is only moderate. The extent of PMCD in four categories is different for different topics. However, the extent of PMCD in displacement is comparatively high in all the categories. These findings prove that it is the need of the hour to rethink upon the various aspects regarding the transaction of concepts from mechanics and problem solving involving mathematical operations in the secondary and higher secondary stages of schooling.

Conclusion and Implications

Conceptual understanding is based upon building of the higher order thinking capacity. If the student lacks proper conceptual understanding, he or she will never be able to apply it to solve problems based on the concept. So, building the schemas of the conceptual framework is very important to learn any of the subject areas. In physics, distance, displacement, speed, velocity, acceleration, equations of motion, Newton's laws of motion and Law of conservation of momentum are the grass root level concepts introduced in the Class VIII upon which the whole idea of mechanics is built up which they encounter in their higher classes.

Physics teachers are meant to identify the basic conceptual foundations in students regarding the topics taught in high school stage, before teaching the theories and principles in higher secondary physics. Otherwise, it will hinder the vertical transfer of knowledge among learners. If the teacher finds gaps in the basic conceptual understanding in 'Motion along a straight line' among students at higher secondary level, adequate remedial assistance must be provided to them, before introducing 'Motion in a three-dimensional space'.

Visualisation of concepts is very necessary especially in learning mechanics. The various representations used by teachers to transact the topics helps in deepening the understanding among students. The method of using representations is considered to be a powerful instructional strategy especially for physics teachers, who have to deal with the students with low level of conceptual understanding and mathematical problem-solving ability in mechanics. A single concept has to be presented to the learners via different modes or representations like, visual, verbal, graphical, mathematical, etc. The results of this study are strong evidence that the ability of students to translate or to switch from one type of representation to other, for example, from verbal representation to diagrams or graphs and vice-versa, is low.

At high school level, while introducing the basic concepts in motion, the teacher has to use representations including computer based ones such as animations and voice over simulations which discuss the instances from daily life, where each learner can personally connect

and the applications of these concepts occur. For example, instead of teacher explanations and blackboard drawings, showing the video of the school and the various roads that connect home and school, the teacher can explain that the shortest path corresponds to displacement in a more effective manner. Then the students will be able to visualise the disparity between distance and displacement. This example can also be elaborated with the situations of students who actually take different roads to reach the school. The same is in the case of other basic concepts discussed in this paper.

To tackle the difficulties in dealing with mathematical problem solving in 'Motion', equal weightage and importance as that of concept or theory learning should be laid down in problem-based exercises in the classroom, from high school stage onwards so that students become more familiarised with application of mathematics in solving mechanics problems. Formative assessments must be strengthened by providing more problem-solving drills, exercises, home works and assignments that focuses mainly on practising the transformation from one representation to another.

To cater to the mathematical skill of the students, they are to be monitored strictly and systematically in each and every step in problem solving so as to derive at the precise solution to the mathematical physics problems. Sufficient attention should be directed to foster the ability of the student to plan for problem solving and to execute it efficiently. Specifically, while teaching problem solving in 'Motion', students should be taught first how to convert the questions to symbolic representations using alphabetical notations and diagrams, and only then to proceed with pure mathematical simplifications and calculations to reach the solution.

Physics teachers can plan the instructions regarding the conceptual areas in 'Motion', while the mathematics teachers can involve completely in the procedural skills such as reading and construction of graphs, mathematical figures and diagrams and simplification of equations. The weaknesses of the pupil in executing mathematical procedures like solving equations and geometrical problems have to be pinpointed in the remedial sessions in mathematics.

In Kerala, the situation is that the higher secondary school teachers are already burdened with the exhaustive subject area to be taught to a wide student group in a comparatively less span of time. In such circumstances, the distribution of simulations and interactive multimedia packages on the concepts in 'Motion' along with the mathematical practice exercises and worksheets on MOODLE platform will be a boon for all the students who find it difficult to learn solving of problems in a logically systematic way.

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Academic Resilience as Predictor of Academic Achievement among Secondary School Students

Rajwinder Kaur* and Gagandeep Kaur**

Abstract

In the present system of education, understanding of the factors associated to academic achievement is essential and research studies have supported that academic resilience is a major factor influencing the academic achievement. Present study explores the association between these two variables and concluded academic resilience as predictor of the academic achievement with special reference to gender. For this purpose, academic resilience scale developed by Mallick and Kaur was employed on a sample of 488 students studying in Class XI of various schools in Amritsar district of Punjab. The percentage scores of the previous class were taken for academic achievement. Multiple Linear Regression analysis was employed on the total scores as well as on the scores of male and female students. Results revealed that the four dimensions of academic resilience viz. academic confidence, sense of well-being, motivation and ability to get goals, relationship with peers and adults and emotional regulation and physical health are capable of predicting the academic achievement of students.

Introduction

Every nation aims for the production of skilful and developed human resources and achievement of this objective depends upon the highly qualitative education system (Mwangi et al., 2015). Despite the provision of the quality education, problem of lessening the school enrolment and expansion in students drop-out ratio is striking high at global level (Pandita, 2015) and this is considered as the biggest problem of the world (Hammack, 1986 Canada Manpower

*Research Scholar, Department of Education, Guru Nanak Dev University, Amritsar.
**Assistant Professor, Department of Education, Guru Nanak Dev University, Amritsar.

and immigration, 1990).The statistics provided by Global Education Digest Report, 2012 and Census of India, 2011 emphasised on the rising rate of drop-out and this statistics can be attributed to various personal and scholastic factors (Pandita, 2015; Karabiyik, 2020).

Students themselves cited a variety of school, family and work related reasons for the problem of dropouts (Bridgeland, DiIulio, and Morison, 2006; Rotermund, 2007). Poor academic performance, lack of coping with school activities and work (Rotermund, 2007), gender disparity, boredom at school, type of faculty and their behaviour, level of difficulty of course, lower accessibility, lack of satisfaction with school's physical and emotional environment, change of residence and social mobility are other some reason cited in the research studies (Simsek, 2013; Peer, Hillman and Hoet, 2015). Such factors contribute towards academic stress, poor scholastic performance, high level of dissatisfaction, precariousness and poor interpersonal relationships (Franco, 2015; Peer, Hillman, and Hoet, 2015). In such situations some students decided to change the school or discontinue the studies but majority of them survive in such adverse circumstances and conditions. Although there are varied number of students whose academic accomplishment is poor and continues to be poor whole year (Dauber, Alexander, and Entwisle, 1996), there are remarkable number of other students who control the adverse situations and excel in the academics (Jimerson, Egeland, and Teo, 1999) and those termed as resilient (as cited in Martin and Marsh, 2006).

Resilience is a multifaceted term including various dimensions viz. emotional, social and academics, etc. Generally, resilience is termed as a way, capacity for or outcome of successful adjustment despite adverse situations (Howard and Johnson, 2000). Resilience, with reference to academics is considered as "the probability of favourable educational outcomes and other life consummations irrespective of adversities caused due to previous attributions, situations and experiences" (Wang, Haertel, and Walberg, 1994). In the viewpoints of Alva (1991), "The students who succour academic excellence and motivation irrespective of the presence of exasperating and difficult learning conditions that may lead towards the peril of lower academic performance are considered to be academically resilient." As a construct, academic resilience is considered to be a dynamic developmental process that involves the protective qualities associated with individual students (internal protective factors) and their environments (external protective factors) that contribute to the adjustment and academic success of at-risk students (Luthar, Cicchetti, and Becker, 2000).

Academic achievement is considered as one of the appropriate indicator of academic competence and resilience for school age children (Masten and Coastworth, 1998). Research studies have suggested that resilience can significantly affect teaching leaning process and expectancies of life of students and academic achievement is at the top of that (Macharia, 2011; Kwena, 2007; Sarwar et al., 2010; Murugami, 2002). Some studies examined positive correlation between academic resilience and academic achievement (Gonzalez and Padilla, 1997; Dass-Brailsford, 2005; Lee, 2012; Hanson and Austin, 2003).

Past researches have revealed mixed results related to academic resilience and academic achievement. Some studies examined academic resilience as significant predictor of the academic achievement (Abolmaali and Mahmudi, 2013). Study conducted by Mwangi et al., (2015) and Rao and Krishnamurthy, (2018) revealed that academic resilience had a positive correlation with academic achievement.

As far as gender variation is concerned, researches have revealed that gender variation exists in the levels of academic resilience and academic achievement. Researches had suggested that females had high levels of academic resilience as compare to males (Mbindyo, 2011; McLafferty, Mallet and McCauley, 2012; Allan, Mckenna and Dominey, 2013; Mwangi and Ireri, 2017; Mwangi et al., 2018). However, some studies also suggested that male students have high level of academic resilience and academic achievement (Sarwar et.al., 2010). So the present study aims to investigate whether academic resilience can predict the academic achievement of adolescent students.

Objectives

1. To study the Academic resilience make-up of the secondary school students.
2. To study the relationship between academic resilience and academic achievement.
3. To study whether academic achievement can be predicted by any dimension of academic resilience.

Research Questions

1. What is the academic resilience make-up of the secondary school students?
2. What is the relationship between academic resilience and academic achievement?
3. Can academic achievement be predicted by any dimension of academic resilience?

Method

The population considered for the present study was the students of twelve grades (Commerce stream) of all the schools affiliated to CBSE Board of Amritsar district. A list of all the schools was taken from the District Education Officer. Through random sampling technique, a sample of

488 students was selected from 6 schools of Amritsar district. Firstly, a demographic detail sheet was filled by the students and the Academic resilience scale (Mallick and Kaur, 2016) was administered on them. Scale has been developed on five point Likert scale as (strongly agree, agree, undecided, disagree, strongly disagree). Scale was having five dimensions as academic confidence, sense of well-being, motivation and ability to get goals, relationship with peers and adults, emotional regulation and physical health. The reliability coefficient of the scale measured through Cronbach Alpha is 0.78 and by split-half method of reliability it is calculated as 0.84 which is highly acceptable. The scale is comprised of total 52 items (41 positive and 11 negative items). Proper instructions were given to the students regarding answering of the items and they were assured that this information will only be used for research purpose. Later on scoring of the collected sheets was done according to the scoring key given in the scale.

Analysis and Discussion

R.Q.01: What is the academic resilience make-up of the secondary school students?

There are five levels of the scale on the level of academic resilience of the students viz. High, Above Average, Average, Below Average, Low.

Table 1 represents the break-up of the sample with respect to different levels of the academic resilience and gender. It shows that maximum number of students have average academic resilience.

R.Q.02: What is the relationship between academic resilience and academic achievement?

Normality pattern in the data sets was examined through the application of the Shapiro-Wilk's test. Findings indicated that computed value of Shapiro-Wilk's test statistic was 0.982 which associated with a fairly low (0.00275) value of p. So, it could be concluded that normality pattern in the available datasets was at a doubt.

Table 1: Levels of Academic Resilience

S. No.	Levels of academic resilience scale	Total number of students		
		Female	***Male***	***Total***
1.	High	35	37	72
2.	Above Average	32	39	71
3.	Average	72	75	147
4.	Below average	41	47	88
5.	Low	58	52	110
	Total	238	250	488

Studying Association between Academic Achievement and Different Dimensions of Academic Resilience

Due to the general tendency of non-normality in the datasets, (non-parametric) Spearman's rank correlation method was resorted for the purpose of studying association between academic achievement, and the different dimensions of academic resilience. Computed values of the correlation coefficient have been presented in Table 2 below:

Table 2: Spearman's Rank Correlation Analysis in Respect of Academic Achievement and Different Dimensions of Academic Resilience

Gender	Variable-1	Variable-2	Corr. Coeff. (rSp)	p-Value	Significance
Male	**Academic Achievement**	Academic confidence	0.201	0.0013	**
		Sense of well-being	0.163	0.0098	**
		Motivation and ability to get goals	0.253	0.0001	***
		Relationship with peers and adults	0.235	0.0002	***
		Emotional regulation and physical health	0.255	< 0.001	***
		Total	0.292	< 0.001	***
Female	**Academic Achievement**	Academic confidence	0.166	0.0100	*
		Sense of well-being	0.140	0.0304	*
		Motivation and ability to get goals	0.234	0.0003	***
		Relationship with peers and adults	0.193	0.0027	**
		Emotional regulation and physical health	0.213	0.0009	***
		Total	0.258	0.0001	***
All	**Academic Acheivement**	Academic confidence	0.185	< 0.0001	***
		Sense of well-being	0.153	0.0007	***
		Motivation and ability to get goals	0.242	< 0.0001	***
		Relationship with peers and adults	0.211	< 0.0001	***
		Emotional regulation and physical health	0.229	< 0.0001	***
		Total	0.273	< 0.0001	***

***: Significant at 0.1% probability level; **: Significant at 1% probability level; *: Significant at 5% probability level; No. of degrees of freedom for rSp : For Males = 250; For Females = 238; For All = 488.

Main Implications from Table 2

The nature and extent of association between academic achievement and the academic confidence was considered. For the two variables, the computed value of Spearman's correlation coefficient (r_{Sp}) was +0.201, which was associated with 249 degrees of freedom. The value of r_{Sp} was tested (through t-test) to be statistically highly significant (at 1 percent probability level; p-value = 0.0013). This implied that in respect of males, the association between academic achievement and the academic confidence was positive (i.e., direct) and highly significant.

In other words, with an increase in the value of the first dimension of academic resilience among males, there was a tendency for academic achievement to increase, and vice versa. For the males, each of the remaining four dimensions of academic resilience (viz. sense of well-being, motivation and ability to get goals relationship with peers and adults, emotional regulation and physical health) as well as the aggregated score of academic resilience were also observed to be directly and highly significantly associated with academic achievement. For females as well, all the five dimensions (as also the aggregated score) of academic resilience were seen to be directly and significantly associated (though at varying levels) with academic achievement. And, similarly, for all the students taken together, all the five dimensions (as also the aggregated score) of academic resilience were observed to be directly and highly significantly associated (at 0.1 per cent probability level) with academic achievement. In a nut-shell, it can be concluded (through the Spearman's correlation analysis) that there existed a strong tendency of academic achievement, on one hand, and each of the five dimensions (as well as the sum total of the score of the five dimensions) of academic resilience, on the other, to move hand-in-hand. It may, however, be remarked that significant associations may not be taken to imply that all the dimensions of academic resilience would necessarily turn out to be important predictors of academic achievement.

R.Q.03: Can academic achievement be predicted by any dimension of academic resilience?

Dependence of academic achievement upon the five different dimensions of academic resilience was studied. The primary objective was to examine if academic achievement of the students could indeed be predicted on the basis of some of these dimensions. For this purpose, multiple linear regression analysis was applied wherein, academic achievement was taken as the dependent (or the explained) variable, and the five dimensions of academic resilience as independent (or the explanatory) variables. The analysis was carried out (through least-squares technique) separately for males, females and then for all the adolescent students taken together.

Regression Analysis for Males

For male students, computations in respect of Stage 1 of the regression analysis is presented in Table 3.

Table 3: Multiple Linear Regression Analysis of Academic Achievement on all the Dimensions of Academic Resilience—Males

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	56.7828	3.3255	17.075	< 0.001	***
Academic confidence	0.0278	0.0984	0.283	0.7774	NS
Sense of well-being	–0.0177	0.0723	0.245	0.8069	NS
Motivation and ability to get goals	0.1859	0.0802	2.319	0.0212	*
Relationship with peers and adults	0.0906	0.0721	1.257	0.2099	NS
Emotional regulation and physical health	0.1155	0.0566	2.041	0.0423	*

R^2 = 0.1075; = 0.0893; F for R^2 (at 5 and 245 d.f.) = 5.903***; p < 0.0001

Main Implications from Table 3

Computed value of the coefficient of multiple determination (R^2) for the multiple linear regression equation was 0.1075, which implied that of the total variation in the dependent variable, i.e., academic achievement is merely 10.75 per cent of the variation was attributable jointly to the five independent variables (viz., different dimensions of academic resilience). Rest of the variation (nearly 89.25 per cent) in academic achievement was found to be occurring due to other unknown forces. Value of the adjusted (for number of degrees of freedom) coefficient of multiple determination (R^2) was still lower at 0.0893. F-value for R^2 (at 5 degrees of freedom for numerator and 245 for denominator) was computed to be 5.903, which was tested to be statistically highly significant, because the associated value of p was exceedingly small (<0.0001). Equivalently, the computed value of R^2 was highly significant. This could be taken to imply that the five independent variables taken together were capable of predicting the dependent variable quite precisely.

In the estimated equation, only two of the dimensions (viz., motivation and ability to get goals and emotional regulation and physical health) were, however, observed to be statistically significant (each at 5 per cent probability level), while the other three were non-significant (so far as their effect on academic achievement was concerned). Intercept term was observed to be highly significant (at 0.1 per cent probability level), which implied that when each of the five

explanatory variables assumed a value of zero, then the expected value of academic achievement (=56.78) was highly significantly more than zero.

Next, in Stage 2, an attempt was made to explore the possibility of simplifying the regression model (without incurring any major loss in the information provided) through the step-wise regression analysis. Results in respect of such an equation are reported in Table 4 below:

Table 4: Results on Step-wise Multiple Linear Regression Analysis of Academic Achievement on Different Dimensions of Academic Resilience—Males

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	57.0362	3.0539	18.676	< 0.001	***
Motivation and ability to get goals	0.1846	0.0720	2.563	0.0110	*
Relationship with peers and adults	0.0916	0.0689	1.330	0.1848	NS
Emotional regulation and physical health	0.1142	0.0555	2.058	0.0407	*

R^2 = 0.1071; R^2 = 0.0962; F for R^2 (at 3 and 247 d.f.) = 9.874***; p < 0.0001

A glance at Table 4 reveals that the first two dimensions (viz., academic confidence and well-being) of academic resilience got filtered out from the regression equation. Thus, the most appropriate combination of the explanatory variables for the purpose of predicting academic achievement of males were last three dimensions of the academic resilience as mentioned in the table. Out of these three dimensions, motivation to get goals and emotional regulation and physical health were tested to be statistically significant (each at 5 per cent probability level), whereas relationship with peers and adults was non-significant. Although non-significant, yet it was supposed not to leave out these dimensions, otherwise there would be perceptible reduction in the predictive power of the equation. In the simplified equation n the value of R^2 has marginally come down (from 0.1075 to 0.1071). However, the value of R^2 has improved from 0.0893 to 0.0962.

The value for R^2 was observed to be statistically highly significant (at 0.1 per cent level), because its p-value was exceedingly small (< 0.0001). Thus, among males, three of the dimensions taken together were capable of predicting the score on academic achievement in a highly significant manner.

Regression Analysis for Females

Table 5: Multiple Linear Regression Analysis of Academic Achievement on all the Dimensions of Academic Resilience—Females

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	60.6098	3.1150	19.457	< 0.001	***
Academic confidence	0.1152	0.0893	1.290	0.1984	NS
Sense of well-being	-0.0317	0.0687	0.462	0.6445	NS
Motivation and ability to get goals	0.1075	0.0752	1.430	0.1541	NS
Relationship with peers and adults	0.0410	0.0727	0.563	0.5737	NS
Emotional regulation and physical health	0.1024	0.0600	1.707	0.0892	NS

R^2= 0.0772; R^2 = 0.0574; F for R^2 (at 5 and 233 d.f.) = 3.897**; p = 0.0021

Here, in case of females, computed value of the coefficient of multiple determination (R^2) for the multiple linear regression equation was 0.0772, which implied that of the total variation in the dependent variable Academic Achievement, merely 07.72 per cent of the variation was attributable jointly to the five independent variables (viz., different dimensions of academic resilience). Rest of the variation (nearly 92.28 per cent) in ACAC was found to be occurring due to other unknown forces. F-value for R^2 (at 5 degrees of freedom for numerator and 245 for denominator) was computed to be 3.897, which was tested to be statistically highly significant, because the associated value of p was exceedingly small (< 0.0001).

In the estimated equation, no dimension was however observed to be statistically significant (each at 5 per cent probability level), in next stage again, step wise regression analysis was applied. Results in respect of such an equation are reported in Table 6 below:

Table 6: Results on Step-wise Multiple Linear Regression Analysis of Academic Achievement on Different Dimensions of Academic Resilience—Females

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	60.9081	3.0024	20.287	< 0.001	***
Academic confidence	0.1160	0.0834	1.392	0.1652	NS

Motivation and ability to get goals	0.1064	0.0684	1.555	0.1213	NS
Emotional regulation and physical health	0.1049	0.0565	1.855	0.0649	NS

R^2= 0.0750; R^2 = 0.0632; F for R^2 (at 3 and 235 d.f.) = 6.354***; p = 0.0004

Dimension number 2 and 4 were filtered out from the regression analysis. All the remaining dimensions as described in Table 6 were resulted to be non-significant. So the findings revealed that none of the dimensions taken together were capable of predicting the scores on academic achievement in highly significant manner.

Regression Analysis for all Students

Findings of Table 7 revealed that computed values of the coefficient of multiple determination (R^2) for the multiple linear equation was 0.0908 which is merely 09.08 per cent of the variation and was jointly attributable to five independent variables. F value for R^2 (at 5 and 484 d.f.) was 9.672, which was tested to be statistically highly significant. In this equation, only two dimensions, i.e., motivation and ability to get goals and emotional regulation and physical health found to be significant while the other three were non–significant. In next stage step wise regression analysis was applied and dimension 1 and 2 were excluded. Results in respect of such an equation are reported in Table 8 below:

Table 7: Multiple Linear Regression Analysis of Academic Achievement on all the Dimensions of Academic Resilience—All Students

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	58.6098	2.2701	25.819	0	***
Academic confidence	0.0735	0.0661	1.111	0.2670	NS
Sense of well-being	-0.0218	0.0496	0.441	0.6595	NS
Motivation and ability to get goals	0.1430	0.0546	2.619	0.0091	**
Relationship with peers and adults	0.0716	0.0507	1.412	0.1585	NS
Emotional regulation and physical health	0.1059	0.0408	2.597	0.0097	**

R^2 = 0.0908; R^2 = 0.0814; F for R^2 (at 5 and 484 d.f.) = 9.672**; p < 0.0001

Table 8: Results on Step-wise Multiple Linear Regression Analysis of Academic Achievement on Different Dimensions of Academic Resilience—All Students

Explanatory Variable	$\hat{\beta}$	SE($\hat{\beta}$)	t-value	p-value	Significance
Intercept	58.5366	2.2621	25.877	< 0.001	***
Academic confidence	0.0671	0.0645	1.041	0.2984	NS
Motivation and ability to get goals	0.1349	0.0514	2.625	0.0089	**
Relationship with peers and adults	0.0697	0.0505	1.380	0.1681	NS
Emotional regulation and physical health	0.1026	0.0401	2.562	0.0107	*

$R^2 = 0.0905$; $R^2 = 0.0830$; F for R^2 (at 4 and 485 d.f.) = 12.062***; $p < 0.0001$

As per the calculations depicted in Table 8 it was observed that two dimensions of academic resilience, i.e., motivation and ability to get goals and emotional regulations and physical health were found to be significant whereas dimension first and fourth found to be non-significant but it was supposed not to leave out first and fourth dimension, otherwise there will be perceptible reduction in the predictive power of the equation. In the simplified equation, the computed value of R^2 has deceased marginally from 0.0908 to 0.0905 and the value of R^{-2} has improved from 0.0814 to 0.0830. The value of R^2 is statistically observed as highly significant, so from the findings, it can be concluded that the four dimensions of academic resilience viz. academic confidence, sense of well-being, motivation and ability to get goals, relationship with peers and adults and emotional regulation and physical helth are capable of predicting the academic achievement of all the students in a significant manner.

Discussions

As the results revealed that all dimensions of academic resilience viz. academic confidence, motivation and ability to get goals, relationship with peers and adults, emotional regulation and physical health except the dimension of sense of well-being can predict the academic achievement and gender variation exists as in case of male students three dimensions, i.e., relationship with peers and adults, sense of well-being, emotional regulation and physical health are predictor of the academic achievement but in case of female students no

dimension seems to be predictor of the academic resilience.

As far as relationship with peers and academic achievement is concerned, research studies showed that there exists a relationship between these two variables. The findings were in line with other previous findings by Foster (2006), Nicole (2004), Ide, et al. (1981) and Bankole and Ogunsakin (2015), Uzezi and Deya (2017) whose findings also revealed that peers relationship influence academic performance of secondary school students. Studies associated with motivation and ability to get goals show the relationship of these with academic achievement (Bouffard et.al, 1995; Sideridis, 2005 and Roebken, 2007). Although sufficient literature is not found in case of academic confidence and academic achievement, but still, it can be said that that the confidence in academics had direct relation with academic achievement and it can predict the academic success of an individual. In case of motivation, many studies support that motivation can predict academic achievement of students. (Ali and Mcinerney, 2009; Ghafor, 2004). Additionally, studies on academic resilience are predominantly focused on the mental health and well-being of the learner and not in terms of academic development (Leysa and Malnegaro, 2016). So, various dimensions of academic resilience are the predictor of academic achievement.

Recommendations

For the further research, it is recommended that while calculating the prediction of academic achievement only gender variation was in focus but other demographic variables like type of family, working status of mother, socio-economic status of the students, locale, etc., can also be taken into consideration. However relation of academic achievement and academic resilience can also be ascertained. Although various studies have already been conducted on these two variables, still there is scope that this type of study can be conducted on a larger number of a sample. The answer of the question that why in case of females no dimension of the academic resilience found to be the predictor of the academic achievement can also be ascertained in the further research. Longitudinal studies in the field of academic resilience can also be conducted. Present study was of quantitative nature, moreover initiative of qualitative studies can also be taken in case of academic resilience and achievement. Most of studies on academic resilience established its links to different domains that range from academic and educational constructs to psychological factors, socio-demographic as well as family and peer-group characteristics.

Conclusion

Academic resilience is a tool that can help the students to pass through the tough academic situations and can also predict the academic excellence of the students. Recent innovations and trends in education have focused upon the resilience building among the students. Moreover, the National Education Policy, 2020 has recommended more skill based and experiential learning structure for school education which will ultimately lead to more academically resilient young generation. Further, with due impact of the policy, the restructuring of the school and higher education system in India will not merely be relied on the dominance of the examination system for the academic enrichment of the students. In the present study, it was found that various dimensions of academic resilience are predictor of academic achievement however, gender variation also exists. On the basis of the findings of the study, it can be concluded that in the classroom, innovative teaching methodologies should be used that not only focus upon the academic enrichment, concept formulation and understanding but also focus on the development of resilience among the students. More they are academically resilient; more effective will be their learning outcomes. Teachers should opt the strategies as recommended by the various commissions and committees and should make efforts to implement those recommendations. Recent suggestions recommends on the life skills based learning strategies that not only inculcate values and develop skills among the students but are also focused on the completion of the academic content in an effective way with the help of certain activities and strategies.

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Whose Disability? A Centrifugal Quest to Confront the Stereotypical Views on 'Disability'

Shankha Shekhar Rakshit* and Sumedha Mukherjee**

Abstract

The word 'disability' is generally associated with a negative connotation, i.e., 'the lack of ability to do something.' But it is not necessarily true in all circumstances. The level of disability of a person does not always determine the limitations of their activities. Many people have succeeded in their lives overcoming their difficulties by proving themselves as differently abled in such activities which are supposed to be impossible due to their disability on those contexts. But every human being should realise the potency or ability of those people who have the power to fight against any adverse situation. So, our paper aims at analysing in detail the stories of success of the so-called disabled people. The quest of the paper is to find out how the people with physical deformities have challenged and surpassed the notion of common people regarding disabilities.

Introduction

'Disability' is often understood as the lack of ability of a person due to any type of physical or intellectual deformity. It is an age old concept and customary to treat such people either with sympathy or with apathy or with antipathy. Some people in the society are sometimes found trying to favour them thinking that without their assistance that affected person can do nothing. Some people are indifferent to such people and the words like 'sympathy' or 'empathy' are hardly included in their dictionary of humanity. In this race of dehumanisation some people have surpassed the former type, as

*Assistant Professor, Department of Education, North East Regional Institute of Education, NCERT, Umiam, Ri Bhoi District, Meghalaya.

** Research Scholar, Department of Education Central University of Jharkhand.

these kind of people usually treat the physically and intellectually challenged people with hatred or mockery.

Despite so many endeavours undertaken by the government and NGOs, if a baby is born with any kind of deformity or later becomes affected due to illness or accident, many families, even till now treat them as a burden and do not pay much attention to their upbringing. The above-mentioned facts require no research-based evidences to be believed, as these things are experienced by us in our surrounding, may be within families, or in neighborhood or during transportation or in any public institution. A large portion of the society often spend their time to scrutinise the problems of the physically or intellectually challenged people. They sometimes do it out of concern or sometimes their purpose is to criticise those so-called disabled people regarding their performance in a particular task. We are most often worried about the efficiency or inefficiency of other people but we seldom think of our abilities and inabilities. But we seldom think of our abilities. First, we must understand that there is a difference between inability and disability. Inability denotes failure in a work due to lack of skill. But disability indicates failure in a work due to physical or mental obstacles. This indicates that inability may be decreased or removed by acquiring skill, while disability may be coped with treatment or using any complementary equipment. On the other hand, some inabilities cannot be defeated or it is till now impossible, like to fly in the sky having two wings like a bird, or to land on the sun. Similarly, there are some disabilities which cannot be mitigated despite the intervention of sound medical support. It depends on the nature and the adverse effect of disability. Like, if a person who has lost his power of speech completely is asked to recite, it is an impossible task to him. But history witnesses how many great persons have surpassed their 'disabilities' which is assumed as their disability by common thought and this 'disability' has been converted into their strength. Like, the brave conqueror Timur, lamed for life never gave up and crossed his physical limitations. Social or religious prejudices and hypocrisy often snatch the basic rights from the people suffering from impairment. Indian philosophy believes in the shloka *"Mūkam karoti vācālam pangum langhāyate girim"* (Kumar, 2013), i.e., a speechless person can speak and a lame person can also climb the mountain. We may attend spiritual lessons but the social and religious biases and fanaticism follow the principles of segregation and thus, directly or indirectly we have made the society paralysed. Bengali poet Jibananda Das uttered in a poem, *"Advut andhar ek esechhe e prithibite aaj,/jara andha sab theke beshi aaj chokhe dekhe tara"* (Das, 1954), i.e.,

a strange darkness has come upon the world today; those who are blind can see the most today. So, who is disabled and why and how are they disabled is very ambiguous and relative.

When we hear the term 'disability' or 'handicapped', the first picture that flashes in our mind is of a person having some kind of deformity of his or her organs. Surprisingly, many a time those people who are supposed to be disabled for doing a work surpass our one-dimensional view exhibiting their excellence in those works while challenging the so called physically or intellectually sound people. Thanks to some reality shows which depict such examples and, we also sometimes get the chance to witness such cases such as some 'disabled' person without hands or feet performing some unthinkable tasks like swimming, or cutting vegetables with the help of feet in the absence of hands. The time has come to rethink the circumstances in a reverse way. Are those people really disabled due to the loss or impairment of their organs or it shows our disability due to the lack of power to envision the latent or overt talent already in them? No person is handicapped but situations made them so. We may interpret that in such cases where a person cannot prove his or her ability due to some physical or mental challenges most of the times situations are handicapping. Human beings sometimes create such situation themselves due to their negligence towards infrastructure, or the surrounding ambience.

Objectives

- To find out the achievements of the people suffering from any type of physical or intellectual disabilities.
- To provide reflective suggestions to the members of the society who regard the people suffering from some kinds of disabilities, as not worth of doing any work properly.

Methodology

Based on secondary database collected from epics, literary pieces, movies, and telenovelas (mega-serials) and real-life incidents in our society the entire paper has been written through critical analysis using qualitative approach.

Discussion and Analysis

It is customary to think that a person having active organs can perform better than a person having any impairment of the organ necessary for a particular task. But such conception is not necessarily evident in every case. Already some examples have been displayed in the above discussion. We may also travel to the kingdom of history, myth, and literature to visit the characters that have already proved that any kind of impairment cannot be a parameter of disability or inability. If a person has talent, potentiality and will power s/he can even perform the unthinkable tasks. Throughout his

whole life Dhritarashtra, the Kuru prince, played the role of an acting king but never had he experienced his coronation. His blindness had robbed him of his right to be a king as it was against the tradition to select a blind person as an official king. But Dhritarashtra was a brave fighter and skilled archer. Without eyesight he could easily pierce the target. On the contrary, Pandu, undoubtedly being a good archer once missed his target. Pandu had the ability to hit the target only hearing the sound just like king Dasharatha. But both the kings mistakenly killed human beings in lieu of killing animals. They had no problem with vision and they were well equipped in throwing *shabdabhedi baan*. Still, they committed their worst sins. But Dhritarastra despite being visually challenged by birth had the ability to identify each person separately hearing his or her footfall. Eklavya was another example from the same epic. Guru Dronacharya asked him to cut his right thumb as a tribute with the evil intention to stop him from archery. But despite losing his right thumb which was supposed to be an essential limb to grasp the arrow, Eklavya never gave up hope and kept on practising archery well and was eventually followed by many archers, specially from the tribal community, to throw arrow without using the right thumb as a tribute to their ancestor Eklavya (Bose, 1997). These instances from the great epics point out the abilities of so-called disabled people and the failure of doing the same by the physically gifted warriors.

Seldom people concentrate on their own deficiencies. It is easier for them to stamp someone as mentally 'ill' or physically 'handicapped.' But how many of us look at the weak points of ours? When a person avoids the difficulties faced by a person with physical disability while crossing the road or trying to do something, the person mirrors his or her mental poverty and disability of his or her affective domain. Many a time, it has been observed that a so called mentally challenged person offers a separate angle of thought, which is philosophically sound also, while the people with 'intelligent' brains fail to decode such explanations from that matter. If we turn towards literary domain, we may also experience such things. Like, from the famous play *King Lear* by Shakespeare we get such examples. King Lear misjudges the reality when he has been mentally stable but the moment he loses his sanity, he discovers the bitter truth. So, he is compelled to undergo a journey to insanity to gain the rational mind. Lear's madness here certifies his normalcy, his rationality, and his introspection. Another character in the play, i.e., Earl of Gloucester who also cannot understand the reality lying in front of him and when he loses his eyesight and faces the harsh reality utters, 'I stumbled when I saw' (Shakespeare, 1888). Men can be blind without losing eyesight if they lose rationality driven by blind faith.

On the other hand, when we witness visually challenged people playing cricket, executing household works properly, travelling alone, etc., we can understand visual disability has not hindered their life spirit. Such people are more alert than a person having proper eyesight, just by tracing people nearby just hearing and assessing the footfall of the comers. Many times, the latter person fails to identify who has come secretly. The visually challenged people can do this using the vision of their mind. Thus, a visually challenged person faces no problem in a sudden power cut which seems to be a tough hindrance to the people with proper eyesight as they have not experienced such situations. We must think who is really disabled or handicapped in this situation. The blind person is then differently abled. These examples also show the efficiency of the person with disability and the weakness of the so-called mentally and physically fit people.

The same things happen in the case of other forms of disabilities also. Like, many people consider that a person who is deaf or dumb or both would be unable to perform many works which depend on hearing or speaking. But they forget that if such a person is trained properly in lip reading, they can understand the words through lip reading. A person who is unable to speak can also express feelings through body gestures and facial expression. When we go to watch mimes in the theatre hall, can we not understand what messages are being delivered by the artists? But when we judge the off-stage scenario, we often express our anxiety regarding a dumb person. Most of the time, we overlook the other qualities in them which may establish them in the society, if they can achieve proper guidance. Like, many of them can be a good painter, good dancer, good mime artist, or even they can act in serials or movies where such characters are necessary. We must utilise their potentialities. If they are properly communicated, they can play in team sports also.

Impairment cannot always be overcome even after proper medication or treatment. But the rest of the people of the society can dig out their talent and potentialities and must utilise them through proper channel. To outskirt them in the name of their disability projects, our disability to identify their potentialities and to use them in proper way. If despite having all the physical and mental abilities, we fail to do this work, we must rethink who really are disabled.

Helen Keller was not only visually challenged but also deaf and dumb at the same time. Still, she crossed all her limitations, handicapping situations and achieved world-wide fame (Keller, 1903). It might be astonishing to common people that a person specially a lady can be so successful suffering from multiple disabilities. Milton also lost his vision in his later life but had not given up writing (Rumrich, 2019). Homer was a born blind (Beecroft,

2011). But both Milton and Homer composed their classic epics in the absence of their eyesight. At present also we find Ravindra Jain, a famous singer, lyricist, and composer, born with visual impairment (Pandya, 2015). Being a sufferer of blindness, Louis Braille first created the Braille Language which is till now one of the most important and widely used assistive devices for the visually impaired students to study by on their own (Bullock, Galst, 2009). These great people might have lost their eyesight but not their insight.

There are many inspiring instances which compel us to question whether the people seemed to be disabled are really disabled or not. Briefly we can remember a galaxy of stars shining in various fields overcoming all their difficulties which once seemed to be their disabilities. Despite losing both legs, Masudur Rehman Baidya became entitled as the first physically challenged Asian swimmer because of his success in crossing English Channel and achieved the position of the world's first physically challenged swimmer to swim across the Strait of Gibraltar (Imtiaz, 2021). Born with right hand only, Bharat Kumar became a world champion in para-swimming contests (Panwar, 2016). Sudha Chandran became a famous dancer with amputated leg (Singh, 2020). Arunima Sinha became the first Indian amputee to conquer Mount Everest with a prosthetic leg (Chakraborty, 2015). Stephen Hawking, one of the most brilliant British theoretical physicists, was a patient of rare motor neuron disease and used to speak with the help of a voice synthesiser (Rawlins, 2018). In his childhood, Abhishek Bachchan attended special school to get rid of dyslexia (Varma, 2018). Being autistic and deaf in one ear Lewis Carroll became a renowned writer and a storyteller (Gilmore, 2015). American president Roosevelt guided America in World War II sitting on a wheel chair as he had suffered from a paralytic illness known as Guillain-Barre Syndrome (Ott, 2020). Keeping aside her problem with dwarfism, Jyoti Amge achieved her success in many TV shows (Strohm, 2020). Peter Dinklage is also a promising Hollywood actor who is a dwarf (Gallagher, 2019). Being quadriplegic, H. Boniface Prabhu is an internationally acclaimed wheel chair tennis player (Chakravorty, 2016). All of them have proved that the word 'disability' cannot hinder our progress if we properly use our insight or vision. The other members of the society should also think over these facts and nurture their own humane qualities.

Whatever the types of disabilities are, it would no longer keep a person or the situation handicapped for the person when these loopholes can be properly channelised. Even if we cannot minimise their physical deficit always, we can at least remove the obstacles before them. Like, if we create another way for the

physically challenged person, they will also no longer feel segregated. If we arrange a ramp instead of stairs, an orthopedically challenged person who faces difficulty to go upstairs or downstairs can easily move. Thus, we must open our eyes all the time so that no person is deprived of displaying their talent. Most of the people unfortunately till now are indifferent to the problems faced by the physically or mentally challenged people. And apart from this, the problems which are not directly visible remain unnoticed most of the time. How many of us are there to think about the problems faced by a dwarf? Dwarfism has got entry into the list of disabilities under 'The rights of persons with disabilities act, 2016' (RPWD Act, 2016). Do we think how the dwarfs manage the urinals in a public toilet where there are no several provisions for them, like a separate urinal according to their height? How many of us are bothered about the problems faced by them while they get on the bus? There are so many problems lying before our eyes but due to the lack of empathy, these things cannot stir our mind. Is it not our disability in dealing with our affective domain fruitfully? Is it not our lack of ability in using our emotional intelligence or social intelligence? We need to focus on these quests and also decentralise our stereotypical thoughts on disability to confront our own conscience.

Conclusion

We must remember that every person is unique from the point of individual difference. Every person has certain limitations as well as qualifications. So, it will not only be a crime but also be foolishness to place the mentally or physically challenged people in a segregated compartment. Not only from this perspective but also from another dimension it is also true. Often, we come across some guardians, relatives, or other people and sometimes even teachers who judge the merit of a student by their academic score or sometimes even the subjects undertaken by the students. If we follow Gardner's theory of Multiple Intelligence, we see there are many types of intelligence (Gardner, 1993). Failure to prove excellence in Math or Science subjects does not indicate the low merit of a student. If their mathematical intelligence is poor, they have had merit in other fields be it in music, in sports, in literature etc. Such stereotypical belief also mirrors the void of knowledge of those people to who have framed some benchmarks and are used to judge a person by those predetermined yardsticks. This indicates the lack of our rationality, power of thinking critically over a matter. Are those not also disabilities of those persons? The time has arrived to think from such perspectives also. Before thinking about or pointing out others' weakness, every member of the society should analyse themselves.

Transcending the rigid stereo-typical views towards disability, every member of the society must join hands to make an inclusive society which will be just for all. Every person is special having certain qualities to succeed in life. Instead of demeaning others, everyone should learn the positive factors from others and inculcate the constructive qualities within themselves and in others. If this symbiotic relationship is maintained, the society will be able to move beyond disabilities as every person is able to do something as per their inner qualities.

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Classroom-based Assessment Practices for Learning

Sweta Gupta*

Abstract

The present paper recognises the importance of Assessment for Learning (AfL) in enhancing students' learning. Attempts have been made to translate the theory of AfL to actual classroom practices. Such assessment, when used with classroom instructions, provides the scope to improve students' learning. Herein, feedback, one of the significant components of AfL is used to find the learning gap; thereby, helpful information is provided to students, which scaffolds their present performance to reach the desired level. Many such practices have been elaborated on in this paper to help the teachers better understand AfL. The paper attempts to highlight the potential power of formative assessment which, when used with summative assessment, contributes to improving the students' learning, raising the quality of education.

Introduction

The process of teaching is intended to bring learning and what the students have learned or where they are in their learning is gauged by assessment. Therefore, assessment forms an integral part of the teaching and learning process. Over the years, assessment has answered many questions: What do students focus on? How do students learn? What is the quality of engagement with the particular task? How does the teacher understand what students have learned? What motivates and drives a student to learn? Assessment is seen as a tool to answer these crucial questions. It is also considered as a process to enhance the learning and achievement of the students. However, the kind of assessment most visible at school is pen and paper tests, or examinations under the controlled condition that takes place at the end of a term or year. This is commonly known as a summative assessment.

*Assistant Professor, Department of Education, University of Delhi, New Delhi.

It measures students' performance at a time, which takes the form of grading and certifying students' achievements. This kind of data is used to draw inferences about what students know and measure the success of teaching and learning.

It is of crucial importance to school administrators to make a judgment on teaching standards. Policy makers use such inferences on a broader scale to reach decisions.

Parents look for grades as their interest is in knowing how their children are doing at school, particularly in comparison to other students. They assume that the only way to find out this is through grades; hence, they strongly support grading.

Administrators do realise the limited effect of grading students. In the word of Paul Dressel, "A grade can be regarded as an inadequate report of an inaccurate judgment by a biased and judge of the extent to which a student has attained an undefined level of mastery of an unknown proportion of an indefinite material" (Dressel, 1957). Such an impact of grading has a detrimental effect on students' learning. Their attention is drawn more towards achieving scores and comparison with fellow students. These further encourages surface learning while the urge for deep understanding finds a secondary place. Students are more concerned about consequences than the process of learning, often creating stress among them. Having assessed at a point in time, teachers are left with limited information about students' understanding. With this bit of information, the teachers, too feel short of knowledge to design intervention strategies. All that meant here is not to negate summative assessment but to reduce an overemphasis on it. Encouraging practitioners to use these results formatively will support students' learning and achievement. The term formative, when used in the assessment context, broadly means an assessment that goes on along with classroom instructions purposefully to improve the learning and attainment of students.

Learners in the classroom come from backgrounds with diverse cultures and expressions. This way, each learner has unique experiences. Catering to the variety of needs of students, the teacher requires creating a classroom culture characterised by acceptance and appreciation. It further necessitates a classroom where learners feel confident without fear of being judged. Learning becomes joyful when mistakes turn into opportunities for learning. Learners look for teachers who respond positively and constructively to them. They need an environment where they can engage with multiple tasks, activities, and resources and where there is encouragement for meaningful engagement with peers. A classroom with all these characteristics promotes Assessment for Learning (AfL). This kind of assessment encompasses

two things. One is the role of teachers in assessing the student's progress through frequently interacting with them, continuously identifying their learning needs, and adjusting the instructional process accordingly during teaching (Looney, 2005).

The identification of learning needs and enhancement of students' progress is made by way of feedback. Secondly, the active engagement of students is encouraged in self and peer assessment. AfL is a relatively new term that was first used by Harry Black in 1986 and brought to the light of the audience by Marry James in 1992. Initially, the term AfL was known as Formative Evaluation, an outcome of the research of Michael Scriven (1967), often used to describe the role of evaluation in the 'improvement of the curriculum'. Later the term was refined to Formative Assessment as information from the students is used as feedback to adapt teaching and respond to students learning (Black and William, 1998) during learning (Cowie and Bell, 1999).

This way of assessing the students meaningfully was proposed in the Continuous and Comprehensive Evaluation Policy implemented through enacted Right to Education (RTE) Act, 2009. The rationale behind adopting Formative Assessment was the overemphasis on Summative Assessment, that produces enormous stress and anxiety among learners (CBSE 2010: 14). But the larger population of school teachers over the country couldn't understand and implement it in the absence of adequate training. As a result, CCE became an isolated reform in measurement techniques unaccompanied by concomitant changes in classroom culture where teachers are no longer deliverers of textbooks (Nawani, 2013). Later in 2017–18, CCE was replaced by Uniform Assessment System. Recently, the New Education Policy 2020 has focused on assessing students formatively (NEP, 4.34). In such a context, the understanding and effective implementation of Formative Assessment gains relevancy.

Defining Assessment for Learning

Black and William (1998) define assessment for learning (AfL) as "All those activities undertaken by teachers (and by the students in assessing themselves) which provides feedback to shape and develop the teaching and learning activities in which both teachers and students are engaged. This becomes formative assessment when the evidence is used to adapt the teaching to meet the needs or by students themselves to change how they work at their learning."

Formative Assessment or Assessment for Learning, with whatever term we call them, what matters, is the kind of process involved therein to the larger goal of teaching and learning. Five essential functions

are involved in the assessment for learning:

1. Questioning—which helps to know where students are in their learning.
2. Creating effective feedback for every student.
3. Ensuring active participation of the students in the learning process.
4. Develop students' abilities to direct their learning by participating in peer assessment and self assessment.
5. Acknowledging assessment is crucial to enhancing the motivation and self esteem of the students.

Implication of Assessment for Learning in the Classroom

There are various ways in which Assessment for Learning can guide classroom processes. The following is a discussion of some aspects of the teaching-learning process that can be nurtured by a deeper understanding of Assessment for Learning. The debate places feedback at the centre of the teaching-learning process because Assessment for Learning intends to further aid student learning, and continuous feedback about their learning ensures that the learning process never stops. Many of the classroom practices discussed in this paper resulted from the strategies owed by the teachers in several schools in North and West Delhi who support formative assessment to improve students' learning in the period 2018–20. They practice these strategies at the primary, elementary, and secondary levels.

Feedback

Assessment is an integral part of the teaching and learning process as it serves the purpose of knowing where students stand in their learning. This learning is enhanced through a formative assessment which includes all those activities, processes, and tasks which a teacher uses in the teaching process to create feedback. Constructive feedback is, in turn, any information, process, or activities that shape and accelerate the students learning. Its critical role in students' learning makes it the key component of assessment for learning. Both powerful tools create student learning opportunities when provided in a supportive and constructive environment. The formative feedback process begins with collecting all information from various sources that manifest in the student's present state of learning concerning learning outcomes, where they need to go, and how they will be able to reach their goal. It is where the role of the teacher as a mentor is of critical importance in planning a sequence of steps that would motivate the student to reach the expected level. These sequential steps must be worded to encourage the students to take action to address the learning issue between their present performance and the goal. These goals need to be understood

well by the students with their valuable and achievable beliefs.

Students learn from the feedback that the teacher provides. Students must have the opportunity to express and communicate their understanding of the feedback, else feedback is likely to have limited effect. Therefore, within the classroom, the environment of open discussions and discourse on the process of learning needs to be cultured. Herein the process, students must acknowledge taking ownership of their learning. In addition, the teacher needs to understand the motivation and drives of the students' learning and master the skill of giving feedback as a part of effective teaching.

Principles of Effective Feedback

Black (1999) suggested four basic principles of formative feedback.

1. Students must have clarity about the learning goal (learning objective).
2. Feedback should assess the students' current learning state.
3. Feedback should be used to close the gap between students' learning state and learning goals.
4. Feedback must be of high quality and should be effective.

Clarifying Learning Goals

The students must be aware of learning goals from the beginning of the academic year. The specific learning outcomes for each of the content and activities need to be clarified to the students. This way, students know where they are going in their learning. It also helps the teacher to shift away from an assessment which is based on the comparison of learners towards an assessment based on individual growth. In a way, it creates confidence in learners to believe in their abilities.

Let us take one illustrative example from a textbook published by the NCERT, New Delhi. 'Beehive' is an English textbook of Class IX. In a classroom observation at a school in the year 2019, a teacher shared the learning goals she expects her students to achieve while introducing the book to the students.

Students will be able to—

- read aloud the text with proper pause and modulation.
- summarise the story,
- comprehend the meaning of the story,
- able to write short answers in short paragraphs with appropriate vocabulary and grammar,
- appreciate the character and themes, and
- organise and structure thoughts while presenting the information in oral and written form.

She had a good deal of dialogue on learning outcomes. Students too appreciated the teachers' effort in the clarification of expectations.

Giving Effective Feedback

The critical function of feedback is to enhance the learning of the students. To bring it into practice, the teacher

needs to understand the following four aspects—

- Students should be clarified about learning outcomes.
- The student's current learning state is assessed through the feedback.
- Feedback mechanisms bridge the gap between student's current learning state and learning outcomes.
- The relevancy of the feedback to the individual need of the student is crucial.

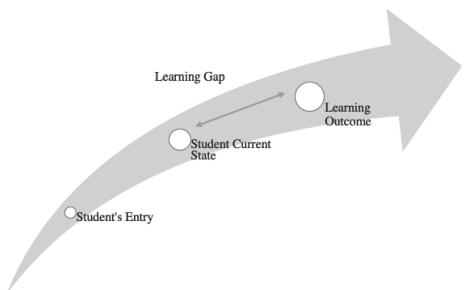

Fig.1: Learning gap between student's current state and learning outcome

Providing effective feedback is indeed very difficult. This difficulty is because the information given to the students is unhelpful.

A teacher wrote on an assignment submitted by the student, "You need to be more systematic". The information is accurate, but it is unhelpful to the student. It focuses on what is deficient in the work submitted. But feedback to function formatively, the information given as feedback to the student is used in improving the learning and thereby, the performance. Hence, designing a sequence of small steps would be helpful in this particular case.

Sankalp is a four-year kid in Grade KGI. He is struggling with writing small alphabets a, b, c, d, …., z. His desirable goal is writing three-letter words with phonics sounds 'at', 'an', 'ag' words like cat, mat, pat, sat, etc. Telling him to 'practice more' won't work. Define the sequence of steps which he would follow in reaching the goal as—

- Read and identify English alphabet letters once every day.
- In a four line notebook, you must write within 2 and 3 lines as required.
- Once you learn to form alphabets correctly in the required line, join two letters as 'at', 'ag',' an'. Practice it for several days.
- Then add letters like s, p, n, r, and c, to make sat, pat, fan, ran, and can.
- Practice writing these words without lifting the pencil until the word is complete.

Since Sankalp is a young student, the teacher shared this individual plan with his parents to help them practice.

The feedback is helpful if the teacher has the skill of being able to define the journey of the student in between the present state and his desired goal. Only when the learner uses the information given as feedback in improving his performance, then only feedback works as feedforward. The teacher's

job is to design the steps between the learner's present state and desired performance.

Scaffolded Feedback

Another form of feedback that can be helpful to students in enhancing their learning is scaffolding. Sometimes giving clues to the students would embark them to think to evoke their learned response. Learning done in this way is retained for a longer time. Example of scaffolded feedback:

Teacher: Which part of the problem did you not understand?
Student: I just didn't get it.
Teacher: Ok! Solve the first part as the previous problem, then multiply this variable. See if you can get the answer this way. I will come back in a few minutes.

Here the student's response, "I didn't understand, I can't do it." is the anxiety about the changing nature of the task. An immediate clue can help the student. The teacher may begin solving like the previous one and then add a new variable. I will come back in a few minutes. This allows the student to actively engage with the problem, make sense of it, and reach the solution. The teacher may verify its correctness later.

In another example, an art teacher sketched a face beautifully before a group of students. She then clearly shared the principle of drawing a well-aligned face. He said, "draw the eyes half down the face. Keep the distance between two eyes nearly the width of an eye". Such feedback will communicate to the student what is to be given attention and still a lot to be done by them. Well! scaffolding becomes essential at the primary level, where kids cannot take the task independently.

Verbal and Written Feedback

A question that often perturbed teachers is whether verbal or written feedback is more effective. Boulet, Simard and Melo (1990), in their classroom experiment, found that students given time to incorporate the feedback and make improvements in the works were more effective in their learning than merely giving them feedback in verbal or written form.

Quantity of Feedback

Students expect a certain amount of feedback. It is disheartening for them when they experience that they put so much effort into the assigned task and, in turn, could have to satisfy with marks or a vague statement of 'good' or 'can do better'. Lunsford (1997) suggested that a teacher must give feedback in three carefully thought comments per assignment. In addition, this feedback should express how the teacher has experienced the write-up rather than offering judgmental comments.

Timeliness

Cowan (2003) strongly refers that feedback—oral or written, must be provided immediately to be the most effective. Keeping this in consideration, the sooner the student gets feedback, the better it is. That is why they should get it while the topic is still fresh in their minds. Therefore, the teacher must take care to—

- return the assignment the next day
- prepare a regular oral and written response to the student report

Description

Feedback given by the teacher must be in a clear affirmative sentence rather than using ambiguous or sarcastic comments. Often teachers provide feedback that is accurate but ambiguous. For example, 'confused', 'adequate', 'excellent', 'poor', 'be careful on how you began the sentence'. They are accurate but unhelpful. These remarks, which teachers often think to be feedback, are accurate but unhelpful because they don't state what is causing confusion or why something is good. Similarly, being too sarcastic undermines the students' confidence as, "Did you make an effort to find all these?" and "It seems to be copied from the book". Other unhelpful issues are spelling and grammar while ignoring essential aspects such as conceptual understanding and critical analysis.

Peer Assessment

When students are encouraged to assess each other's work, it becomes easier for the teacher to engage in formative activities with the student. Evaluating each other's work helps the students understand the assessment criteria and develop self assessment skills. A successful peer session involves the learner thinking like a teacher; then, the learner will explain to the other how to improve their work. In doing so, students improve their work. Peer assessment is also an effective strategy to encourage dialogue by asking for jurisdiction and proposing alternative solutions. It enhances classroom culture and social skills among students. A description of peer assessment and its impact was made as follows—

Suppose 'X' teaches mathematics to students of the secondary level. He wanted to reduce the time on checking assignments by involving students more and more in this task. So, 'X' adopted a strategy. The student did not know how the assignment would be checked and was graded weekly during the evaluation period. Sometimes 'X' gives a rubric and asks students to grade themselves. Sometimes students are asked to swap the notebook and grade each other's work.

Interestingly, those who didn't do the assignment were not allowed to participate in the evaluation process. Instead, they were supposed to complete tasks in class that they should have done at home; within

one month of implementation of this approach, more and more students were always ready with their homework. The penalty they paid for not doing homework was excluded from the evaluation. Secondly, students seemed to communicate with each other than speak to the teacher.

In another case, a Grade VI teacher chose project work to create a model on several of the given options. On completion of the task, the students were divided into groups of four each. The groups were supposed to assess the poster among each other. Abhishek, who chose the topic of pollution for himself, prepared a model on it. His work was assessed by three of his group members. They gave the feedback to Abhishek as follows—

Khushboo: The model shows gas coming out of factories, garbage on land, and traffic on the road. It has a visual impact.

Suraj: It would be better to see some animals in polluted water.

Jaya: It is attractive. It should have more vehicles on the road.

Later Abhishek expressed the feedback. "I am thankful to my friends for their valuable feedback. They helped me add to my work and make it better… I am getting clarity… I am feeling confident."

Grading

Kohn (1994) gave a principle in his work—The question is not how but why. "Don't grade students while they are learning." As soon as they are graded, learning stops. This is the nature of the human mind. To deal with this, an assessment system may be designed according to this principle. The practice of grading students has to be kept

Student's Name	1st attempt	2nd Attempt	3rd Attempt	4th Attempt	Arm	Leg	Breathing	Timing
Aditya	0	1	1	2	fine	fine	fine	Timing needs to be improved as soon as the bell rings to start

Fig. 2: Swimming grid

infrequently. A high school student may have to mark once a year. At an elementary level, the grading system is unjustified, knowing that they create an environment of comparison. Instead, there is a need for a supportive classroom environment that promotes learning and provides data that is helpful to teachers and students.

A swimming teacher drew a grid. The name of the students was written in the first column. The next column was a column for marking on each of the four attempts. (William, 2011)

He scored in the first four columns for a student as 4 out of 8. In this case, knowing 4 or 8 is useless for any teacher to plan intervention. Instead, if one knows that hand, arms, legs, are in coordination, the improvement is required in timing at the point when the bell rings for a start. Such information would be useful even if another coach takes over this group.

Techniques of Assessment for Learning

There are various techniques that a teacher can use for the assessment for learning. Some of them are listed below, and some can be added by the teachers themselves.

Alternative to Questioning

There is no doubt that questioning is an excellent way to engage students in the classroom. But sometimes, it may not attract a vibrant discussion. For example, a teacher asked his students, "Which country is to be blamed for the outbreak of World War I?" The students replied in a single word, "Russia". Instead, if a statement was made by the teacher, "Russia is to be blamed the most for the happening of World War I", would invite students to respond thoughtfully. It would be clear that they not only have to agree but to reason as well. This way, when students are allowed to discuss, the quality of classroom discussion is enriched.

Portfolio Assessment

Portfolio assessment is an innovative pedagogic practice promoting quality learning in a subject domain. It is an excellent formative assessment approach to equip students with reflective skills such as metacognitive thinking and self regulating learning capacity. A portfolio, in a general sense, means carrying loose papers, artefacts, and documents in portable cases. Pedagogically portfolio assessment equates to showcasing students' best performance over some time. They can be used at different education levels in focussing various aspects; for example, in kindergarten, portfolio writing may include key skills that children learn, such as vocabulary building and simple sentence construction with the pictorial presentation. At the secondary level, the portfolio may include reports and snapshots of models in science exhibitions, creative poetry written in school literary fest, the experience of the educational visit etc. Students may be

encouraged to keep notes, feedback, corrections, and assignments for review and reflection throughout the study period.

The procedure for portfolio assessment follows collection, selection, self assessment, reflection, and delayed evaluation, looped by feedback from multiple sources, as shown in the following diagram.

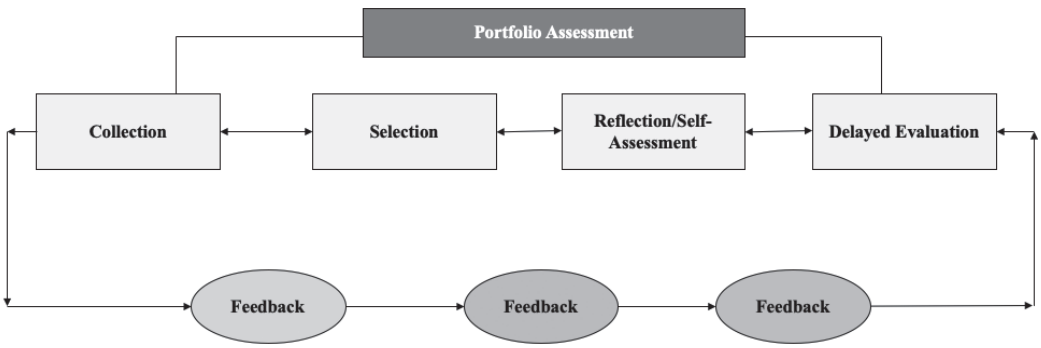

Fig. 3: Portfolio assessment procedure. Source: Lam, R. (2017, pp.6)

The teacher may ask the students to list those works that need to be reviewed and revised. From the reviewed work, selections are made to be put in their dossier. Self assessment purposes of focusing on evaluating microscopically every draft and incorporating the feedback from multiple sources. In the diagram, three feedback loops represent feedback by self, peers, and teachers in the portfolio assessment process. Delayed evaluation is summative grading of the assignment in the final draft.

Example: Mrs Shalini is an English Teacher in Grade IX. Analysing the semester result, she found her students had generally better spoken English than written English. She planned to take a portfolio assessment. She assigned students to write four compositions of 300 words over two months. She also instructed to prepare two drafts for each composition, first and final, after incorporating feedback. Before completing for final review, students are encouraged to get their work reviewed by a self, a peer, and by a teacher. She asked them to incorporate this feedback while refining the final draft. After two months, students were supposed to reflect on their writing progress over the period. They identified the strength as well as weaknesses in their writings. In response to their portfolio assessment process, the students expressed that they liked the idea of completing portfolios. They got the opportunity to look into their work critically, which was indeed a good learning experience.

Encouraging Reflection and Self Assessment

Reflection and self assessment of one's work is a productive way to engage formatively. Both of these ways can be explained here in writing a portfolio assessment. Students can reflect introspectively on the problems they went through in writing their composition and plan to work on their weaknesses. Thus, reflection is an act taken up privately wherein students think of their ways of writing. Such monitoring promotes the development of a critical stance and self regulation. This is crucial for raising the intrinsic motivation of the students. But reflection may not lead to measurable outcomes, and therefore, need for self assessment arises. Students can self assess themselves by grading, marking, commentaries, and their standard of writing concerning criteria. It allows learners to become more active in learning and think like a teacher about where they are now, where they are going and how to get there. This aligns with the findings of Darrow et al. (2016), who supported that students can assess themselves quite accurately but only when the stakes are low.

"Students need to learn for themselves how to move to the next Level".

Students can use a checklist to self assess to evaluate their piece of writing, usually suggested at secondary and primary levels, which guides students to think in a structured way. But to enhance metacognitive skills and composing skills blend of close-ended and open-ended guided questions should be encouraged.

One such example is a portfolio checklist.

Please check '✓' in the boxes appropriate to you.

Items	Well Done	Good	Improvement Needed
I take pride in compiling portfolios.			
I manage to keep a portfolio sheet systematically.			
After each entry, I reflect on my strength.			
After each entry, I reflect upon my weakness.			
I have incorporated my teacher feedback.			
I have assimilated feedback from my peers.			
I approached my teacher to understand my writing capability.			
I have picked up two works from my portfolio as a dossier of writing ability.			
I feel I can monitor my writing reflectively and confidently.			

Fig. 4: A checklist for writing portfolios

Putting Assessment for Learning in Practise

Ice-cream Sticks

The classroom in which student engagement appears to be high has been found to significantly impact student achievement (William, 2011). So, if more and more students participate in questioning and discussing, students tend to get smarter. It improves their mental readiness, academic enthusiasm, better speaking, thinking, and organisation of content, which in turn enhances their learning. At the same time, those avoiding engagement actually play negatively on enhancing their learning. Hence, more and more engagements are an essential condition of a classroom following formative strategies. (Leahy, Lyon, Thompson, and William, 2005).

One such effective practice of encouraging students' participation is using ice cream sticks. In this practice, teachers write the names of each student on ice-cream sticks. Before asking a question, the teacher randomly picks a Popsicle, reads the name, and calls the student to answer. Once a student has responded, this selected stick is kept out of the beaker so that others may get a chance to respond.

Some cautions are required here in this practice. Selecting a student randomly may not be welcomed by those who are accustomed to answering most of the time. Thus, the students who participate regularly may get discouraged. One way to overcome this is by randomly asking a student and then asking the remainder of the class "if anyone would like to add to it". It is very important that a question is asked first, and then an ice-cream stick is used to choose a student. If the teacher does it the other way round, then only the picked student is supposed to pay attention to the question.

Mini Whiteboard

William (2011) regards Mini Whiteboard as the latest incarnation of slates of the present time. This is a powerful tool in a way that as soon as the teacher asks a question, s/he can get the answer from the whole class, whether it is asking students: if the point (x, y) is equidistant from the point (6,2) and (4,5), what is the relation between x and y or what is the role of media in democracy?

The use of a mini-whiteboard allows every student to engage. The teacher receives instant responses and a state of every student's understanding of the content. One may also keep the pre-printed question in sheets to be distributed in the classroom. This is more flexible, so while teaching history, s/he may use a map of the country and while teaching geography, an unlabelled diagram.

Conclusion

Teaching is contingent; we cannot accurately predict what learners

have learned from a sequence of teaching instructions. Assessment for learning involves getting the best possible pieces of evidence of what the students have learned from the instructions. This high quality information is further used to create feedback that moves learning forward. If we want the feedback to be effective, it must focus on both the cognitive and emotional aspects.

In teaching-learning, the teacher plays a crucial role in creating a situation where learning can take place. But it is the learner who has to learn. Therefore, every learner must take responsibility for their learning. Learners' agency gets highlighted in both peer assessment and self assessment, which can prove to be contributory factors here.

This present paper highlighted many techniques of assessment. It is suggested here that a teacher should pick one or two techniques at a time and practice until it becomes a normal process and then try a new one. In the end, the teacher is the most influential person to influence learners; they can significantly contribute to their careers. Hence, if all the teachers accept the need to improve the practice of teaching-learning, then they can prepare students who will be equipped enough to meet the complexities and unexpected situations of the twenty-first century.

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Private and Public Schooling
The Experience of Rural Punjab in School Education

Kamalpreet Kaur Toor*

Abstract

Present study qualitatively analyses some of the critical issues of the rising demand of private school education in Punjab more specifically among rural community. Focus group discussions are administered with teacher activists and educational administrators to generate data. After thematic analysis six major themes such as quality education and infrastructure facilities, attractive propaganda of private schools, insecurities of parents due to agrarian crises, English as medium of instruction, ostentatious culture, and deterioration of the status of government school teachers have emerged that all collaboratively accelerate mushrooming of private schools in rural areas of Punjab.

Introduction

Due to new-liberal practices adopted in India after nineties, the scope of state activities was redefined and school education was claimed to be a private good allowing for the participation of the private sector in state endeavors. Consequently, the structure of education sector of the whole country has changed drastically with the change in relative proportion of different types of service suppliers (more particularly private) in the school sector and this has highly captured the education sector. This change is more profound in some states like Punjab where education sector has got divided into parallel public and private streams. Government schools have become schools for children of the most poor and low-ranked caste groups, while better off children (upper caste, urban and upper middle class middle

**Assistant Professor,* Mai Bhago College of Education, Ralla , Mansa, Affiliated to Punjabi University, Patiala.

class) are increasingly accessing private schools, resulting in a new form of social inequality (Vasavi, 2003; Singh, 2007; Srivastava, 2006; Kainth, 2016; Singh, 2016; Gill, 2017; Kaur, 2018; Toor, 2019). It is insufficiently appreciated that even at the elementary levels there are a bewildering variety of schools today and each offering different services, course content and catering to different strata of the population. This is disturbing that children from different strata are increasingly being bunched in different type of schools, partly as a result of market forces and partly as result of policy. Therefore, the situation of school education in the state is compounded by the growth of multiple schooling systems and emerging segregation of children. Above mentioned hierarchies in educational provision and access are thus, mirroring social hierarchies and these developments in education system are neither proper nor equitable (Harma, 2011) creating hindrances in achieving the goal of an egalitarian society.

Empirical Background of the Study

Statistically speaking, over the past few years, there has been a steady drop in enrolment rates in government schools of the state and a steady increase in enrolments in private schools as there has been upsurge of private schools. Looking at the interstate variations in the extent of utilisation of private schooling, Muralidharan and Kremer (2009) in their nationwide survey reported that Punjab had one of the highest percentages of villages with private schools as compared with all-India averages. Kingdon (2017) analysed data of the National Sample Survey (2014–15) and concluded that 33.5 per cent rural and 56.2 per cent urban and overall 44.4 per cent six to eighteen years old children attended private schools in Punjab during 2014–15. State Elementary Education Reports Cards (NUEPA and GoI, 2003–04 to 2016–17) of various years have shown that percentage share of government schools were 99.96 per cent in 2003–04 and diminished to 72.69 per cent in 2016–17 whereas percentage share of private schools were 0.04 per cent in 2003–04 but increased dramatically and reached to 26.33 per cent over subsequent period. This may look like a small figure as in percentage but is still fairly large in real terms. Initially, more particularly in 2003–04 at the time of starting years of SSA, large chunk of students were getting education in government schools (1239961) of Punjab which was 99.92 per cent (1238960) of the total enrolment, however within the period of fifteen years proportion of private schools in total enrolment proliferated rapidly and reached at 46 per cent in 2016–17. Annual Status of Education Report (Rural)–2018 also revealed that 52.2 per cent children in the 6–14 age groups go to

private schools in rural areas against 46.7 per cent to government schools in the state. This trend is also well documented that majority of school students in many states are either attending private schools or seeking paid tuitions (Aggarwal and Jha 2001; ASER, 2012; Sharma and Saini, 2012; Mohanty and Acharya, 2016; RTE Forum, 2015–16; Kainth, 2016).

It is observed from research work that phenomenon of private schooling is quantitatively explained in multitude of studies but this particular issue is not explored qualitatively more particularly in rural set up. Therefore, through this paper an attempt has been made to qualitatively analyse some of the critical issues of the rising demand of private school education in Punjab specifically among rural community as a whole. Consequences and efficacy of private education are mainly discussed with the educational personnel who are working directly with schools, teachers and communities. Findings of this study tries to unravel the factors based on which rural parents decide which type of schooling is required for their children and why parents are now abandoning government schools in spite of free and quality inputs.

Objectives of the Study

The main aim of the study is to explore factors promoting private school education in rural areas of Punjab.

Research Design

Focus group research is one kind of qualitative research methodology is used in this study for in depth exploration of determinants of school choice in rural community of Punjab. This type of research is primarily used in the social and behavioural sciences, and usually involves some type of interview with people, either in groups or one-on-one (Gordon and Langmaid,1988).

Sampling

Selecting participants who share a similar perspective toward the topic is the most common strategy for producing the kind of group composition that will generate active exchanges (Morgan, 2008). Therefore, by following the principle of homogeneity that is common interest for school education, educational administrators (DEOs or BEOs) along with teacher activists from every district of Punjab has been interviewed. The study is conducted in eight focus groups in different villages of Punjab in various districts namely Gurdaspur, Patiala, Sangrur, Tartarn, Nawashahar, Ferozepur, Mukatsar, Moga, Mansa where number of private schools in rural areas is higher as compared to urban areas (District Report Card 2016–17).The total sample size is

40 respondents including DEOs or BEOs (21) and teacher activists (19). The age range is 35–62 years and 45 (75 per cent) participants are male. Focus group discussions (FGDs) are comprised of 5–6 respondents and one session has been varied from 2 to 2.5 hours. The period of data collection for this study is July to January 2017 to July to January 2018.

Research Tools

Focus groups as a form of qualitative interviewing are conducted through a semi-structured focus group interview schedule which is developed after try-out on the individuals who directly work with schools, teachers and communities. Questions related to trend of private schooling, social exclusion and the policies or actions for school education as a whole more particularly for public education are prepared which are modified after field testing. The central question is why are government schools in rural Punjab losing thousands of students each year. All other questions are interrelated to this fundamental question. (See Table 1).

Analysis of Data

Focus group discussions with teacher activists of various teachers' organisations and educational administrators are duly recorded in field diaries and supplemented with field notes and observation of the investigator. Permission to record the focus group discussions is sought prior to conducting them. After conducting all the focus group discussions, the voice files are sent to a private company for transcription. After that most widely used approach of thematic analysis by Braun and Clarke (2006) is completed on transcripts of FGDs. This approach involves six steps from generation of initial codes, identification of broad categories, defining and naming of themes and followed by presentation and discussion of results.

Results of the Study

Data of FGDs have depicted that school choice decision is a combination of both demand and supply side factors. These factors reported by large majority of respondents are produced into six themes which are presented in Table 1 and explanation is thematically presented in the following section.

Theme 1: Quality education and infrastructure facilities is emerged from the question 'why rural masses have prevalent assumption that it is the private schools that provide better and quality education?'. This theme is framed on the basis of six codes and two categories (Table 1). All the respondents have comprehended that on supply side quality of physical infrastructure of the school such as condition of school building, clean drinking water and hygienic toilet facility, well equipped classrooms, libraries, laboratories, transportation

Table 1: Thematic Analysis of Causes of Rising Demand for Private Schooling

Code	Category	Theme
Question 1: Why rural masses have prevalent assumption that it is the private schools that provide better and quality education?		
Good building	Physical characteristics	Quality education and infrastructure facilities
Adequate classrooms		
Furnished classrooms		
Clean drinking water	Ancillary facilities	
Libraries and laboratories		
Transportation facility		
Question 2: What type of market strategies do private schools use to increase their enrollment?		
Hoardings on roads	Advertising	Attractive propaganda of private schools
Attractive sign boards		
Advertising through mass media		
Participation and organisation of extra-curricular activities	Understanding of customer behaviour	
Development of attractive school brand		
Engaging of influencers		
Question 3: Why this trend of private schooling is more prominent among rural parents?		
High expectations of parents	Parental aspirations	Insecurities of parents due to agrarian crises
Economic pressure		
Farming sector is no longer profitable	Reducing reliance on agriculture sector	
High cost of production		
Question 4: How does rising demand of learning of english make contribution in escalating demand of private schools?		
Education in English is need of the hour	Employment	English as medium of instruction
Without English learning no employment		
With English students can easily clear IELTS	Immigration	
English will help in adjustment overseas		

Question 5: Although there are number of government schools which are giving excellent results, still why do people think that their children should study only in private schools?		
Status symbol	Show off culture	Ostentatious behaviour
Prestige issue		
Social acceptance		
Government schools for poor and disadvantaged ones	Social exclusion	
Concerned about social circle of children		
Superiority complex		
Question 6: What is the role of government school teachers in this process of preferring private schools over government schools ?		
Negative professional behaviour	Lacking accountability	Deterioration of the status of government school teachers
Teacher absenteeism		
Neglecting duties		
Lackadaisical attitude	Irresponsible behaviour	
Lack of job commitment		

Source: Focused group discussions with respondents

facility have emerged as the most significant detriments for the selection of private schools. It is the parents who are equating well furnished buildings, colourful uniforms, and transportation facilities of private schools to quality education. In this context, one participant stated: "Education has become business now. Today, private schools have AC classrooms, AC buses and ordinary high fees. Private education has taken away education from larger section of the society. But the problem is that parents believe that costly education is quality education." This first theme of looking quality education through infrastructural facilities supported by Mehta, 2005; Mehrotra, 2006 who have concluded that private schools have better infrastructure facilities as compared to government schools and it is the infrastructure of the school to some extent is said to be important criteria in shaping school choices for all social classes (Ahmad and Sheikh, 2014; Singh., Monga, and Kaur., 2015).

Theme 2: Attractive propaganda of private schools is framed from the question 'what type of market strategies do private schools use to increase their enrolment?'. From the discussions of this question six codes are generated which are further classified into two categories such as advertising and understanding of customer behaviour (See Table).

Respondents have pointed out that parents are made to perceive that pricey schools are the only route of good education through advertisements. Private players of the state are very much mindful about apprehensions of parents and perceive a child as their customer and knowledge of customer behaviour is the main strategy of market. Therefore, private managements use attractive propaganda in form of hoardings on roads, attractive sign boards, advertisements through mass media to lure rural parents and they are quite successful to some extent to create an illusion of quality education and able to make out that children learn well only in private schools.

Theme 3: Insecurities of parents due to agrarian crises have emerged from the question 'why this trend of private schooling is more prominent among rural parents?'. Table 1 show that data derived from FGDs on this question is classified into four initial codes and two categories that is parental aspiration, reducing reliance on agriculture sector. All the participants viewed that it is the expectations of parents due to agrarian crises that lead rural parents to private system of schooling. The reason may be that rural society has lost faith in agriculture occupation, stagnant production, high cost of inputs and decreasing income from agriculture attributed to this attitude. They normally want their children should join non-farming sector and feel that they have already spent their life in hardships and their children should lead a better life. Inspired by this hope, rural parents prefer to send their children in these schools and invest heavily on their education but parents are not aware about the actual learning of their wards.

Theme 4: English as medium of instruction has come forward from the question 'how does rising demand of learning of English make contribution in escalating demand of private schools?' Table 1 exhibits that the fundamental reasons of demand of this burgeoning of English medium schools are employability and immigration which are main categories of this theme. Dataset from interviews have depicted that private schooling is also directly related to English as medium of instruction and the absence of English medium in government schools is also one of the main arguments for out-migration to private schools. Parents have developed a mindset that without English efficiency their children will remain unemployable in this competitive world as English is the need of the market. Recently, the trend of international educational migration has also persuaded parents to enrol their wards in English medium schools. English Language Proficiency tests such as IELTS, PTE, CELPIP are mandatory to work and study in many foreign countries that has resulted in increase in English medium schools. Parents think that if a student gets education in English

medium, this will more likely increase the chance to crack these tests which are nowadays considered to be the most preferred way of international migration. Therefore, every parent of the state who can afford or cannot afford wants to provide education in these so called English medium schools. This trend of English medium schools is also represented in various reports on elementary education and concluded that more than forty percent school students in the state has English as their medium of instruction. (NUEPA and GoI, 2016–17).

Theme 5: Ostentatious behaviour has appeared from the question 'although there are number of government schools which are giving excellent results, still why do people think that their children should study only in private schools'. This sub-question during FGDs have generated four codes and two categories which are reported in Table 1. Majority of respondents have opined that pretentious mindset of Punjabi society also boosts this demand of private schools because these schools are considered as a distinction of social class in the rural areas. Parents are relating private schools with their status symbol and perceive it more prestigious than sending their kids to public school. Many reported that parents think that they do not want their children should study with children of migrants or poor parents studying in government schools, because they are concerned about impact of influence of peer or social circle on the behaviour of children.

Theme 6: deterioration of the status of government school teachers is structured from the question 'what is the role of government school teachers in this process of preferring private schools over government schools?' Responses derived from participants are developed into five codes and two categories which further have lead to theme that with passage of time status of government school teachers have degraded significantly. One of the respondents have said that before nineties teacher of a village school enjoyed huge respect and perceived as deferential figure. Village school was the epicenter of all religious and cultural activities of the rural community. Not a single marriage or religious ceremony was completed without the participation of school teachers. One time food was sent to schools just as a token of love and respect from that particular family. However, after the dawn of privatisation, people were made to think that teacher community lacks sincerity, accountability and punctuality. Eventually, people have started to show less faith in public system as private managements that assures not only discipline, commitment and but also follows result oriented approach. Therefore, lack of accountability on the part of teachers and also lack of monitoring mechanism in public school system are held responsible for this growing demand of private education.

Points of concerns: From interpretation of data it is clear that above mentioned six themes are the legitimate reasons in shaping school choice in rural community of Punjab. However, this trend of private schooling is creating serious concerns for Punjabi society. Due to relegation of poor children in to government schools, school education now has not been regarded as an equaliser or an instrument for developing shared attitudes and social characteristics but rather known as way of differentiating one class from other classes. It does not connote that private schooling is not good for rural community, but affordability is mammoth issue here. Families are spending major share of their income to pay fees to these schools. Apart from the miscellaneous expenditure incurred on admission fees, uniform, stationery, private schooling also entails additional cost in form of other monthly expenses such as transportation charges, activity charges are quite high and parents are putting themselves a lot of financial hardships just to give quality education to their offspring. It is seen that the exorbitant high fee structure of the private schools has adversely affected the socio-economic status of rural households. The burden of indebtedness increased 18.50 per cent of on the rural families to meet the financial requirements to provide private education (Singh., Monga, and Kaur., 2015). Lower middle class parents are making huge sacrifices to enable their children to pursue their studies in English medium schools. Moreover, after sending their children to expensive schools, still arrange private tuitions for children. This is debatable issue here that what is the need of tutors or private coaching after sending their children in these schools that are considered as the best schools according to parents?

Additionally, all the policies and programmes of universalisation of school education recommend for availability of schools within safe and accessible distance from the habitation where a child lives. According to RTE-2009 norms a primary school should be within one kilometer and an upper primary school should be radius of three kilometers, unfortunately privatisation of school education has changed the definition of physical access of school as on a nursery school child (three to four years old) on an average daily commutes twenty to thirty kilometers in school vans to reach their respective schools which are situated at nearby towns or cities and spends two hours of the day in travelling. Yellow coloured buses of private schools with name of school, affiliation board along with medium as English written boldly on the sides can be seen lining up like swarm of bees early in the morning to pick children from villages to schools. Hence, knowingly or unknowingly these travelling hours can give physical and mental exertion to growing ones that creates a great deal of imbalance in study-play time.

Suggestions for Bridging Gap Between Government and Private Schools

Therefore, it is crucial here to clarify some misconceptions which are associated with this phenomenon of choosing government schools over private schools.

Undoubtedly, getting quality education is everybody's fundamental right and it is the duty of government to provide quality education in schools. However, firstly it is the duty of the society which has to decide what type of education is required for future generations. Society should be made to think that private schools may be better in infrastructural facilities but this does not mean that the quality of the teaching-learning experience is much better than in government school. Moreover, it is noticeable that these schools cannot be seen as important players to achieve the goals of UEE (Tooley, 2001) as RTE is not adopted in private schools in true spirit (Kainth, 2014). Parents must understand that teachers in these schools are poorly trained, less qualified and less paid as compared to government school teachers but better in terms of regularity of attendance of teachers and their instruction is attractively packaged (Srivastava, 2006). Hence, there is urgent need to change the perception of parents who look quality schooling from prism of private schools and to look at effectiveness of private schools in terms of achieving the aims of education for all and quality education.

Secondly, there is a belief that students have marginally higher learning levels in private schools (De., et al. 2006). There is need to see with reference to research studies that have indicated minor differences in the learning levels of children from private schools and government schools are only visible when socio-economic background is kept constant. When socio-economic background of the children studying in private and public schools are considered in analysis, the large raw learning-gap between private and public school falls (Kingdon, 1996; Desai. et al. 2009; Goyal, 2009; French and Kingdon, 2010; Chudgar and Quin, 2012; Muralidharan and Sundaraman, 2015; Singh, Monga, and Kaur, 2015 and Azam, Kingdon and Wu, 2016). ASER reports on the basis of evidences on the differences in learning outcomes of government and private schools also revealed that even though private schools consistently perform better than government schools, this is not a fair comparison because it is a well known fact that children who go to private schools come from relatively affluent backgrounds and tend to have more educated parents.

Educated community should have to play pivotal role towards the proper functioning of the government schools in these circumstances. They know the reality but are not willing to take any initiative. Time

has come for the higher education faculty to come out of their self made cocoons of seclusion from other levels of education and try to involve themselves in the social process of education. Otherwise apathetic attitude of educated community directly or indirectly will tarnish the social set up of the society. They should work at ground level to explain to the rural parents the real differences in learning achievement of private and government schools and inform them that teachers in government schools are more qualified as compared to private school teachers.

Furthermore, it is necessary to build the national system on the lines of the common school system. In this connection, the recent Allahabad High Court judgment (August 18, 2015) which directs for admitting the children of Government employees, people's representatives and other receiving perks and benefits from the government in public schools needs a special mention. This judgment should not only be implemented forthwith in Uttar Pradesh but it should be extended to cover all states of India. The experiences from the other public services show that when a service is accessed by people from all ranks of the society particularly the elite; the quality of such service improves.

The goal of quality education cannot be achieved without strengthening the public education system. Private and public schools can co-exist, but greater efforts can be made to improve public education system. Finally, it is also needed for policy makers to address all issues emerged from FGDs of present study to regain the faith of Punjabi society in governmental system. Also, they should analyse data according to the demographic profile of students on the basis of gender, social group and location in both government and private schools in order to effectively compare enrolment rates and learning achievement in both government and private schools to provide incentives accordingly. In short, instead of permitting over burgeoning of private, ill-equipped, profit oriented, unrecognised, teaching shops in the nook and corners of every village or cities which misguide rural masses, government should develop clear and specific plans to provide quality education for children of government schools by amalgamating the themes of this study with other factors such as optimum level of learning outcome, maintaining gender-caste hierarchies, and socio-economic stratifications by keeping in mind socio-regional contexts.

Rural transformation is tantamount to the transformation of schools in rural areas into powerful centers of learning, in such a way that children, parents, and the whole community look at schools as the pivot of transformation. Hence, it is essentially required to regenerate the lost image of 'village

government school' and make it 'a vital force of rural development' and should necessitate the special attention of policy makers and planners to make government schools socially reproductive and socially transformative rather than disjunctive. Ultimately, if we are able to save government schools and able to increase participation of all social and economic classes in schools, it can become as a universal remedy to unravel the nexus of rural distress in the long run.

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Mathematics Education in India through Policy Documents

Madhu B* and Biju K**

Abstract

The Government of India approved the National Education Policy 2020 in July 2020, which envisions many systemic changes in school and higher level education. Mathematics education is considered one of the significant components of school education as a compulsory subject up to Class X after the Kothari Commission, which continued to be the most difficult one. In this paper, we observed developments in mathematics education in India in accordance with the policy documents from the Kothari commission up to the NEP 2020. A critical analysis of the policy documents was done to portray the significant challenges of Mathematics education in Indian schools, which still prevail. We expect that this paper will contribute to the on-going discussions about the National Curriculum Framework while offering valuable inputs for the development of mathematics textbooks.

Introduction

The Government of India released a 60 page National Education Policy (NEP) 2020 on 29th July 2020. New Educational Policy (NEP 2020) as a document has invited many debates, arguments, and discussions among the populace. Here is an attempt to analyse Mathematics education in India after independence that is reflected in various policy documents and curriculum frameworks made by the Indian Government from time to time in light of the National Education Policy (NEP) 2020.

One should understand the fact that the education policy systems are incredibly complex. A policy document is a vision and path for the future. However, it will turn out as expected only if all the supporting systems work well. A change in one

*Assistant Professor, DESM, Regional Institute of Education (NCERT), Mysuru, Karnataka, India.
**Assistant Professor, Department of Education, Central University, Tamil Nadu, India.

policy can have unexpected effects elsewhere in the system. Some unintended effects may take years to emerge.

For example, curriculum reform that aims to match international standards will require other policies, such as teacher education and professional development, to succeed. Understanding interactions and interdependencies in education policy are challenging, particularly within short political timescales.

Brief History

Before colonisation, our education was majority ruled by a caste system which did not allow lower-class people to learn *Vedas*, which is of prime importance. Lower-caste people have to stick to the learning of vocations allotted to them by the caste system. There were indeed, many contributions to the knowledge domain by ancient India, which included vast areas like Mathematics and Astronomy, Medicine, Language (grammar), and Technology. Also, the people who contributed to these areas faced different societal issues. For example, those who practised *Ayurveda* were considered untouchable. The first change came during the period of Buddhism. However, after the decline of Buddhism in India, caste politics came into power, which also had long-lasting implications in education. The second incident that tried to make education reforms in India was Christian missionary attempts. Even though they had a vested interest in providing education to all, irrespective of caste and creed, its after-effects were enormous.

One major aim of education in British India was to develop clerks to run the government. So the Indian knowledge system has very little space in the curriculum. Another reason is the reluctance of Westerners to accept the contributions of Eastern civilisations. When India got independence our education system was primarily inherited from Britain. However, most Indians were not getting the privilege of being educated which is evident from the data provided stating that Indians woke up to freedom with a 14 per cent literacy rate. So the national leadership in India gave prime importance to reforms in education. (Arora and Sinha, 1992)

Various committees and commissions were formed, and their suggestions were discussed in detail. The first major commission in this regard was the University Education Commission of 1948, under the chairmanship of Dr. S. Radhakrishnan, which aimed to report on the status of Indian university education and suggest improvements. The Secondary Education Commission was set up under Dr A. Lakshmanaswami Mudaliar in 1952 and submitted their reports in 1953, which included suggestions for establishing multi-purpose high schools and setting up technical schools.

At the end of the 1950s, educationists and stakeholders agreed that all was not well with school (mathematics instruction). They required the explicit listing of objectives of mathematics education. There were two other problems brought to notice. The first was that school dropouts were mathematically illiterate. The higher education sector and the job market raised the second problem by complaining that the mathematics aptitude intake was not satisfactory. These concerns give more emphasis to teacher education.

National Council of Educational Research and Training (NCERT) was formed in 1961 by merging seven existing national government institutions, namely the Central Institute of Education, the Central Bureau of Textbook Research, the Central Bureau of Educational and Vocational Guidance, the Directorate of Extension Programmes for Secondary Education, the National Institute of Basic Education, the National Fundamental Education Centre, and the National Institute of Audio-Visual Education. Thus, NCERT was established with the agenda to design and support a national education system that enables and encourages diverse cultures across the country.

Kothari Commission

In 1964–66, Kothari commission was set under the chairmanship of Dr Daulat Singh Kothari. Kothari commission very clearly expressed its vision in the opening paragraph "the destiny of India is now being shaped in her classrooms. In a world based on science and technology, education determines people's prosperity, welfare and security. The quality and number of persons coming out of our schools and colleges will depend on our success in the great enterprise of national reconstruction whose principal objective is to raise the standard of living of our people". This commission evaluated the school education system at the micro and macro levels. The Commission proposed the idea of universalisation of primary education and the 10+2+3 pattern. The committee suggested that Science and Mathematics must be integral to school education in the first ten years of schooling (Arora and Sinha, 1992).

Two main things related to mathematics education in the Kothari commission and 17-point National Policy resolutions; firstly, the nation understood the importance of Mathematics education at the school level and mathematics became a compulsory subject up to the school level. The second one was more gender-related. As we observed earlier, Mathematics was not a compulsory subject in school (Arora and Sinha, 1992). Children who feel mathematics is difficult to start taking different other easy-to-learn subjects. In mathematics education, there is a common myth that mathematics is not the cup of tea for girls. So girls were permitted to choose the so called

'lighter subjects' like household arithmetic and domestic science in place of serious mathematics. One should also look into the following data that when the literacy rate in India in 1951 was 18.3 per cent, the female literacy rate during that period was 8.9 per cent to understand the role of gender in education (Arora and Sinha, 1992).

The commission should have addressed the issues and concerns of mathematics education at that time more profoundly. Herman Rosenberg explained some of the issues that mathematics education in US schools faces which are relevant to the Indian context also (Rosenberg H, 1962). The first one was due to the concerns of the public. The Kothari commission recommended mathematics as a compulsory subject in school education (Kothari Comission, 1970). But this created another problem in the school curriculum. The curriculum and syllabus should be designed in such a way that it should have a balance between mathematics and non-mathematics subjects. The commission document should have clearly stated which areas of mathematics, whether in pure or applied form, should receive emphasis in school classes. Later this was addressed by NCERT at the time of syllabus and textbook formation.

Another primary concern raised by Herman Rosenberg was diversity VS unity. People who supported diversity in mathematics curriculum demanded diversity in the content, arguing that it will help students and teachers to pick up mathematics insights via alternative structures of the same content. However, the opposite argument was to bring the maximum amount of agreement on the nature and content of mathematics (Rosenberg H, 1962).

The Kothari commission and 17-Point National Policy Resolutions should have been more vocal on these concerns and pedagogy-related issues. Many mathematics educators consider mathematics teaching to be done logically, as logical thinking is the subject's heart. Nevertheless, psychologists concerned about children's mental processes feared that so much formalism might repel students from Mathematics.

The 1950s are marked in the history of mathematics education as the beginning of a movement called New Math which started in the US and spread through many parts of the world (Hayden, 1981). The Kothari commission and 17-Point National Policy Resolutions gave scope for this movement. Even though the commission did not mention this movement in detail, mathematics textbooks tried to incorporate some of these approaches. Our classrooms of 1960–80, did not use the discovery method as a learning strategy envisioned by New Math. After a period, New Math was criticised in the USA, and another movement called 'Back to Basics' started in mathematics education which was not reflected in the documents.

The Debate about Mathematics Education

Mathematics education—its objectives, learning strategies and assessment techniques were critically analysed, and new models were also suggested as part of worldwide debates. The continuous erosion of mathematics abilities has become a concern of educationists worldwide. Studies worldwide showed similar trends in mathematics education, and India was also not different. It was observed that our children know things but they need help in understanding the concepts as an after-effect of rote learning in place of assimilating the concepts. (Ramanujam and Subramaniam, 2012). The NCERT developed a document named, *The Curriculum for the 10 Year School: An Approach Paper* in 1975 through seminars and workshops throughout the country and in a continuation of this document, mathematics for various levels was defined (Morris, 1980).

Teacher education and mathematics education have significant changes after these documents. Textbooks were revised, and teachers were given training on content and pedagogy. However, the issues were not resolved entirely. Mathematics textbooks and teachers focused on fixed procedures, with less emphasis on real-world problems in classrooms. Many times, mathematics was separated from other subjects and a vicious circle formed in teaching-learning of mathematics. Arora and Shirali (Arora and Shirali, 1981) have observed that the root cause of the problem lies in teacher education. Upon completion of their pre-service training, teachers require greater motivation and a deeper understanding of the underlying philosophy behind the syllabus, rather than simply completing it without conviction. In the absence of well-informed and engaged teachers, there is a risk of perpetuating a cycle in which students are similarly disinterested and lacking in knowledge, thereby hindering the learning process.

As many students drop education due to financial problems, the dropout rate in the 1980s was more than 60 per cent as per the document by NCERT *Curriculum for the Ten Year School: An Approach Paper* (NCERT, 1975). The students, who become dropouts, go to work. Nevertheless, they needed to become more skilled workers, which affected the quality of the work. It was observed in (Arora and Sinha, 1992) that the students who went to school did not work, and those who went to work did not go to school. This emphasised vocational education from an earlier stage. Even though these issues were anticipated and suggestions were given in the National Policy Resolution in 1968, they still needed to be implemented with the true spirit for various reasons.

National Policy of Education 1986

The National Policy of Education in 1986 (NPE 1986) suggested that mathematics should be visualised as a vehicle to train a child to think, reason, analyse and articulate logically. Mathematics should be considered concomitant to any subject involving analysis and reasoning, as it is one of the essential tools in understanding the cause effect relationship and interplay between the variables. India has a rich heritage of ethno-mathematics, including calculations by carpenters and astrologers, geometrical drawings by artists, pattern formations by women in the form of rangoli and kolam, etc. It was suggested that the curriculum should be standardised. However, it should provide space for language, culture and economic diversity and need to be redesigned to bring it with modern technological devices.

One of the significant suggestions in the NPE 1986 was about emphasising the Minimum Levels of Learning (MLL) for each stage of education as a prerequisite for setting performance goals for the teachers for which a committee was constituted under the chairmanship of Prof. R. H. Dave (Dave, 1991). This committee draws up MLL for each level of learning, which can be considered the preliminary form of Learning Outcomes (LOs). As considered by the committee, some basic features of the MLL are achievability, communicability, evaluability and learning continuum. According to MLL for primary children who complete their lower primary classes should develop numeracy skills and be able to do calculations with speed, accuracy and ease. They should be able to think logically and should be able to identify the pattern. MLL suggests that teachers use concrete objects and mathematical equipment for mathematics education. In upper primary mathematics, curriculum should be functional with the child's day-to-day life. As the child progresses from upper primary to secondary class, there should be a smooth transition from functional mathematics to matured mathematics. Arithmetic should be viewed through the eyes of algebra. Students should be able to appreciate the beauty of mathematics. It was also suggested that computers can be taught at this stage, not as a subject but as a tool to help teaching-learning (Gabriele et al., 2002).

National Curriculum Frameworks

NCERT came out with the National Curriculum Frameworks (NCFs) in 1975, 1988, 2000 and 2005. Between the NCF 1988 and 2000 Yash Pal committee was constituted in 1993 to advise on how and means to reduce the load on school students at all levels, particularly the young students, while improving the quality of learning, including the capability for life-long self learning and skill formulation. This committee analysed the root

causes and provided suggestions that they are still relevant regarding mathematics education. Yash Pal Committee recommended that "Mathematics curriculum for primary classes in all parts of the country be reviewed with a view to slowing down the pace at which children are required to learn basic mathematical concepts, and broadening the scope of primary mathematics to include areas other than number work (For example, space and shape-related concepts and problem-solving). The tendency embedded in the syllabi and textbooks of primary mathematics to accelerate children's mathematical skills by teaching them mechanical rules at the expense of understanding and intelligent application ought to be discouraged in future syllabi and texts" (Yash Pal Commitee, 1993). This document starts looking at mathematics textbooks and mathematics in a broader sense.

The following central document was the NCF 2005 and its position paper in mathematics education, which emphasised the main aim of mathematics teaching as the mathematisation of a child's thought process. The NCF 2005 emphasised constructivism and textbook revision. As per the position paper in the NCF 2005, school mathematics takes place in a situation where: (i) Children learn to enjoy mathematics, (ii) Children learn essential mathematics, (iii) Mathematics is a part of children's life experiences which they talk about, (iv) Children pose and solve meaningful problems, (v) Children use abstractions to perceive relationships and structure, (vi) Children understand the basic structure of mathematics and (vii) Teachers expect to engage every child in class (NCF Position Paper 2005).

The NCF also analysed the problems in mathematics education in schools. The document identified core areas of concern, such as a sense of fear among children, the curriculum's non-participatory nature, the crude assessment method and the lack of teacher preparation. Structures of social discrimination reflected in mathematics education aggravated the situation, especially the gender dimension, leading to a stereotype that boys are better at mathematics than girls. However, this observation shows that the issue of gender bias and myth was not resolved entirely.

Based on these analyses, the NCF recommended shifting the focus to higher goals, engaging students by offering conceptual challenges, focusing on mathematisation in assessment and enriching teachers with various resources.

In *Mathematics education in India—An overview*, Ramanujam gives an overview of the challenges and issues which are continuing in mathematics education in India (Ramanujam and Subramaniam, 2012). It is observed that even though the Kothari commission indirectly addressed the myth that girls are not suitable for learning mathematics, the same preconceptions persist in rural areas. Another issue pointed

out is that since board exam patterns have not changed much, the textbook and pedagogy of mathematics in secondary and senior secondary classes do not show a positive change compared with the elementary classes. Along with this, the entrance coaching culture also took a toll on meaningful mathematics. The authors noted a similar observation based on the feedback received during the various content-cum-pedagogy training program for the mathematics teachers conducted at Regional Institute of Education, Mysuru. It was found that the participants were most engaged in problem-solving sessions that focused on board exam and competitive exam questions. In such sessions, the teachers are interested in the preparation, analysis and solving through shortcut methods that essentially use routine procedures rather than non-routine or concept-based problems.

R Ramanujam and K Subramaniam say that the significant challenge in school mathematics education is "creating a pool of good mathematics teachers in the required numbers". He also observed that the educational reforms like *Learning without Burden,* NCF 2005, etc., has seen a churning across the country within the school mathematics in terms of attitude and approaches. However, he says that even though the trend is positive, it is too early to tell whether these efforts will lead to radical shifts (Ramanujam and Subramaniam, 2012).

During the 1960s and 1970s onwards, social science methods became common to examine the effect of various factors on educational development, accompanied by a debate on the relative merits of quantitative versus qualitative studies (Gabriele et al., 2002). In different global scenarios, all the countries, whether they participated or not, started looking at and analysing the results of international tests like the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS).

NCERT also conducts a nationwide survey called the National Achievement Survey (NAS), initially planned and designed to be an independent project. The Baseline Achievement Survey (BAS) was carried out during 2001–2004 followed by the Mid-term Achievement Survey (MAS), carried out during 2005–2008. Over the last decade of SSA implementation, the focus shifted from dealing with challenges around access to improving the quality of learning. Hence, NAS emerged as a tool to provide periodic feedback to the system on the health of education in the country, which became a regular and ongoing cycle in the Indian education system.

After 12 years of the NCF, a report of NAS 2017 (NAS-2017) point out that children who study mathematics are facing difficulties in the following areas:

- Measuring length in standard units and comparing. Estimating

the volume of a solid body. Finding surface area and volume of cuboidal and cylindrical objects. Finding out the approximate area of closed shapes by using units-square grid or graph sheets.

- Extending patterns in shapes and numbers.
- Solving problems related to converting percentages to fractions, decimals, and vice versa.
- Generalising properties of addition and subtraction, multiplication and division of rational numbers through patterns. Using the exponential form of numbers to simplify problems involving multiplication and division of large numbers.
- Applying operations of numbers in daily life situations.
- Arranging given or collected information in the form of table, pictograph and bar graph and interpreting them.

The articles by Ramanujam and Subramaniam (2012) and report of NAS 2017 give a rough status of Mathematics education in India highlighting a positive trend in lower primary classes. According to them, there have been notable changes in textbooks and pedagogical approaches used in lower primary classes. However, the pressure exerted by the society on students who are preparing for board exams can have a detrimental effect on their ability to develop mathematical mind-set and thought process.

Even after no retention policy and the Right to Education act, the dropout rate was reduced to 17 per cent in secondary classes (1.8 per cent in upper primary and 1.5 per cent in lower primary classes) (Gohain, 2021). Some studies show that more than 60 per cent of students want to drop their schooling after the pandemic and lockdown. Even though the number may not be accurate, in tribal areas, the number is high. The quality of online classes and the digital divide increase these issues. Other than this, the universal issues of mathematics education, 'Why are the literates from the school so mathematically illiterate?' which is raised in (Arora and Shirali, 1981), still exists.

NEP 2020

The Government of India has published the National Education Policy, 2020, in short the NEP 2020. At a glance, the NEP 2020 gives more emphasis on structural reforms than the pedagogical paradigm shift. In the case of mathematics education, the NEP 2020 does not put forward a motto like the NCF 2005's *Mathematisation of Thought Processes*. The pedagogical philosophy is almost the same as that of the NCF 2005, which are constructivist and child centred. The following are the significant suggestions in the NEP 2020 related to mathematics education (GoI, 2020).

1. It is recognised that mathematics and mathematical thinking

will be essential for India's future and leadership role in the numerous upcoming fields and professions that will involve artificial intelligence, machine learning, and data science. Thus, mathematics and computational thinking will be given increased emphasis throughout the school years, starting with the foundational stage, through various innovative methods, including regular puzzles and games that make mathematical thinking more enjoyable and engaging. Activities involving coding will be introduced in the Middle Stage.

2. 'Knowledge of India', its contributions to modern India and its successes and challenges, and a clear sense of India's future aspirations concerning education, health, environment, etc. These elements will be incorporated accurately and scientifically throughout the school curriculum wherever relevant; in particular, Indian Knowledge Systems, including tribal knowledge and indigenous and traditional ways of learning, will be covered and included in mathematics, astronomy, philosophy, yoga, architecture, medicine, agriculture, engineering, linguistics, literature, sports, games, as well as in governance, polity, conservation.
3. All subjects and corresponding assessments, beginning with mathematics, could be offered at two levels, with students doing some of their subjects at the standard level and some at a higher level. Board exams in certain subjects could be redesigned to have two parts—one of an objective type with multiple-choice questions and the other of a descriptive type.

The NEP 2020 does not suggest drastic changes and does not critically analyse the textbooks or teaching-learning methods adopted after the NCF 2005. Policy needs to mention the present status of mathematics education in India, referring to the National Achievement Survey. Nevertheless, at the same time, it states that in the foundational stage, puzzles and games have to be used as a learning strategy. Present NCERT textbooks in lower classes use puzzles and games as a learning strategy.

The curriculum framework on the other hand, will serve as a guide or roadmap that outlines the steps needed to achieve the goals outlined in the policy document. As such, it will need to provide more detailed information on the issues and concerns identified in the policy document.

The NEP put forward some suggestions as mathematics education should equip the learner to handle 21st century skills rather than specifically. The 21st century skills differ from the skills in the previous century due to the prominent use

of technology. In the blog of Applied Educational Systems, Bri Stauffer lists 12 skills including critical thinking, creativity, collaboration and communication, as essential skills imparted through Mathematics learning (Maya, 2012). One can agree with the fact that the general thinking skills can be taught and learned, their effectiveness is strongly influenced by the specific domain knowledge in which they are applied and they are most effectively learned when integrated within a particular domain rather than presented in isolation. This approach is consistent with the constructivist ideas of Jean Piaget, which suggests that the students learn more effectively when given opportunities to explore and experiment with concepts in a particular domain rather than simply being instructed in general principles and asked to apply them. So while considering twenty-first century skills in Mathematics education, the emphasis should be on children's analytical thinking and problem-solving skills and better communication in mathematics classrooms. These skills were the essence of the mathematisation of the thought process as envisioned in the position paper 2006 (NCF; Position Paper, 2005).

The part of the NEP 2020 mentioning the Indian knowledge system should be read in the context of the 42nd amendment to the Indian Constitution in 1976, which included 'development of scientific temper, humanism and the spirit of inquiry and reform' in the list of Fundamental duties of every Indian citizen. Abhishek Saxena points out that a nation where people (rulers and subjects alike) believe in miracles and supernatural beings and powers will neither understand and appreciate the developments of the modern philosophy of science, nor will it be able to progress based upon the innovations of modern science (Saxena, 2014). Pandit Jawaharlal Nehru, nation's first prime minister said that "no country or people who are slaves to dogma and dogmatic mentality can progress." Many people, including educationists, believe that scientific temper can be developed by teaching Science in the classroom. But according to Sharma et al. (2019), scientific temper will not be obtained only by teaching science, and this raises the question: Is the Indian social milieu scientific or non-scientific in nature? They claim that one can observe that scientific temper is not so common in the Indian context even though one can observe sparks of scientific temper in abundance, hence argue that the concept of developing scientific temper only from schooling is unscientific. They even suggest the idea of 'school the society' to develop scientific temper in society. Hence, to incorporate the Indian knowledge system as per the document in the classroom in a scientific manner, textbooks and other materials must be prepared with utmost care.

Another significant suggestion in the NEP 2020 is about a structural change that offers two Mathematics parts. This will help design Mathematics which is easy to go and deals with more narrow goals like numerical skills for the students who do not prefer Mathematics for higher studies. However, this also brings some concerns about the future of Mathematics education. We have to design the curriculum to keep it from a period before the 1960s. As per the data provided by the Centre Board of Secondary Education (CBSE), there is a rush to choose Mathematics as a subject. There were more than 6 lakh enrolments for Mathematics in 2018 (Kancharla, 2020) but the deciding factor in choosing Mathematics may be societal pressure and its demand in competitive examinations.

Conclusion

Tracing the suggestions reflected in policy documents is easily related to Mathematics education, but not so easy with its implementation and improvement. Periodic reporting has to be followed, focusing on different documents' content, methods, assessment, and enrichment. Reflecting the essence of improvements in the field through strengthened implementers like teachers, parents, and learners is still crucial. There is a need to develop dialogues with clarity of epistemological underpinnings in teaching. Engaging applied reasoning with a strong backbone of numeracy and functional literacy needs to be expected as a future possibility. Reasons for engaging in Mathematics teaching and learning should get highlighted and valid meanings and forms of Mathematics education need to evolve. Negotiation on the various socio-economic-political-cultural meanings of Mathematics should be encouraged. As we reach Government of India, Ministry of Human Resource Development, Department of Education, New Delhi, 1993, a structural modification juncture; content, methods and support system for Mathematics education at various levels need to be seriously addressed, thus, embracing the varied needs of the learners and society.

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