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Research Paper

Student Learning Styles, Intelligence, Development and Engagement During Online Classes

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ABSTRACT

This research paper focuses on understanding real life applications of psychological concepts such as developmental milestones (Lev Vygotsky, Jean Piaget, John Dewey), learning styles (David Kolb), multiple intelligences (Howard Gardner) and engagement (Phil Shlechty) in education. The objective of the paper is to gander knowledge about application of different student learning styles, developmental milestones and student engagement during online classes. Based on a qualitative research design the paper explores the same through in depth interviews of both students as well as teachers and also incorporates available primary research data. The paper then concludes that even though the application of the following concepts is evident in online classes it falls short when compared to the offline mode of education. Both students as well as teachers prefer offline education so as to produce better learning outcomes.

Keywords: *Learning Styles, Intelligence, Development, Engagement, Online Classes*

"The principal goal of education in the schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done; men and women who are creative, inventive and discoverers, who can be critical and verify, and not accept, everything they are offered." – Jean Piaget

On 16th march, 2020 the Indian Government imposed a nation-wide lockdown, schools and colleges were shut down in lieu of the Covid-19 pandemic. Education as we knew it changed and shifted online, physical classrooms became zoom videos calls where videos were seldom on, blackboard-chalks-markers were replaced by keyboards and digital whiteboards, students who once shared books and notebooks started sharing screens. Students have always been excited by the idea of attending classes from home, getting up late and a 6-month long vacation until logistics of the same were considered. Change is constant but change to online classes from offline were a hard hit for students and teachers alike.

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According to UNESCO, since the outbreak of COVID-19 began, some 1.37 billion students in 138 countries worldwide have been affected by school and university closures. Nearly 60.2 million school teachers and university lecturers are no longer in the classroom. It is thus important to see how the teaching pedagogy has adapted itself to the online mode of teaching.

This paper thus, aims to study the application of different student learning styles, developmental milestones and student engagement during online classes.

THEORETICAL BASIS

Developmental Psychology

Developmental psychology is a scientific approach which aims to explain growth, change and consistency though the lifespan. Developmental psychology looks at how thinking, feeling, and behaviour change throughout a person's life. For educationists it is important to be aware of the know-hows of developmental psychology so as to be able to understand how children think at different stages of development, capability of children at each point of their growth with the aim to create instructional methods and materials best aimed at certain age groups.

1. Piaget: Piaget identified four stages in cognitive development: sensori-motor, pre-operational, concrete, and formal. He then explained developmental milestones which were a key part of each of these stages.

2. Vygotsky: Vygotsky developed concepts of cognitive learning zones, zone of proximal development, scaffolding and theories of language and thought.

John Dewey:

He gave the concept of Progressive education which is emphasizes the need to learn by doing. Dewey believed that human beings learn through a 'hands-on' approach placing him in the educational philosophy of pragmatism. From Dewey's educational point of view, this means that students must interact with their environment in order to adapt and learn. Dewey felt the same idea was true for teachers and that teachers and students must learn together. His view of the classroom was deeply rooted in democratic ideals, which promoted equal voice among all participants in the learning experience.

Intelligence:

Intelligence is described as the global and aggregate capacity to think rationally, act purposefully and deal effectively with one's environment.

Howard Gardner proposed that not every individual is born with similar intelligence. He gave 8 major intelligence types:

1. *Spatial:* Individuals who are spatially intelligent have the ability to visualize the world in
2. *Interpersonal:* Individuals who are high on interpersonal intelligence are good at sensing people's emotions and motives.
3. *Intrapersonal:* Individuals high on intrapersonal intelligence are able to understand what they feel and want well.
4. *Naturalistic:* Individuals high on naturalistic intelligence read nature
5. *Bodily kinaesthetic:* Individuals high on bodily-kinaesthetic intelligence are good at coordinating the body and mind.
6. *Logical- mathematical:* Individuals high on logical mathematical ability are skilled at computation.

7. *Verbal or linguistic:* Individuals high on verbal intelligence are good with words.
8. *Musical:* Individuals high on musical intelligence are good at discerning sounds, vocals, pitches etc.

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Learning styles:

Kolb's learning styles are one of the best-known and widely used learning styles theories. Psychologist David Kolb first outlined his theory of learning styles in 1984. He described the following learning styles or learners:

1. *The Converger:* Dominant abilities in the areas of abstract conceptualization and active experimentation i.e.: highly skilled in practical applications of ideas.
2. *The Diverger:* Dominant abilities in areas of concrete experience and reflective observation i.e.: They are good at seeing the big picture or arranging smaller ideas to create a whole. (exact opposite of convergers)
3. *The Assimilator:* Dominant abilities in the areas of abstract conceptualization and reflective observation i.e.: the ability to understand and create theoretical models efficiently.
4. *The Accommodator*: dominant abilities in the areas of concrete experience and active experimentation i.e.: ability to use theoretical concepts in real life applications. (exact opposite of assimilators)

Student Engagement:

Student engagement refers to the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education.

Phil Shlechty provided with a continuum called "levels of student engagement" which lists the following 5 stages of student engagement:

1. *Engagement:* High attention and high commitment
2. *Strategic compliance:* High attention and low commitment
3. *Ritual compliance:* Low attention and low commitment
4. *Retreatism:* No attention and no commitment

5. Rebellion: Diverted attention and no commitment

Moving from retreatism to engagement the understanding, application, creativity, evaluation and analysing abilities of a student increases. Thus, creating a high engagement class maximizes learning as well as learning outcomes.
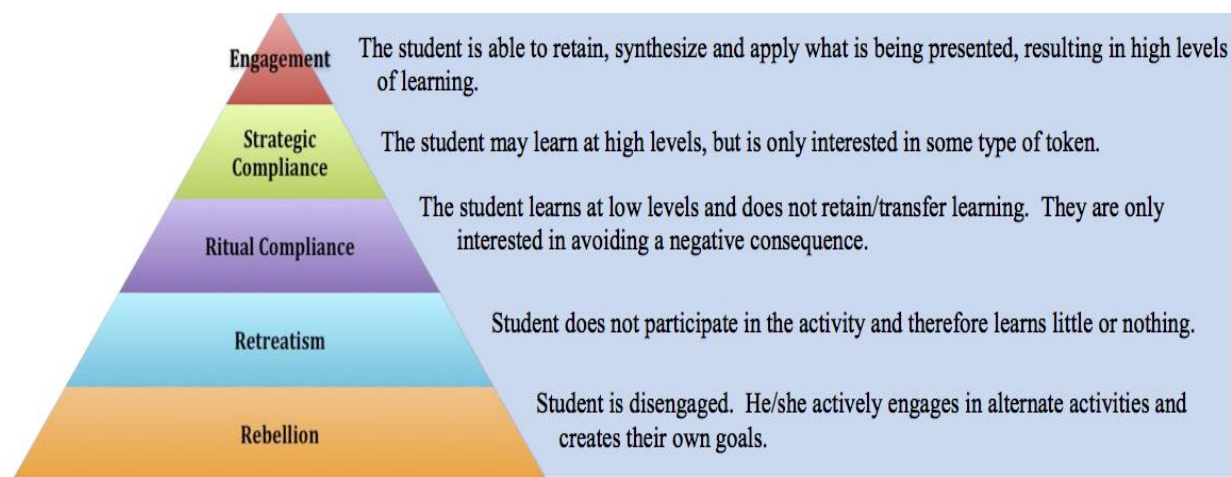
LITERATURE REVIEW

Schneuwly, B. (1994), in research paper titled *"Contradiction and Development: Vygotsky and Paedology"* talks about the concept of zone of proximal development being a vogue concept and views Vygotsky as a paedologist. The paper explains how development is viewed by Vygotsky as external and depends on teaching and education and play is an integral part of education by creating tension which permits an individual's transition beyond their current level to more complicated functions and thoughts. The paper overall discusses the entire theory of Vygotsky well an provides key insights on the same. Another paper by Davydov, V. titled *"The Influence of L. S. Vygotsky on Education Theory, Research, and Practice"* critiques how the general ideas of Vygotsky can't be used for longer durations in the education system of totalitarian societies because of contradictions to the principles of the society. The paper also presents a viewpoint where the ideas are rather understandable and concrete when it comes to contemporary theories and are very necessary when it comes to creating an educational system aimed towards inculcating democratic and humanistic principles. By providing contrasting viewpoints the paper gives an overall summation of the pros and cons of Vygotsky's theory in education and is a useful resource. Ninah Beliavsky in her research paper titled *"Revisiting Vygotsky and Gardner: Realizing Human Potential"* talks about how education needs to focus on maximizing individual potential and educators need to teach and plan ahead of developmental milestones, to teach for understanding, promote creativity and imagination and growth in terms of their personal, social and emotional growth. This can be achieved by combining the theories of Gardner and Vygotsky. Gardner's theories can be implemented in education in terms of multi-angled approach to student thinking and intelligence which will help every student reach their potential and also reach out to more students. It will help create a more enriching educational setup and also motivate students to think creatively. This article provides key insights into how we can combine the theories from cognitive and developmental psychology in the psychology of education and provide holistic education to every learner.

Research article by Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. titled "*Learning Styles: Concepts and Evidence*" aims to explain why it is important to understand a student's

learning style- "The research on learning styles is lacking and required more but it is important to understand learning styles despite lacky evidence." A similar article by Sabine Graf, Kinshuk, & Tzu-Chien Liu Titled "*Supporting Teachers in Identifying Students' Learning Styles in Learning Management Systems: An Automatic Student Modelling Approach*" builds on it- "There are tools that can be used to identify student learning styles and then students can be supported accordingly. We can also use behavior of students to gauge learning styles and not on understand student strengths and weaknesses but also help students understand the same for better learning. Both articles provide key insights into the theoretical base of learning styles. Research article by Hong Lu, Lei Jia, Shu-Hong Gong, & Bruce Clark titled "*The Relationship of Kolb Learning Styles, Online Learning Behaviours and Learning Outcomes*" introduces Kolb's learning styles as well as KLSI or Kolb's learning styles inventory and explains how educators in online mode need to gauge the learning styles of their students and the course should inculcating the diverse learning styles of students as well. In order to get better learning outcomes instructors teaching online courses are inclined to encourage students to participate in discussions and activities. It is important to give students enough time to absorb knowledge online through effective reading to improve quality of online education. A book titled "*Should we be using learning styles? What research has to say to practice*" co- authored by Coffield, F., Moseley, D., Hall, E., & Ecclestone, K explains how learning styles are not fixed personality traits but are rather relatively stable patterns of behavior which are both stable and flexible. Though learning styles shouldn't be used for individual student selection they are important when it comes to education. The paper also discusses the disadvantages of learning styles given by Kolb and explains how they are based on an explicit theory and are problematic in terms of their reliability and validity. Overall, the book provides some very valid insights and viewpoints about learning styles based on researched evidence including pros and cons of the same.

Zyngier, D in his research article titled "(Re)conceptualising student engagement: Doing education; not doing time" talks about engagement as a concept is difficult to define operationally but is pretty visible when missing. It also talks about many students hold a belief that school experience doesn't necessarily have a lot of bearing on the future but when students aren't engaged in terms of peers and studies, they feel dissatisfied with school life and start withdrawing. It talks about how student engagement depends on connecting with the student's cultural background, owning in terms of students feeling represented in their work, responding to the student's experiences and critiquing when necessary and lastly empowering the students overall and giving them the opportunity to discover themselves and grow discovering their own authentic life. Overall, the paper presents information in an engaging manner and provides key insights in terms of student engagement. A similar article by Bowen, E. R titled "*Student Engagement and Its Relation to Quality Work Design: A Review of the Literature*" talks about how student engagement could be bettered if the teaching styles change and aren't out dated. It explains how in many classrooms across the U.S.A. the teaching practices date back to 50 years and even 100 years which needs to be changed. It talks about how rote memorization is absolutely out dated and students need to be engaged in education to establish long term meaningful habits of learning. It also talks about how teachers need monetary support so as to develop better and more engaging education systems which are effective and provide quality lessons to the students. Student engagement is multidimensional according to a research article by Min Hu and Hao Li titled "*Student Engagement in Online Learning: A Review*" It explains how student engagement involves behavioural, cognitive and emotional engagement and online student engagement is an important aspect of understanding student learning and promoting it in research so as to

analyse students' learning process from different dimensions to ensure effective online learning outcomes.

A shift of paradigm from physical to online mode has put certain restrictions on both students and teachers as explained in an online article "*Effects of the Disastrous Pandemic COVID 19 on Learning Styles, Activities and Mental Health of Young Indian Students - A Machine Learning Approach*" the paper aims to explain how the online mode has caused stress and burden on the children and have affected their mental and emotional health. As stated in an article titled Analysis of student learning styles and geometry thinking skills: During the covid-19 pandemic "*in social restrictions due to the current pandemic, there is a change in the learning system and changing learning styles*" the paper talks about how mathematical skills are affected due to the pandemic and has concluded that during pandemic students preferred auditory learning styles and one to one personal discussions with their mentors furthermore the level of effect of pandemic on the mathematical skills depended upon the child's ability to do mathematics. Another research paper titled "*role of virtual learning environments in modern education system*" highlighted the advantages and disadvantages of virtual mode of learning and also spoke about the challenges faced during the online mode especially in terms of network difficulties and providing special reference material to students with same ease as before especially to students in rural areas.

A research paper on John Dewey's work titled "*John Dewey and his philosophy*" elaborated on his theory and called it a progressive theory as it focused on revising the subject matter rather than removing them. The activities under his curriculum were aimed at achieving certain goals. Dewey received both positive and negative feedback for his theory as quoted in the paper- His methods enriched the curriculum and allowed a student to carry a problem through to completion without division of subject matter. Dewey was criticized for trying to take a short cut to education. Without formal subjects his system of education appeared to be only trial and error. He neglected to develop his concept of subject matter content, its selection, development, and organization.

Another paper titled "*the concept of experiential learning and John Dewey's theory of reflective thought and action*" draws a comparison between Kolb's and Dewey's idea of experiential learning. It was established that Kolb's idea does not give an idea of Dewey's theory of reflective thought. According to him experiences include objective form of interactions between humans and their environment. concept of experiential learning, in the form used by Kolb represents the kind of psychological reductionism that Dewey considered a misinterpretation of his anti-dualist conception of experience. The paper also states that the belief in an individual's capabilities drives us away from the evaluation of cultural and social conditions of learning that are essential for fostering learning in real life.

Explaining the use of the Dewey's theory in outdoor educational settings, the paper titled "*The Substance Beneath the Labels of Experiential Learning: The Importance of John Dewey for Outdoor Educator*" refers to outdoor educational setting as a package of thinking action and learning. Outdoor setting consists of a lot of complexities that were taken in account in Dewey's theory with an appreciation of it we can ultimately enhance all our outdoor educational experiences. Dewey's theory implores us to engage with the whole experience and engage with the participants fully and meaningfully throughout.

While studying the Multiple Intelligence model a paper titled "*Teaching to student diversity in higher education: how Multiple Intelligence Theory can help*" defines the 8 intelligences

in three main groups being, objected related intelligence, object free intelligence and personal intelligence. The paper has further studied Multiple intelligences as a pedagogy that can be used in education considering the increasing student diversity. By encouraging the use of multiple intelligence, the students can relate studies in their personal life and enhance their studies and can help change the negative view towards the educational system.

Analysing the theory of multiple intelligences proposed by Howard Gardner, a paper titled "*analysis of Howard Gardner's theory of multiple intelligences*" explains the 8 different intelligences and criticises them. Harvard Gardner proposed 8 distinct units pf mental functioning which he referred to as intelligences. These 8 different intelligences were: verbal linguistic, mathematical, spatial, naturalistic, intrapersonal, interpersonal, bodily kinaesthetic and musical. In a paper titled "*Multiple Intelligences Go to School: Educational Implications of the Theory of Multiple Intelligences*" the applications of the theory of multiple intelligence have been discussed. It was found that the theory can be applied by incorporating art and craft in the curriculum and incorporating more formal assessments and games that test different intelligences a child has.

The paper "*The Effects of the Multiple Intelligence Teaching Strategy on the Academic Achievement of Eighth Grade Math Students*" While studying the results of an 8th grade student in his math test elaborated that the students who were exposed to the theory showed a significant improvement in their performance as compared to the students who weren't exposed to the theory. It was further established that the theory plays an important role in several other aspects of the child's academics.

METHODOLOGY

Objectives

This paper aims to study the application of different student learning styles, developmental milestones and student engagement during online classes.
1. To study student learning styles based on the theory of David Kolb and its application in the online classes.
2. To understand the teacher's understanding of developmental psychology especially in terms of Piaget's and Vygotsky's theory of development.
3. To understand student engagement in online classes based on Phil Schlechty's theory.
4. To understand the application of Howard Garner's multiple intelligences model in the curriculum especially in online classes.

Research design

The research conducted was qualitative in nature. Based on random sampling method 2 students each were selected from class 8th and 7th respectively. They were interviewed based on a script of 24 questions which were tweaked according to their responses. Their respective teachers were also interviewed based on a script of 30 questions so as to understand student engagement, learning styles, intelligence and applications of developmental/ child psychology in education. It was ensured that both the teachers were teaching same subject to different classes. Consent was taken from both the students as well as the teachers. For the purpose of this study the participants would be kept confidential.

RESULTS

For the sake of this research paper the identities of the subjects are kept confidential. We would present the teachers as "Teacher A" and "Teacher B" respectively and the students as

"student A.1" and "student A.2" studying under "teacher A" and "student B.1" and "student B.2" studying under "teacher B."

DISCUSSION
Online classes
1. Teacher/ instructor:
Even though teachers and students are now very well accustomed to online classes, teachers have reported not to prefer online classes when compared to offline classes. This is majorly due to the reason that it lacks physical touch which as explained by the teachers is necessary when it comes to teaching humans. No additional aids were provided to students for online classes and text books and guides being used were pretty much the same. Parental engagement saw huge increase in the online mode of education as quoted by teachers "yes it has, a little too much." The teachers explained how increase in parental engagement has made them a sort of customer executive, parents are not only questioning teachers about their methodologies of teaching, adding suggestions and attending their classes to monitor what the students are being taught but also call them at inappropriate time to which teachers have responded by creating designated call times. Teacher also explained how increase in parental engagement isn't all that bad as teachers have started getting much needed support from parents. Parents have been helping their children learn and appreciate the teachers for all their hard work. Validation in teaching comes not only through how your students are doing but also when parents recognize the efforts made by teachers thus even though increase in parental engagement in online learning has its downs there are also some plus points of the same. Skipping classes can decrease engagement in terms of not knowing what happened and needing to catch up, it creates a sort of cluelessness. It is important to ensure that students are helped in bridging this gap. The teachers explained how most of the missed classes are caught up by student through the support provided on whatsapp groups. In case, the students have issues understanding, remedial classes are also provided especially in math and science.

Developmental Psychology
1. Teacher/ instructor:
Teachers explained how they prefer following a child centered, constructivist approach when it comes to education. During college specifically in B.Ed. child psychology is taught with developmental psychology being a part of it. Teachers were well aware of Vygotsky and Piaget and reported how their works are rather ground-breaking with key applications in education especially Vygotsky and ZPD. Teaching pedagogy involves stages and other applications of Vygotsky and Piaget. Teachers are well aware of developmental milestones and stages but have reported not being able to ensure that the students achieve the same online. Teachers discussed how their students need to form an identity (identity versus role confusion- Erickson), need to develop self- talk, and move away from egocentrism. The teachers explained how buddy system isn't really incorporated in their pedagogy but when it comes to group projects students are paired with peers who can help them learn better. The education provided to the teachers especially in B.Ed. has been a key in equipping teachers in understanding the children, development, milestones of child development including pioneers such as Piaget, Vygotsky, Erickson, etc. It also involves application of these concepts through projects and researches which then helps teachers apply these in classroom settings so as to increase student learning. Student centric education and classroom learning is especially helpful in terms of ensuring better student learning.

Intelligence
1. Teacher/ instructor

Intelligence is the global and aggregate capacity to think rationally, act purposefully and deal effectively in one's environment. Students can have multi-faceted intelligences as explained by Howard Gardner. Teachers showed knowledge and admittance of the multiple types of intelligences that exist in children and how it is important to understand them and teach children accordingly. This can be done through extracurriculars and not limiting academics to just studies- "all study and no play makes jack a dull boy". When asked about extracurriculars provided on the online mode so as to incorporate these multiple intelligences the teachers explained how they are making as much efforts as they can so as to ensure that extra curriculars go unharmed in the course of online classes. The teachers when asked about the education system being impartial to explained how the education system doesn't necessarily incorporate the multitudes of available intelligences and is highly focused on marks which aren't a measure of intelligence at all.

Not only the realization of multiple intelligences is important but it is also important to incorporate the same in our education system. We need to rethink where we are going wrong if marks are seen as the measure of intelligence and extracurriculars are either lacky or not considered as important despite our awareness that extracurriculars are rather necessary and academics aren't the sole determiner of intelligence. We need to look beyond our marks centered approach and correlating the same to intelligence.

Learning styles
1. Teacher/ instructor

Every student learns differently. These differences in learning are referred to as learning styles or learning differences. Teachers showed awareness of difference in learning styles in terms of how students receive things, think, understand and respond. This can be fast or slow, visual or auditory etc. Every learner is different even twins as quoted by a teacher. Response students aren't necessarily the only ones learning. Even though according to the teachers learning styles aren't well incorporated in the education system especially when it comes to NCERT or CBSE after gaining experience it's easier for teachers to ensure that their plans incorporate differences in learning. This can be done through differential tasks especially for slow learners, marking scheme differences such as not checking grammar and being a little lax, assessment differences and learning through objects or aids such as audios or visuals.

The knowledge that ever learner learns differently is important so as to ensure holistic learning. It is important to figure out ways to gauge learner differences, teach them in line with these differences and ensure that learning is happening effectively and efficiently. We need to ensure that our education system incorporates the same since the purpose of education is learning and not memorization.

Student Engagement
1. Teacher/ instructor

Student engagement is important to facilitate learning. Student engagement is multifaceted. As reported by teachers, student engagement is especially difficult in the online mode of education. Teachers tend to gauge student engagement through non-verbal clues such as head nodding. Even after multiple pleas to turn cameras on the same isn't done. This has led to a decrease in student engagement in the online mode. Teachers have tried maintaining student engagement through questioning targeted at understanding what they are thinking

and providing cues for the same. Teachers have also started incorporating audio visual aids such as PowerPoints to keep the screen always busy. Different learning styles are targeted through differential aids. To make the subjects more interesting jokes and references such as my historians are utilized. The teachers explored how social sciences especially history are considered "boring" making it rather difficult to interest or engage students making it important to de bunk these preconceptions and gage ow students tend to engage well despite it being difficult in the online mode.

2. Students

The students believed that there has been a dip in student engagement and that the studies take place better in a classroom setting as the child has to pay attention in a classroom naturally and there is a connect with the teacher whereas at home they can get distracted by the family or society they live in. the students have been as enthusiastic participants as before as they understood the seriousness of studies. There should be constant attempts at having face to face interactions and the students should be encouraged to switch on their cameras and interact. the children shouldn't hesitate in presenting their point of views as that makes the class more engaging.

CONCLUSION

In recent times there has been a lot of discussion about robots taking over human jobs. The same discussion applies to education as well. Can robots teach our children? Can robots replace teachers and peers? Is Digi education the new normal? Applications such as byjus, educom, tata e-learning, etc are being used widely in schools but from our discussion above, it is very evident that education is done best and learning happens effectively when there is physical touch. Engagement, learning. Development, etc are best studied under real life settings. Even though online education was the need of the hour it may not be as effective as offline education for both students as well as teachers.

Over the last few decades, the education system has changed, evolved and adjusted. The understanding of child psychology and developmental milestones has been crucial in the same. Of course, we have issues but there are also solutions developed through education and expertise. We need to look at the loopholes one by one and make effective changes which are possible. We have the knowledge but we have changes that are yet to be made. Knowing that every learner is different is important so as to ensure holistic learning but it is important to figure out ways to gauge learner differences, teach them in line with these differences and ensure that learning is happening effectively and efficiently. We need to ensure that our education system incorporates the same since the purpose of education is learning and not memorization. Similarly, the understanding that every child is intelligent in their own way is important but it is also important to incorporate the same in our education system. We need to rethink where we are going wrong if marks are seen as the measure of intelligence and extracurriculars are either lacky or not considered as important despite our awareness that extracurriculars are rather necessary and academics aren't the sole determiner of intelligence. We need to look beyond our marks centered approach and correlating the same to intelligence. Due to the online mode of education the extracurriculars especially have taken a back seat and students seem to miss that in this mode. The school and teachers should try and incorporate dramatics or role plays in the classes as well as conducting activities like talent hunt that could make this online mode a little more for the students.

The students have also reported higher stress levels as they felt more burdened as compared to offline classes. The daily routine has been greatly impacted and the students need prepare

a routine where the studies can be incorporated, the teachers and students need to balance out the number of assignments and homework given so that the child feels more excited and less burdened.

It is time to work towards a more holistic educational set up regardless of whether its online or offline. It is also time for us to start respecting, valuing and paying our teaching staff well and providing them with aids necessary to develop a more holistic education system which incorporates child psychology well and takes into consideration individual differences because every child, every learner is different and it is important to respect these differences. Its not the children that need to be moulded into the education system, it's the education system that needs to be moulded according to the needs of our children and our future generations.

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Conflict of Interest
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