R14-2013

Maithreyi R.
Amita Basu
Parvathy Jayan
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Ajay Chandra and Anitha Kurup*

National Institute of Advanced Studies
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January 2013

* Dr. Anitha Kurup, Principal Investigator of the NIAS Gifted Education Project, is the corresponding author of this report.

Published by
National Institute of Advanced Studies
Indian Institute of Science Campus
Bangalore - 560 012
Tel: 2218 5000, Fax: 2218 5028
E-mail: admin@nias.iisc.ernet.in

NIAS Report: R14-2013

ISBN 978-81-87663-72-0

Typeset & Printed by
Aditi Enterprises
Magadi Road, Bangalore - 23
aditiprints@gmail.com

Foreword

We all know stories of exceptional talent emerging from humble backgrounds and defeating all odds to achieve at the highest levels. But for every such story, there are countless other stories that will never be told of ability succumbing to discouraging circumstances. The case where ability and determination overcome obstacles without support is in fact the exception. In most cases, without adequate and appropriate environmental support, ability falls far short of its potential.

It is sad that many of us refuse to acknowledge the role of society in developing children's abilities. Many of us continue to believe that "If a child is truly exceptional, s/he will 'make it' on their own." As years of research and practice in countries with gifted education programmes demonstrate, we simply cannot expect a gifted child to realise his potential without support from parents, teachers, schools, and the wider community. A gifted child is above all a child, with a child's needs and vulnerabilities. If we accept that children in general have a right to appropriate education, it is unjust for us to deny as much to gifted children.

The following document is presented as part of the NIAS Gifted Education project, commissioned in 2010 by the Office of the Principal Scientific Advisor, Government of India. The document presents a selection of case-profiles undertaken by the project in an attempt to understand the nature of giftedness in India as well as the challenges faces by gifted children in a country without an integrated or accessible gifted education programme. This document challenges the belief that gifted children can succeed on their own. It highlights areas in which gifted children need support in order to optimise their social and emotional adjustment, academic performance, and ability development. Importantly, it also clearly shows that gifted children, like any other children, are vulnerable to limitations in their socioeconomic circumstances, biases and obstacles in our educational system, and to challenges posed by the fact that their own cognitive development often outstrips their emotional development. These are some of the problems that India must address in its effort to develop a national, accessible, and comprehensive gifted education programme for India.

As a scientist, educationist, and community member, I have believed for years that the education and nurturance of our gifted children is a responsibility we must undertake as a nation. In the current scenario, a few private institutions and government schemes exist that tend to cater primarily to children from already educated and privileged backgrounds. As well, few programmes address young gifted children. This document suggests the need to develop a programme that caters to children from all backgrounds, and that includes young children.

I am happy that the government has recognised the need for such a programme, and that NIAS is spearheading the effort to develop means of identification and nurturance that are appropriate to the Indian context. I join with the Gifted Education team in expressing the hope that researchers, educationists, and educational policymakers across the country come together in their attempts to develop a gifted education programme for India.

Prof. V.S. Ramamurthy
Director
NIAS Bangalore India

Acknowledgements

In the context of scarce attention, expertise, and resources available for gifted education in India, it has been the valuable contribution made by many people and organisations in different forms that has allowed this project to move forward and achieve success. We express our sincere gratitude to each of them.

First and foremost, we would like to express our gratitude to Prof. V. S. Ramamurthy, Director, National Institute of Advanced Studies (NIAS), Bangalore, under whose leadership this project was conceived and launched. He also importantly proposed the idea of profiling children identified as a means of bettering our understanding regarding giftedness and documenting their life histories through which valuable information has been generated regarding the developmental histories of those showing high potential.

We would also like to express our gratitude to Dr. R. Chidambaram, Principal Scientific Advisor to Goverment of India and his staff, Dr. R. P. Gupta, and Dr. Ketaki Bapat who have recognised the importance and need for this project and supported us generously. Their active association and participation have guided our work on the project.

Our sincere gratitude goes out to the Project Review and Monitoring Committee consisting of Prof. N. Mukunda, Prof. K. Siddappa, Prof. H. P. Dikshit, Dr. Shailesh Shirali, Prof. Manoj K. Harbola, Prof. Raghavendra Pratap Singh, and Prof. Pratibha Jolly, whose guidance, suggestions, and insights have been useful in systematically planning and undertaking the project.

We would also like to acknowledge and thank all the children covered in this project, their parents, families and schools, all of whom have been cooperative and supportive of our efforts. Without their help this study would not have been possible. Many thanks are also due to some media organisations such as Jaya T.V., Indian Express, and Deccan Herald, and to scientific institutes such as the Homi Bhabha Centre for Science Education and Shastra University, for having drawn our attention to the achievements of these children, as well as for enabling us to establish contact with them.

Our collaborators, Dr. Jyoti Sharma, Delhi University and Mr. Ajith Basu, Agastya International Foundation, have also provided valuable support by exchanging resources, information, and ideas. We express our gratitude to them for their support in taking the project forward.

Last but not least, we would like to thank the NIAS team, particularly the administration which has provided us ample support in taking this study forward.

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Executive Summary

In the West, there has been a long history of research on issues of giftedness and gifted education. This field, once dominated by IQ tests and other standardised psychometric measures, has responded to criticisms of bias and under-representation of minorities to embrace divergent manifestations of giftedness and apply multimodal methods for identification. In India, however, gifted education has largely been ignored by educationists, researchers, and policy makers, leaving few educational options for children demonstrating specific needs arising from their accelerated cognitive development. Currently, no explicit, justifiable, and inclusive definition for giftedness is available in the Indian context to provide a basis for the systematic identification and nurturance of this group of children.

It is within this context that the NIAS Gifted Education project was undertaken as a first step to open up the academic domain to research and discussion on indigenous conceptions of giftedness and means of identification. The project, supported by the Principal Scientific Advisor's Office (PSA) to the Government of India, has been collaboratively undertaken by three organisations – Delhi University, Agastya International Foundation, and NIAS. While Delhi University undertook the responsibility of developing an identification measure and an advanced screening matrix for children between 8-13 years in maths and science, Agastya Foundation has focused its efforts on the identification of gifted children in rural areas between the ages of 8-15 years.

The NIAS component of the project involves a multi-pronged approach with a focus on early identification between the ages of 3-8 years in the urban context via classroom observations, a series of teachers' workshops, and a set of case studies of children identified as gifted or demonstrating high potential. Since little literature is available with respect to early identification of children, it was expected that the case studies would provide important perspectives from retrospective accounts of older children who had shown early signs of high potential.

A total of 12 case studies have accordingly been completed from May 2010 to December 2011 with the aim of developing in-depth, longitudinal developmental accounts in order to develop a better understanding of giftedness. Among the 12 children, four were identified via scientific networks or parents' efforts at contacting us; four

others were identified via media reports; two children were identified during home visits to profile their identified siblings; and one child was identified through classroom observations. The majority of the children profiled were in middle childhood (7-11 years); and the group had a larger representation of boys compared to girls (9 boys and 3 girls). The group was also composed mostly of children from the middle class (8 children), and children belonging to tier-one cities (8 children).

The basic demographic composition of the identified children has itself been useful to understand giftedness in the Indian context. For example, age has been an important variable in the study for understanding accelerated potential. It was observed that many parents were unable to present accurate accounts of the developmental chronology of their children's abilities. This suggests a need to sensitise parents and teachers to maintain diaries or accounts of children's development.

Similarly, socioeconomic status was found to influence children's behaviour and outcomes. Parents and children from the lower classes had significantly different aspirations for their children's future compared to middle-class parents, with the latter being more focused on children's current and higher education. This may be perhaps because the lower classes may not have access to the necessary social and cultural capital to pursue higher education. This suggests that it may be important to prepare children coming from less-privileged socio-cultural backgrounds to participate in higher education. Further, since the study itself has covered more middle-class children, many of whom have come to the team's notice through middle class parents' and scientific networks' efforts – it would be important to critically examine the conceptions of giftedness held by parents and teachers, science networks which organise talent search programmes, and by the project team itself; as well as to also actively pursue children from lower classes and rural backgrounds, who may manifest their giftedness in divergent ways.

The large male bias in the study also raises the question of whether gender stereotypes have been operating regarding girls' abilities with respect to maths and science in society at large, in the media, and among scientific networks. It was heartening, however, to note that among the three girls represented in study, two were brought to our notice by their parents (both were also middle-class) and the third girl had received more attention than her brother for her academic acceleration.

It is also important to examine whether the large representation of tier-one cities is due to the advantages urban children enjoy of better schooling, access to scientific and media networks, and more parental awareness regarding accelerated development in children. It may be important for the project to adopt local strategies for identification, through interactions with teachers and observations of children's use and conceptual understanding of scientific toys and other material (as in the Agastya International foundation's model) to better identify children from diverse backgrounds. It is also important to generate publicity regarding the project itself through local newspapers and media, providing opportunities for diverse families to contact as. Further, developing these children's capacities to participate in programmes at the national level is also necessary.

In addition to the insights drawn from an analysis of these demographic variables, the profiles of children have also revealed certain common characteristics that are useful in understanding the forms in which giftedness may appear within the Indian setting. However, individual children's profiles also demonstrate different developmental courses and different outcomes based on personal characteristics and support systems. Overall, many of the children appear to show great intellectual curiosity, an ability to learn rapidly, and to direct their own learning. Children's curiosity has also, in many cases, been reinforced by parents' efforts to satisfy their curiosity – which has also helped identify ways in which these children differ from other children of the same age.

These children have also mostly shown accelerated language development, particularly reading ability. It would be interesting to further explore whether the accelerated reading has stemmed from children's curiosity to gain more knowledge, or vice versa.

Many children, particularly those who have had large academic accelerations or multiple achievements, have shown excellent metacognitive abilities. Again it would be interesting to explore whether metacognition is an essential characteristic that is required to meet the large task demands that these children face. Further, it appears that unlike certain abilities such as curiosity, language development, and information-processing, metacognition has been less affected by parental or school influences and is more reflective of the child's nature. Therefore, metacognition can perhaps be used as an important indicator of acceleration in learning potential.

Information-processing speed, on the other hand, has mainly been observed in children who have received training in programmes such as Abacus. While literature has also suggested that schooling has a moderating influence on information processing speed, it is important to undertake more studies in the Indian context to understand the role of the different types of schools and learning outcomes among children.

Finally, it appears that certain socio-emotional characteristics such as task perseverance and peer adjustment may be related to giftedness and may also be important in preventing poor psychosocial outcomes for these children. Environmental influences such as supportive home backgrounds seem to be influential in preventing adverse problems for children with socio-emotional difficulties. Having said this, it must be emphasized that majority of the children were found to be well-adjusted and demonstrated social maturity.

While the case studies on the whole have indicated areas for research, and have provided important directions for a gifted education programme, there are certain limitations to be overcome in order to make the study more effective. First, the number of children covered in the study is very small, and the findings from the study cannot be generalised. It is important to undertake more such studies, making efforts also to include under-represented groups such as the children from the lower classes and castes, rural children, children from smaller towns, government schools, girls, children from different religious groups, etc.

Second, in the absence of appropriate mentoring mechanisms, the profiled children have received

little help from the project, especially in cases where the children belonged to resource-poor homes and had limited access to further education opportunities. It is important for the project to develop a full-fledged mentoring programme, develop parent networks, and organise regular peer interactions for gifted children in order to help them fulfill their potential. Further, it may also be useful to follow the development of these children's potential on a long-term basis.

Finally, information and interactions with the children and their families and schools has also been constrained by the available time to undertake the profiles, and therefore the information obtained is frequently limited and anecdotal. In order to develop a better understanding and first-hand accounts of children's learning and development, it is important to undertake a more comprehensive and longer-term ethnographic study, with in-depth observations and interviews.

2

Introduction:
'Giftedness: Conceptions and Debates in the field'

Previous commonly accepted IQ-based measures of giftedness have estimated the top 3-5 per cent of the population to be gifted. For India, with a school-aged population of about 193 million (Mehta, 2007), this indicates a gifted child population of 6-10 million children, therefore creating a large-scale identification problem. The actual numbers, however, may be much larger, if we consider the current debates in the West regarding the limitations of IQ tests in identifying gifted children from minority and culturally-disadvantaged populations, and the need for alternative definitions and methods for identification.

Problems with conventional IQ tests and identification methods have led to large sections of the population being left out. There has been a growing dissatisfaction with IQ tests for the identification of the gifted (Ford and Joseph, 2006), since research has demonstrated a lack of one-to-one correspondence between notions of 'giftedness' and intelligence (Renzulli, 2004). Robinson (2005) has pointed out that IQ tests mainly use academic predictors for identification, and hence may fail to identify children with non-academic gifts such as music or art. IQ tests may be insensitive to uneven development of abilities in children, thus missing out on children who display atypical patterns of development. For example, Rivera, Murdock, and Sexton (1995) have pointed out that children may be highly gifted in one domain and average or showing developmental difficulties in another, and therefore may not be recognised by traditional standardised tests.

Further, the discovery of multiple intelligences (Gardener and Hatch, 1989), has now led to the development of multiple measures for the identification of giftedness. Procedures such as multimodal and multidimensional assessment strategies, culture- and learning-style-sensitive tests, parent and peer nominations, creativity checklists, student portfolios, and other performance-based assessments have all been recognised as promising strategies for identifying under-represented populations (Ford and Harris III, 1999).

The implications of these changes for the field of gifted education are enormous, but with no research and policy base in India, the implications remain unanalysed and unaddressed. Therefore, at least three important questions require urgent attention: a. who are the gifted? b. what purpose does identification serve? and c. how do we go about the process

of identification? These issues are discussed in further detail below.

Who Are the Gifted?

A first step to addressing the issues related to gifted education is perhaps the development of a robust and sensitive definition or conception of the phenomenon itself, which can guide practice. Merry (2008) has pointed out that developing appropriate definitions of giftedness is important not only to better understand its nature, but also in order to be able to design better educational provisions.

Many definitions of giftedness are already available within literature. Though there are probably as many varied definitions of giftedness as there are gifted programmes themselves, these definitions share some common features and concerns (Rinard, 2008). For example, a point of agreement among definitions is in defining giftedness as ability superior to age peers. On the other hand, there are also points of contention revolving around issues of whether giftedness is innate or developed through application; of the difference between gifts and talents; in understanding giftedness as potential or actual performance; and so on. Numerical estimates further complicate the issue: programmes define anywhere between the top 1-20 percent of the population as gifted (ibid).

Mönks and Katzko (2005), citing Hany (1987), have pointed that definitions of giftedness in the West now cluster around four broad groups. The first focuses on psychological constructs such as traits. These include traditional notions of giftedness as quantitative differences on a global non-differentiated ability, as well more recent domain-specific approaches to understanding gifts such as Gardner's Multiple Intelligences. The primary feature of the latter approaches is the emphasis on giftedness as quantitative differences in specific domains.

A second approach, such as Renzulli's (1978) three-ring model, defines giftedness as a combination of different cognitive components: high intellectual ability, creativity, and motivation.

A third approach recognises the possible discrepancy between potential and actual achievement among many gifted children and therefore, broadens the scope of giftedness to move beyond demonstrated performance. As Mönks and Katzko (2005) have stated, this approach essentially shifts the focus from giftedness as a stable 'product' to giftedness as a dynamic 'process' and thereby provides directions for intervention. With respect to the process approach to defining giftedness, Merry (2008) has added that "given the right set of conditions and opportunities, many more children than at present would certainly be considered 'gifted'; indeed, most children might be 'gifted' in at least one area."

The fourth approach extends this notion to understand how environmental and sociocultural factors act as inhibitors or catalysts in the expression of giftedness. Drawing these various approaches together, Tannenbaum has presented a five-factor conception of giftedness as an interaction between (1) superior general intellect, (2) distinctive special aptitudes, (3) supportive array of nonintellective traits, (4) a challenging and facilitative environment, and (5) the smile of good fortune at crucial periods of life (as cited in Brown et al., 2005).

Further, Shavinina (2008) has rightly pointed out that a complete understanding of giftedness can only be reached by taking both the external manifestations of giftedness (e.g., features, qualities, traits, characteristics) and its psychological basis (or the psychological source of these manifestations) into account. The latter refers to the unique cognitive experience that helps individuals make sense of the world, or the structural organisation of their experience. This cognitive experience comprises of the conceptual base, knowledge base, and the subjective mental space that allows specific forms of mental representations based on which we can differentiate gifted children from other children.

As Borland (2005) argues, the multiple and differing orientations to the definition of giftedness suggest that the idea of giftedness may not solely be based upon innate talent or demonstrated potential, but also on what the selection process itself seeks to find. Thus, the process of selection plays a determining role in deciding which individuals and abilities are/ are not considered 'gifted' (Freeman, 2005). The political and social implications of this have now received wide attention in the West, where questions of 'elitism' (Merry, 2008; Rinn and Cobane, 2009), 'equality' (Merry, 2008), underrepresentation of culturally, linguistically and ethnically diverse groups (Briggs, Reis and Sullivan, 2008; Merry, 2008; Hopkins and Garrett, 2010), gender biases (Freeman, 2005) and other non-egalitarian practices have been widely debated and discussed.

The different views of giftedness, along with the critiques can provide a useful starting-point from which to undertake research within the Indian context. In the process of developing a context-specific conception of giftedness, however, it is important to remember that the consensus on definition must crucially keep in focus the aims towards which the enterprise of definition-making is undertaken. It is important to evaluate each one of these definitions carefully keeping in mind the complexities of our context and the specific aims of identification.

Identification: Its Purposes and Ends

Definitions of giftedness are intrinsically linked to the processes of identification. They set the parameters based on which individuals may be differentiated, and therefore, it is important to explicitly analyse the aims towards which identification is directed. Borland (2005) has argued that giftedness is not a naturally occurring category in the environment, but an invented category that needs to be judged for its utilitarian or pragmatic value. Thus, he argues that "the basic question to ask about giftedness is not whether giftedness exists but whether the outcomes of the application of the construct, especially in the field of education, are beneficial, innocuous, or harmful" (p.8-9).

While gifted programmes have been criticised for several reasons such as for being elitist and biased and creating exclusive clubs favouring dominant groups who further usurp educational resources, several scholars have also argued for gifted programmes and identification from the viewpoint of educational justice. Merry (2008), drawing on Rawl's concept of 'Fair Equal Opportunity' (FEO), argues that all children, including the gifted, are entitled to an adequately challenging educational experience as a matter of fairness. This requires providing a level of education that is personally useful and

stimulating for all. Since gifted students may have specific and different educational, intellectual, and socio-emotional needs, they may require specific and different provisions within schools. Therefore, just as any disadvantaged group must be given special educational provisions, so too must gifted children be given equal opportunities in accessing relevant education.

Another argument presented in favour of gifted education stems from the belief that schools and teachers have an ethical responsibility to provide a level of guidance and mentorship that helps students succeed and achieve their highest potential (Borland, 2005).

Despite these arguments, however, the common perception that the gifted can and will succeed on their own (Borland, 2005) persists. Further, the charges of elitism and disproportionate resources spent on a small number of students (Merry, 2008) have led to reluctance in identification and planning of gifted programmes. However, research has shown that being gifted does not automatically guarantee high achievement. For example, in a study by Kim (2008), a review of the field showed that up to 30 percent of high school dropouts may have been highly gifted and could have been highly productive with the right environment and mentorship. Supporters of gifted education point to these trends to argue for the need for gifted programmes.

The argument for identification is strengthened by research that suggests that the early childhood period, between birth and 3 years, is crucial for development (e.g., Gross, 1999; Pfeiffer and Petscher, 2008; Smutny, 2000). Henderson and Ebner (1997) have pointed out that while early cognitive stimulation is important for laying the neural wiring for later learning for all children, this may be more acute in the case of gifted children due to their precocious developmental trajectory. They have also pointed out that responsive and nurturing environments in which parents pay special attention to their children's interests and academics are most conducive to the development of giftedness. There is substantial data demonstrating the importance of parental involvement for optimising student achievement (Ford, 1993). For example, Scott-Jones (1987) reported that academically successful African-American children had mothers who provided more books, set clearer academic goals for their children, and were more involved in their children's schoolwork (as cited in Ford, 1995). Henderson and Ebner (1997) have also listed nutritional attention, parental awareness, and educational support as important for gifted children at risk for underachievement. Early identification and nurturing may be particularly crucial in a country like India, where a large segment of the population comes from resource-poor homes with poor parental education levels and awareness. It is in this context that a programme for identification and support of gifted children becomes particularly important, in order to prevent stunting of early abilities due to home backgrounds.

Further, as Neihart (1999) has pointed out, the psychological well-being of gifted children may be dependent on the fit between their educational environment, personal characteristics, and the nature and degree of their giftedness, which makes it important to understand their specific needs. Gifted children may face certain social and emotional challenges that differ from the experiences of other

children. For example, Reis (2002) has pointed out that while gifted girls entering adolescence may face all the psychological challenges of declining self-concept and increasing need to conform to the image of a 'good girl' (like other adolescent girls), this may be further complicated by highly unrealistic expectations gifted girls may set for themselves as a result of their unique abilities. Burton (2011) has similarly pointed out how gifted rural students may have to reconcile popular perceptions that view rural people as "lacking learning skills", as "provincial", and "uninformed" with their own talents and abilities, which may affect their self-image. Further problems peculiar to rural gifted students could arise from either a clash between traditional communal values and their abilities and interests in pursuing different routes or from conflicts that arise from abandoning their community in order to benefit from opportunities away from home. Provisions to identify and address these kinds of concerns are important from the psychological and social perspective in order to promote these students' well-being. Research by Hirsch et al. (2012) suggests that socio-emotional support and a structured school environment that contributes to development within these domains are as important as academic support for gifted children's social adjustment and peer relationships. Mueller (2009) has similarly reported that the "family-school-community" links and social support from this environment can increase resilience and reduce problems such as depression among gifted children.

C. Process of Identification

Finally, attention needs to be given to developing a fair and systematic process of identification, particularly in a country like India with huge diversity. In the context of diversity, the use of seemingly objective "numbers" such as IQ and percentile scores on standardised psychometric tests has been challenged for the inherent biases of these measures. Rejecting these, field-level practitioners such as teachers and special educators have pointed out that it is possible to identify gifted performance even among students selected out by these tests.

The bias of IQ scores and other psychometric tests of achievement have operated in multiple ways. First, as Renzulli (2004) has pointed out, IQ tests have been measuring and defining only a limited portion of the construct of intelligence. Second, as Shavinina (2008) has argued, well-established psychometric intelligence tests such as the Wechsler's Intelligence Scale for Children (WISC) test declarative or factual knowledge. Therefore, what gets tested is one's 'level of socialisation' (ibid) since acquiring factual knowledge is dependent on factors such as parental influences, nature of schooling, socioeconomic power to access resources (Merry, 2008), regional disparities in access to information or in identification processes, and so on. Further, it has been found that even seemingly genetically-based traits such as information-processing speed (Sheppard and Vernon, 2008) are moderated by schooling or education (Duan, Shi and Zhou, 2010). Therefore tests of processing speed may also be similarly testing learnt variables.

While these complexities in defining and identifying the gifted in the West have complicated the identification process, additional factors pose hurdles for defining and identifying giftedness in India. Historical and generational disadvantages imposed by caste, tribal, and

religious backgrounds have affected schooling opportunities, economic resources, poverty, employment, parental educational status, and mobility in complex ways (Majumdar, 2010; World Bank, 2011). For example, Upadhyay (2007) has argued that caste differences have affected the development of 'merit' among the lower castes who lack the necessary cultural capital for 'merit' in terms of economic and cultural resources. Differences in the use of cognitive strategies based on caste factors, poor parental education, and socio-economic status have been demonstrated by several scholars (e.g., Misra and Mohanty, 2000; Nair, 2009) leading to lower academic outcomes for groups such as the Scheduled Castes (SC) and Scheduled Tribes (ST). These factors are further compounded by disparate access to schooling for the different caste, class, and socioeconomic groups. Differences in medium of instruction, infrastructural facilities, students' achievement levels, and teacher qualification and quality have been noted between private and government schools (Anitha, 2000), with only the elite being able to access high-quality private education (La Dousa, 2007; Velaskar, 2003). Differences in syllabi and the presence of multiple educational boards in the country have also increased the variability in educational outcomes. As a result of these factors, schooling in India represents not a levelling of the playing-field, but a reproduction and accentuation of existing inequalities. Thus, children from different backgrounds cannot equally compete on standardised tests or national-level competitions such as the Olympiads or the National Talent Search Examinations, which attempt to identify mathematics and science talent. Entrance to the Jawahar Navodaya Vidyalaya – a chain of schools established by the government as early as 1985-1986 to provide talented students an opportunity to progress faster through quality education – is also dependent on students' previously acquired academic knowledge. While this option may be useful in providing quality education to rural children, the process may still fail to identify students who have fallen behind due to poor teaching quality, teacher absenteeism, resource-poor homes, and other factors that impede learning.

Therefore, the deep social complexities and large numbers in the Indian context make it imperative to use a multi-pronged approach for fair identification. Ambrose's (2005) directions for using "diverse insights at multiple levels" may be a useful method to overcome the limits and biases of unidimensional testing. Along with multiple methods, the identification team may also require a multi-participant team that includes parents, teachers, peers, siblings, media, educational institutions, and national testing agencies. Along with individual performance outcomes, longitudinal case studies may be important to understand the complex interaction between environmental and innate factors in the unfolding of development.

As a first step, it is perhaps important to open up the academic space for research and discussion on indigenous conceptions of giftedness and means of identification. No explicit, justifiable, and inclusive definition for giftedness exists in the Indian context to systematically identify and nurture gifted children. Thus there is an urgent need to develop an Indian programme, paying attention to the unique context of education within our country, and also drawing on the rich experiences of the West.

3

The NIAS Gifted Children's Programme

The NIAS Gifted Children's Programme, supported by the Principal Scientific Advisor's Office (PSA) to the Government of India, is the first collaborative attempt in Indian to draw together a research base to address the issue of equitable educational opportunities for the gifted and develop talent through appropriate nurturance. The project has developed through a series of consultation meetings starting in January 2010 with the Indian National Science Academy's (INSA) INDO-US Forum. Through meetings and collaborations with experts from across India and abroad, four important strategies for India were identified: a. to initiate inter-disciplinary research in the area of giftedness in order to develop suitable definitions in context; b. to design appropriate tools for identification, focusing on early identification; c. to develop appropriate programmes for mentoring and nurturing of the gifted; and d. to develop international collaborations and consultations to take forward the research agenda.

With these aims, three organisations – Delhi University (headed by Dr. Jyoti Sharma), Agastya International Foundation, and the National Institute of Advanced Studies under the leadership of Dr. Anitha Kurup came together to undertake collaborative research in different areas of the programme.

Delhi University undertook the responsibility of developing an identification measure and an advanced screening matrix for children in maths and science. The focus of the Delhi study was the urban population aged 8-13 years. The plan was to conduct a pilot study in and around Delhi covering different types of government and private schools, including the Jawahar Navodaya Vidyalayas, Rajkiya Pratibha Vikas Vidyalayas, and other schools, using a combination of tools such as IQ tests, non-verbal tests, teacher, peer, and parent nominations, and behavioural observations.

Agastya Foundation focused its efforts on the identification of gifted children in rural areas between the ages of 8-15 years. The plan was to identify a set of 15-20 gifted children after two levels of screening based on exposure to scientific experiments, resources, and games. Agastya planned to start with an initial exposure for about 2,00,000 children, from which a group of 5,000 potential children would be identified, and further screened down to 15-20 children based on multiple levels of screening of children's interests and abilities via interactions with resource persons.

The NIAS component of the programme involved a multi-pronged approach with a focus on early

identification between the ages of 3-8 years from urban backgrounds. Three important areas were identified for the project. The first was a detailed, in-depth set of classroom observations in order to generate rich data on traits and classroom behaviours that could facilitate identification. Through the observations, it was also planned to generate a set of activities that could be used to facilitate the demonstration of gifted behaviours within the classroom.

Second, a series of teachers' workshops was planned as a platform to collaborate with teachers, develop insights into issues concerning gifted students, increase sensitivity and awareness about giftedness, and equip teachers in identifying gifted children, with the help of experts at the national and international level.

The third component of the programme involved developing a set of case studies of children identified as 'gifted' or demonstrating high potential to generate rich qualitative insights on the developmental pathways of giftedness.

While the different components of the project are at different stages of completion, the current document discusses the Case Studies component, with reference to a set of 12 identified children and the insights gleaned from them.

4

The Case Study: Its Relevance and Utility

Stark and Torrance (2005, p. 33) state that "the case study assumes that 'social reality' is created through social interaction, albeit situated in particular contexts and histories, and seeks to identify and describe before trying to analyse and theorise." The case study method according to Gillham (2005) is used to understand a unit of human activity in the real world to be studied in its context. It is useful in understanding how people understand themselves and their settings, allowing access to their feelings, experiences, or perceptions; and allowing for a study of "processes (leading to outcomes or 'results')" that becomes the 'key to understanding what needs to be done to change things" (ibid, p.7).

In contrast to tests that measure giftedness as a quantitative variable, case profiles provide a longitudinal, developmental view of the complex construct of giftedness. In-depth understanding of individual factors such as intellectual and cognitive abilities, personality factors, and school and environmental factors that influence particular outcomes for individual children can be historically traced to understand how individual endowments interact with environmental factors and affect the manifestation of giftedness. However, case profiles are time-consuming since they involve repeated interactions with the individual child, parents, teachers, peers and siblings, and significant others. Unlike certain group tests of intelligence that can be mass-administered to several individuals at once, case profiles have to be conducted individually through extensive interactions. Therefore, case profiles must logically follow initial screening with tools that are less time-intensive and are easily administered to groups, in order screen the number of candidates who are profiled.

In doing this, two problems arise: first, without having appropriate tools for screening it may be difficult to select candidates for case profiling. As discussed earlier, since 'giftedness' is a sociocultural and sociopolitical construct, candidates identified for profiling may not represent the diversity among gifted children if the screening instrument used is narrow and restrictive. The second issue that arises is that of 'labelling' or singling out of individuals which can have several psychological and social consequences. While the issue of labelling occurs in any form of identification, in the case of profiling this emerges more sharply as a result of the intensive interactions with the child and his / her significant others.

Keeping these issues in mind, the NIAS Case study component was developed using a specific

methodology, with the following objectives in mind:

- To strengthen identification parameters through developmental analyses of the cognitive, psychological, and social potentials of the identified children
- To trace the trajectory of development and manifestations of signs of giftedness, contributing to the development of measures for early identification of gifted children
- To examine the role of the environment, both at home and at school, in the development, manifestation, and retention of gifted behaviours and to identify supporting and disabling mechanisms during early development
- To assess the awareness and sensitivity among parents, teachers, and significant others regarding the need for nurturing and supporting gifted children at the national level.

The methodology adopted for identification of children for the case studies used a purposive sampling technique, wherein children were identified based on certain demonstrated abilities and brought to our notice by parents, teachers, scientific networks such as the Homi Bhabha Centre for Science Education (HBCSE, Mumbai), and other individual scientists or the media. A combination of qualitative methods was used to collect and record data. Home and school visits were conducted with permission from parents and significant others. Observations of children's potentials, family interaction patterns, and peer interactions were made along with semi-structured interviews with the child (where possible), parents, teachers, peers, and others. A psychological case history was developed covering the following details:

A. Personal details – name, age, SES, school, parental occupation, etc;
B. Early childhood history including prenatal and post-natal development and early milestones of development, etc;
C. Schooling history including change of schools, syllabus, early reading habits, speech and language;
D. Medical, Psychological and Psychiatric history;
E. Family history including genogram, history of medical or psychological problems in the family, intellectual abilities of members of the family, other talents, abilities, interests and schooling history of the family, family environment and relationships;
F. Present History – the child's interests, aptitudes, and achievements;
G. Formal Assessments which parents may have undertaken such as IQ assessments, or outcomes of competitive examinations such as Olympiads;
H. Behavioral Observations – including observations of appearance, communication, affective response, parent and peer interactions, speech and language, thought process, insight, judgement, etc.

The psychological case history format was adapted keeping in mind the purpose of the study. Here the prime focus was to use the format to trace early development and instances of precocious behaviours, skills, judgements, insights, and interests while also focusing on possible familial, school, environmental, or biological influences in the development of

these abilities. In addition to the psychological profile, a checklist was drawn up using traits identified in literature and used by parents and teachers in rating children's behaviours. Further, puzzles, games, and activities in maths, science, and English were used to build a rapport with the child as well as to observe and develop a first-hand account of their performance in relation to their attention / concentration skills, perseverance, problem-solving capabilities, etc. Further, the home and school environments were observed to understand the resources available to the child, the nature of social interactions, school syllabus, activities and interests encouraged and developed and so on. Using these varied sources of information, the case profiles were developed. The data collected for individual children and the group as a whole was analysed to identify similarities and differences with respect to their development and backgrounds. This analysis is discussed in the following chapters. All identifying details of the children have been changed to protect their privacy.

5

First Insights: A Consolidated Analysis of the Case Studies

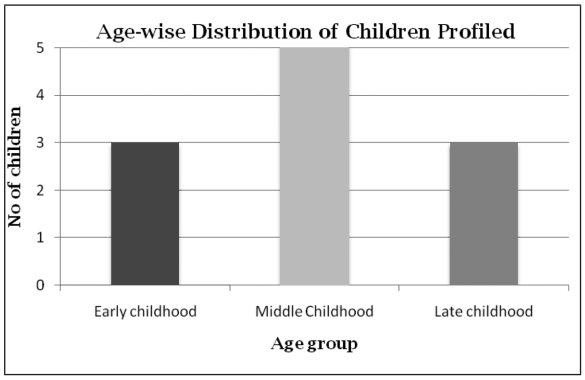
Case profiles for 12 gifted children identified across India were completed between May 2010 and December 2011. Of the 12, four children were identified through the scientific community or through parents contacting our team after hearing about our project. Four other children were identified through reports in the media. One child was identified through classroom observations. Two others were identified through information given by parents when home visits were carried out to profile their siblings.

Not much data seems to be available with respect to giftedness among siblings. Haensley (1993) has argued that the focus on dysfunctional sibling relationships may result in less attention paid to the abilities of siblings of gifted children. Drawing on previous research the author has shown that while in several cases parents have perceived the non-identified child's abilities and talents to match the identified sibling's abilities, in the author's own experience parents have shown ambiguity regarding the other sibling's abilities. This may be a crucial factor affecting research in this area. In our own study consisting of a small sample of 12 children, identification of two pairs of siblings (Kusum and Vimal Singh, and Hamsa and Hari Sridhar) may indicate a need to further explore this area, particularly since research seems to indicate that giftedness may not be completely attributable to shared environmental influences (Jensen, Cohn and Cohn, 1989). Only one of each pair of siblings in the present study had been identified by the media or by the parents. This was true both for Kusum and Vimal Singh who come from the labouring class, as well as for Hamsa and Hari Sridhar who come from an upper-middle class and a well educated family: probably indicating that the problem of sibling identification may cut across classes.

However, in other cases, parents had noticed precocious developments in younger siblings as well, as in the cases of N. K. Devendra, and Kushal Barwe. Parents of both children perceived the younger siblings to be extremely bright and on par with the older sibling in ability. Similar to the previous example, here too identification cut across class barriers with Devendra belonging to a working-class family, while Kushal belongs to a highly-educated upper middle-class family, whose father was a scientist.

In the sections below, a further discussion of the demographic characteristics of the group follows, particularly with regard to how these factors may have influenced identification and outcomes for these children.

Age



Graph 1: Age-wise distribution of the profiled children.

With respect to age, the children can be divided into three groups – early childhood (birth to 6 years); middle childhood (primary school-aged children, 7-11 years); and late childhood and adolescence (12-19 years). The large majority of children in the sample covered were in middle childhood (six children) while the other half of the sample was equally divided between early and late childhood (three children each). Attention to age is important to determine the degree of precocity in children's behaviours. Age differences need to be kept in mind while conducting a comparative analysis since many behaviours or traits displayed by the different groups may have emerged, not emerged, or receded according to the developmental stage of the child.

Piaget (1920) viewed cognitive development as proceeding in stages that were dependent on maturational factors as well as the child's interactions with the world. He argued that these stages were qualitatively different in cognitive development and were hierarchically organised. Further, he recognised that children actively construct their knowledge about the world. While Piaget's theory provides an important lens to understand how cognitive capabilities of children advance, one limitation of the theory was the emphasis on universality of the stages that does not allow for explanations of individual differences in the rate of development. However neo-Piagetians such as Fischer and Bidell have extended the theory stating that individual variations within a stage are possible, as are differences in epigenetic constructions within the stages (Young, 2011). Neo-Piagetian theories thus provide the scope to explain precocious and gifted behaviours resulting from these individual differences and from gifted children's accelerated developmental trajectories.

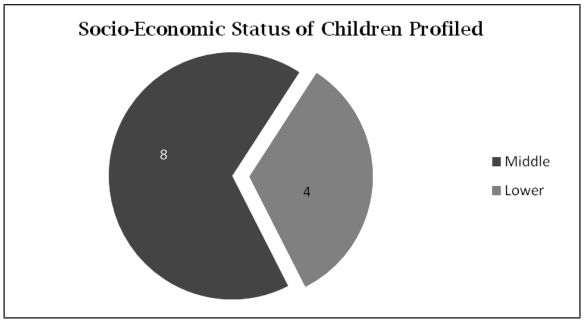
Similarly within our study, signs of accelerated development were visible in some of the children. For example, three children in the group completed schooling earlier than the average child. These were: Vimal Singh, who completed Standard. XII at the age of 11 years (while most children complete it at 17 years); Kusum Singh, who completed Standard. X at the age of 7 years and 3 months (while most children complete it at 15 years); and Naveen Iyengar, who completed Standard. X in the IGCSE board at 13 years. Accelerated schooling may be indicative of above-age academic and learning ability. Cross and Coleman (p. 61, 2005) have pointed out that such accelerations in schooling resemble the natural progression in acquisition of concepts and learning. Therefore, in essence it may mean that children who have completed school earlier may have a higher rate of acquisition of concepts. Further, the acceleration in academic outcomes is seen both in the case of Vimal and Kusum who come from resource-poor homes, as well in the case of Naveen who belongs to an upper-middle-class family, and whose mother reported supporting his interests with additional resources.

Accelerated abilities were also observed in other children in the group in some other areas. For example, while the normal attention span for 2-year olds is about 6 minutes, Hamsa Sridhar reportedly showed an attention span of up to 1 hour at the age of 2 years. Similarly, while a 3-year old possesses a vocabulary of about 200-300 words, Manoj reportedly possessed a vocabulary of about 2000 words at that age. While meta-cognitive ability is said to emerge between 8-10 years (Helms-Lorenz and Jacobse, 2008), Devendra already showed the ability to regulate his learning at the age of 7 years. His learning strategy involved well-established psychological study skills that are taught to improve retention such as spacing out learning by taking breaks between sections, organising material into discrete units, and reviewing units after completion.

Each of these early developments emphasises the need to develop a robust understanding of children's milestones of developments in different domains, in order to be able to identify their precocious abilities. These case examples provide certain important points to be taken into consideration during early identification. It is interesting to note that despite environmental constraints, cases such as Kusum and Vimal Singh, and Devendra, who come from working-class backgrounds, lacking academic mentorship and resources from within the family and community – have demonstrated above-average academic outcomes. In other cases such as that of Manoj, the high degree of involvement by parents in training and exposing the child early to large volumes of information may have led to his accelerated performance when compared to age peers. However, it is important to distinguish the performances of these different children in relation to their context and the strategy involved (e.g., rote memorisation as in Manoj's case versus metacognition and planning in Devendra's) in order to identify whether they do excel, and the domain in which they may compared to their peers.

The different case studies were also important in understanding that there may not be a uniform pattern of early development that can be easily converted into a checklist of early traits of giftedness. For example early milestones of development such as motor ability, language, reading, etc. have not been uniformly accelerated for all children, and several children in the group were also reported to have experienced delays in development. The case studies instead suggest the need to remain sensitive and observant of individual children's progress through the various developmental stages in order to identify their early strengths and nurture them.

Socioeconomic Status

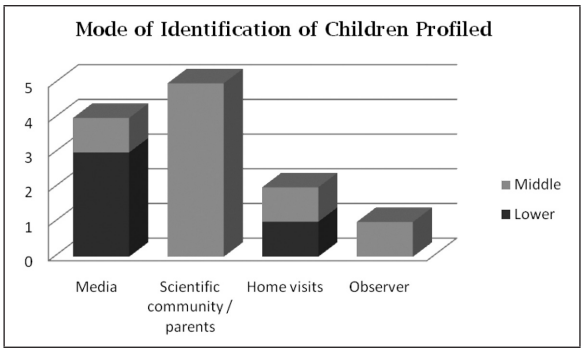


Graph 2.1: Distribution by SES of children profiled.

Another important factor to be kept in mind while comparing the profiled children is their socioeconomic status (SES). Much literature has focused on the relation between socioeconomic variables and identification and nurturing of giftedness. Clemons (2008) has shown

that SES had a strong and direct relationship with academic achievement, achievement motivation, study and organisational skills, and parental involvement and responsiveness. Several studies have shown that the probability of being identified as gifted was linked to one's SES (e.g., McBee, 2010; McBee, 2006). Factors that influence different outcomes for children from different SES include bias even among tests considered to be neutral (Carman and Taylor, 2010; McBee, 2006); differences between teachers' and students' backgrounds, leading to teachers' failure to recognise signs of giftedness in children from dissimilar backgrounds (McBee, 2010, McBee, 2006); parental distrust of school programmes (McBee, 2006), and so on. Children from lower SES are constantly under-represented in gifted programmes for these reasons (McBee, 2010).

Even within the present study, a larger number of children from middle-class backgrounds (8) have been indentified than from lower-SES backgrounds (4). Among both groups, it was heartening to note parental efforts at accessing networks to further their children's educational and extra-curricular interests. However, as Clemons (2008) had reported, differences were evident in the types of networks accessed by parents, achievement orientation of the groups, cognitive support and enrichment, and resources provided by the families to their children. For example, five of the eight children belonging to middle-class backgrounds were identified through the scientific community and parents' initiatives, while three of four children identified through the media belong to working class families. One child in the study was identified through classroom observations, belonging to middle SES. Considering that the largest proportion of children in the study belonged to middle-class families, and that scientific networks and the research team's efforts have also tended to identify middle-class children, it is important to critically examine the methodology of identification and the factors affecting the identification of students. For example, dominant conceptions or notions of giftedness may be determining which children are identified as gifted by scientific networks and through the classroom observations. Further, national-level tests that may have been used as an indicator by scientists may also be biased in selecting students. Parents of middle-class children may be more aware and active in accessing networks for furthering their children's education, when compared to parents from working classes, which might explain why more lower-class parents have not directly contacted us. Critical examination needs to be also made of the modes through which this project has received attention (i.e., mainstream media networks, elite scientific institutions, populations affected by outreach activities such as publications and workshops, and so on), since this may have affected the visibility of the project and consequently limited the populations able to contact us. Therefore, efforts need to be directed at developing sensitive parameters for identification from groups under-represented so far.



Graph 2.2: Relation between SES and Mode by which children were identified.

While more efforts need to be made to develop a representative sample, an analysis of the present set of case studies by SES has revealed some interesting information in terms of differences in attitudes, aspirations, and access to resources and opportunities for the two groups. While no claims of representativeness is being made regarding the findings, it was interesting to note that parental aspirations and efforts among middle-class families revolved around supporting children's academic, scientific, and mathematical interests, by learning about and developing networks to access advanced educational opportunities and resources. This included efforts at accessing scientific networks, providing enrichment opportunities for their children by organising interactions with scientists, and availing of opportunities to participate in formal and informal scientific programmes. For example, for Naveen Iyengar, in addition to seeking information regarding schooling options and scholarship programmes, his mother also visited NIAS in order to explore options for higher studies for Naveen at various science institutions in the country. She actively utilised the contacts provided to meet and interact with scientists from various institutions in order to understand the best options for Naveen after high school. Similarly, Hari Sridhar's parents also showed interest in learning about and pursuing extra-curricular science programmes at IISc and via friends at other research institutions to keep Hari engaged. Middle-class parents also appeared to want to give their children alternative academic and educational options rather than emphasising the need to fit in at school. In both Naveen's and Hari's cases, parents opted for schools catering to their children's learning needs (e.g., Naveen was shifted to an IGCSE school as the curriculum was more challenging, emphasising research rather than rote learning, and allowed him scope for accelerated learning). In Hari's case, parents opted to put him in an alternate school where he is able to engage in experiential and exploratory methods of learning. Further, Hari's school also emphasised overall development and is suited to Hari's temperament.

In contrast to these efforts at accessing options for higher learning suited to their children's interests and abilities, efforts of lower-SES parents seemed to focus on somewhat different ends. Together with efforts at accessing the media, these families focused on developing a form of social capital for their children through publicity, probably as a means to insure the child's future. Parents seemed to be interested in increasing the child's 'merit' and increasing his / her visibility by having them participate in events where they could showcase their skills, in media programmes, and by creating blogs and websites to publicise the child's talents and achievements. This was probably seen as a means through which 'merit' could be developed for the child which would come in hand during school admissions, to request for support and donations, and so on. With the exception of one lower-SES family (N. K. Devendra's) that attempted to access scientific networks and resources and develop the academic and extracurricular interests of the child to give him a broad base for the future, other lower-SES families aspired to secure the child's (and in one case, the family's) future by publicizing the child's talents.

It must be noted that an attempt to generate interest in the child's abilities by accessing the media and creating promotional videos was also

observed in some of the middle-class families. For example, for Manoj, parents reported that videos intended to publicise his abilities came in handy at the time of early school admission. Despite the point system in Delhi, where children are admitted to schools based on points awarded for different parameters such as distance from home, and so on – when Manoj was unable to get admission to a school, his parents showed the school management videos of his abilities in order to obtain admission. Publicising the child's abilities is seen as a way of securing social insurance for him / her to obtain future benefits in the competitive environment of schooling. These issues need to be further explored before conclusions can be drawn.

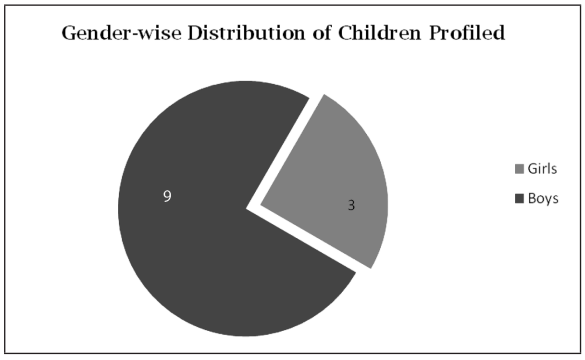
Another area in which the two socioeconomic groups differed was in the cognitive support and resources available at home. Differences were seen in the time spent in the two types of families in academic or intellectual discussions in the child's area of interest as well in provisions made or resources allotted for the children to independently explore their areas of interests. For example, in the cases of Ganeshan and Devendra, children of a bus conductor and taxi driver respectively, parents reported that their children's engagement with practical and experimental activities had been restricted due to the non-availability of resources at home. Parents also reported that they were often unable to answer their children's queries or connect them with the right networks to discuss their interests. In contrast, in the case of Naveen Iyengar and Hari Sridhar, it was observed that parents invested considerable time discussing topics of interest with their children as well as encouraging them to implement their ideas.

In terms of school and teacher support and identification, both groups seemed to have received similar degrees of support and mentoring. In exceptional cases such as Kusum Singh's, whose parents are day-labourers, the school has shown extreme cooperation and support by arranging a place for the family to stay, arranging for special classes, obtaining permission for academic acceleration, gathering donations for her education and managing it, and so on. Overall, it was heartening to note that most families reported supportive school environments and teachers who assumed mentoring roles. With a few exceptions – such as for Naveen Iyengar who did not receive cooperation at some of his schools, and Sandeep Iyer – who have studied in prestigious ICSE and CBSE schools, most children have received some form of support from their schools. Both these children have experienced difficulties with middle-class private schools, with schools having failed to cooperate by providing accelerated learning opportunities, identifying them for 'difficult' behaviours, and so on.

Finally, it was noticed that across social class, parents and schools had poor awareness of the future options available for these children in terms of scholarship and talent programmes such as the national-level Olympiads, the KVPY programme, or opportunities for higher studies. Awareness and understanding of other unique characteristics of giftedness was also low in most families. Tensions between family expectations and children's abilities and interests were witnessed in some middle-class as well as lower-class families such as Naveen Iyengar's and Vimal Singh's homes. This indicates the need for more efforts at developing awareness and sensitising parents and teachers to the nature

of giftedness as well as the educational options available to these children.

Gender



Graph 3: Gender-wise distribtuion of profiled children.

A majority of the children covered in the study were male (nine) while only three children were female. It is important to explore the reasons for this disproportionate distribution of the sample by gender. The majority of the children were not actively identified by the research team, but came to our notice through parents' efforts or due to their performance on competitions. Interestingly, among the siblings who participated in the study, it was the girl children who were identified in both families for their accelerated development. In both these cases the girls were also the younger of the siblings, interestingly presenting the reverse of Haensley's (1993) study which showed that parents showed more ambiguity in identifying their second-born's abilities and talents. The third girl in the study was a 'twice exceptional' child, with Pervasive Developmental Disorder (PDD). It is possible that it was the disorder which brought parents' attention to the child's abilities rather than her gifts.

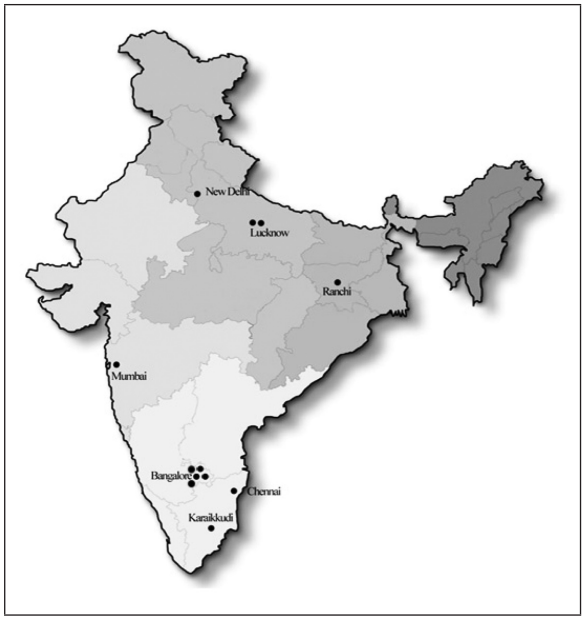
The lower number of girls identified by parents, schools, media, scientific networks, and through classroom observations may be a result of stereotypes surrounding girls' abilities. For example, Jacobs and Weisz (1994) have reported that gender-related stereotypes that parents may hold particularly with respect to mathematical abilities can affect identification, mentoring, and guidance for gifted girls. Eccles, Jacobs, and Harold (1990) have also shown how parents' influences affect children's own perceptions of their abilities in gender-stereotyped activities such as maths and sports, potentially leading to underachievement.

Contrary to these popularly held views, recent research suggests that there is no gender disparity in areas such as mathematical proficiency and complex problem-solving abilities across grades and ethnicity (Hyde and Mertz, 2009). However, unequal representation on on countries' International Mathematics Olympiad teams (IMO) and the Gender Gap Index (GGI) nt point towards the role of sociocultural factors in the development of girls' mathematics potential (Hyde and Mertz, 2009). Freeman (2005) has similarly reported that cultural stereotypes influence parental nominations, resulting in only one girl identified for every two boys, a pattern that is stably reproduced across the world. Betts and Neihart (1988) also showed that gifted girls were more likely than gifted boys to hide or minimise their talents in order to fit in with peer and cultural expectations, and therefore were at risk for underachievement and non-identification.

Sociocultural factors such as parents' economic resources, expectations for girls to contribute to domestic chores, perception of girls as temporary residents at natal homes, and cultural taboos that prevent girls from travelling

far from home to access schools have been identified as factors that affect completion of schooling for girls in India (Nambisan, 2004; Wu, Goldschmidt, Boscardin and Azam, 2007). Further, submissiveness, modesty, and nurturing qualities are seen as important markers of 'femininity' and are valued as cohesive forces in binding the family together (Nambisan, 2004). These cultural perceptions and practices together may contribute to lower identification rates of girls as gifted, particularly in maths and science. Within schools too, it has been found that teachers often reproduce gender stereotypes by engaging girls in 'decorative' and 'tidying' tasks and downplaying their mathematical and scientific abilities (ibid). Therefore additional efforts may be required to actively identify gifted girls through national campaigns and parent and teacher sensitisation.

Geographical Distribution



Map 1: Geographical distribution of the profiled children.

In the sample profiled, seven children reside in the South, four in the North, and one in the West. Further, the majority of them (eight) live in tier-one cities such as Mumbai, Chennai, Bangalore, and Delhi, which have well-established institutions for elementary and higher education as well as well-established scientific institutions. These provisions are important as they allow for access to scientific communities, providing scope for children to interact with scientists and mentors and to work on small research projects at these institutions. For example, Naveen Iyengar, who resides in Mumbai, benefited from visits to the Homi Bhabha Centre for Science Education (HBCSE) and received guidance regarding his educational options. Another child, Devendra was put in touch with a mentor from the Institute of Mathematical Sciences, in Chennai, where he resides. Further, data shared by the HBCSE suggest that children from tier-one cities are over-represented in the Olympiads, probably due to better awareness of and access to educational opportunities.

Four other children in the sample live in smaller cities and in towns such as Lucknow, Ranchi, and Karaikudi. In the case of at least two of these children – Suneetha from Ranchi and Ganeshan from Karaikudi – the families have had to relocate to other places to access resources. In Suneetha's case, the family moved to Bangalore and then Mysore in order to access medical facilities as well as appropriate educational facilities since Ranchi lacked provisions to cater to twice-exceptional children like Suneetha. In Ganeshan's case, the lack of advanced educational opportunities in Karaikudi limited his access to scientific networks and research centres. Ganeshan has been drawing support from Shastra University at Thanjavur, which has provided him exposure to scientific research and mentors who can provide the training

required for competing at the national level on tests such as the Olympiads and the KVPY. Ganeshan's unfamiliarity with the English language and with an urban lifestyle created difficulties in his shifting to a tier-one city like Bangalore where he could receive mentoring and scientific exposure at institutes such as the Indian Institute of Science.

Thus, regional differences, the presence of higher education institutions, and the availability of regular and special educational options are some extrinsic factors that have likely affected the manifestation and retention of the gifts of the children in the sample.

While the demographic factors themselves have been useful in understanding the challenges for identification, in the following section behaviours that were observed among the group are discussed in terms of how they may be indicative of accelerated learning trajectories, while also drawing attention towards the differences in expression of potential which may be related to the differences in demographics factors and contexts of the children profiled.

Observed Characteristics and Learning Trajectories of the Profiled Children

A large number of cognitive, affective, and social traits have been associated with gifted children. These traits include ability to learn rapidly; a wide knowledge base in general and in particular areas of interest; intellectual curiosity and high motivation to learn; advanced knowledge and skills exceeding that of age-peers in domains such as language, mathematics, music, kinesthetic, abilities, and other such areas; advanced analytical and critical thinking skills; ability to synthesise and process large volumes of information; advanced metacognitive skills; ability to develop and execute plans effectively; early sophisticated conceptual frameworks; and creativity and production of novel solutions to problems (Callahan and Miller, 2005; Cohn, Carlson and Jensen, 1985; Geary and Brown, 1991; Jeltova and Grigorenko, 2005; Vaivre-Douret, 2011). These behaviours in turn have been classified along various dimensions by different scholars describing various models of giftedness (e.g. Renzulli's "school house" vs. "creative-productive" giftedness; Sternberg's categories of rational, synthetic, and practical giftedness; Gardner's Multiple Intelligences; and Dabrowski's "over-excitabilities", to name a few).

A primary assumption underlying most of these models centred on specific traits or behaviours is that these traits and gifts are "properties" of gifted individuals (Ziegler, 2005). Borland (2005) has pointed out that while the categories to identify the gifted are formed *a priori* as guidelines for developing conceptual and theoretical understanding, they are often treated as objective categories that unfailingly represent the natural distribution of traits in the population. However, this simplistic dichotomy of the "haves" and the "have nots" or "the gifted" and "the others" poses several problems. The notion of categorisation based on individual traits fails to recognise the interaction between individual potential and environmental factors that produces behaviour. Borland (1997) and Ziegler (2005) have both pointed out that changing test norms and geographical locations can affect whether an individual continues to be considered as gifted or not. Particularly in

the Indian context, with great diversities in home backgrounds, socioeconomic resources, caste and religious factors, multiple school systems and school quality, and several other differences – this may be an important point to keep in mind as gifted traits may not only be hard to generalise, but a trait-based model may also bias identification. Further, traits as innate variables give rise to the notion of the heritability of giftedness, which further suggests that certain groups may be gifted while certain others may not be – thereby ignoring the role of environmental factors that may be responsible for the demonstrated behaviours. Considering these different problems of a trait-based approach, it may perhaps be useful to conceptualise giftedness as a set of dynamically and contextually constituted characteristics or potentials revealed during performance in comparison to peers.

Adopting a similar framework, the present analysis attempts to highlight observed or reported performances that could be indicative of high potential. While a number of the characteristics encountered in the literature on giftedness were evident with this group, there were several differences in the manner

TABLE 1: **GIFTED BEHAVIOURS REPORTED THROUGH THE CASE PROFILES**

Name	Manoj M.	Suneetha	Hamsa Ajay	Kushal Barwe	Niranjan V.	Hari Ajay	N. K. Devendra	Kusum Singh	Sandeep Iyer	Naveen Iyengar	Ganeshan	Vimal Singh
Age	3y 4m	4y 8m	5y 5m	7y 9m	8y 2m	10y 8m	7y 5m	11y 1m	11y 3m	13y 1m	15y 1m	18y
Sex	M	F	F	M	M	M	M	F	M	M	M	M
BEHAVIOURS REPORTED												
Intellectual curiosity	✓	not known	✓	✓	✓	✓	✓	✓	✓	✓		✓
Language/ Reading Fluency	✓	partial	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rapid Learning	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Memory	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	
Information processing speed						✓	✓		✓		✓	
Attention / Concentration			✓	✓	✓		✓	✓	✓			
Observation of details			✓	✓	✓							✓
Analytical thinking	not applicable	not known	✓	✓	✓		✓	✓		✓	✓	✓
Synthesis	✓	not known	✓	✓			✓	✓	✓	✓		✓
Metacognition	not applicable	not applicable	✓	✓		✓	✓	✓	✓		✓	✓
Self directed learning	not known	not known	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perseverance	not known	not known	✓	✓			✓	✓	✓			
Social maturity	not known	not known	✓		✓	✓	✓	✓	✓		✓	
Adjustment	✓				✓	✓	✓	✓	✓		✓	
Peer relations	✓				✓	✓	✓	✓	✓		✓	
Gifted motivation				✓								

and contexts within which these characteristics were noticed or recounted. Thus, it can be argued that what follows is not an attempt to classify or label the children based on a checklist of traits. Instead, to use Ziegler's (2005) concept, the attempt is to discover *learning paths* that could lead to excellence. It would be, therefore, useful to view the characteristics presented here as focus points that can be used to explore other children's learning paths to examine their potential. The variability in the presentation of similar characteristics among the different children in this sample suggests the utility of focusing on trajectories of growth rather than on gifted traits in gifted education programmes. It is important to emphasis that one needs to consider the full developmental profile of the children (see Appendix) in order to fully understand the development of their potential and the manifestation of their gifted behaviours.

A Discussion of the *Learning Paths*

Some characteristics that were repeatedly identified by parents, teachers, and significant others of the profiled children, and were similarly evident on observation and interaction with the children – were high levels of **intellectual curiosity**, the **ability to rapidly learn** new information and the ability to **direct one's learning**. Literature suggests that intellectual curiosity may manifest as an orientation towards discovery or an interest in pursuing a topic in depth (Callahan and Miller, 2005; Jeltova and Grigorenko, 2005). Faster learning rates and progressing faster through the curriculum are traits that have also been well-identified in the literature (refer Feldhusen, 2005). The present case profiles illustrate various ways in which curiosity, rapid progress, and self-directed learning may be connected. Most children in the covered through this study were found to have demonstrated high levels of curiosity since early childhood. This became evident to parents through the kinds of questions asked and independent efforts to obtain more information on topics of interest. Parents' attempts at satisfying their children's demand for intellectual stimulation not only aided parents' recognition of their children's abilities, but fuelled children's interest in developing further mastery and undertaking independent explorations.

For example, Naveen Iyengar's mother reported that Naveen's curiosity about things was evident as early as when he was just 1½ years old, when he repeatedly put himself in danger by exploring and manipulating electrical objects such as switches and plugs. In order to keep him engaged, Naveen's mother began getting him books and teaching him new topics. Gradually this led to Naveen's exposure to computers by age 2, and a by 7-8 years he had independently started browsing the internet for more informations since he realised that his mother was doing the same.

Sandeep Iyer's mother has similarly reported that his curiosity regarding numbers started as early as Upper Kindergarten. Encouraged by his great interest in numbers, his mother nurtured his interest by teaching him mathematical concepts such as operations (i.e., addition, subtraction, multiplication and division). Due to Sandeep's interest and rapid rate of learning, he was able to master multiplication tables from 1-10 within a day's time, and thereafter continued rapid progress in learning tables up

to 10,000. Further encouraging his interests, his parents exposed him to different approaches to mathematics such as the abacus method and vedic mathematics in addition to regular school mathematics. Further, his mother reported that Sandeep's intellectual curiosity was visible in several areas, and that he would also independently try to obtain more information about topics taught at school by browsing the internet to solve his own doubts. Similarly, he independently and on his own initiative would try out science experiments provided in his textbooks.

In Ganeshan's case, a somewhat different trend was reported. Coming from a family with fewer resources, and lower parental education levels, his parents noted no early signs of acceleration. However, when he was in second standard, his father first noticed his potential when he efficiently mastered a set of 40 Thirukurals (a set of aphorisms, composed as couplets in Tamil by the poet Thiruvalluvar) and won a prize for reciting the same. His father thus realized his ability to master large amounts of information rapidly and taught him all the 1330 Thirukurals by the time he reached fifth standard. Following this, Ganeshan and his father jointly attempted to learn the mathematical pattern by which the corresponding day for any given date could be identified within the span of a 1000 years. It is unclear from parents' account whether Ganeshan's ability to learn rapidly was linked to early curiosity (parents suggest that Ganeshan's curiosity may have been limited by lack of resources at home), but Ganeshan himself reports that his curiosity led him to pursue topics taught at school to a greater depth by undertaking independent reading beyond school text-books.

Similarly, while siblings Kusum and Vimal also belong to resource-poor homes with uneducated parents, both children have demonstrated a rapid learning trajectory that has been largely self-directed. In Vimal's case, his father reports that Vimal showed interest in the Ramayana at age three and asked him to teach him to read it. From that point on, it appears that most of Vimal's learning advanced rapidly and independently. His father reports that Vimal learnt by listening and observing others in the neighbourhood. Vimal himself provided an insight into his trajectory of learning. He reported that soon after he started attending a computer course, he became unsatisfied with the pace and depth of learning. So he decided to explore computer hardware and machine language on his own at home with a computer that was donated to him. His independence at gaining more knowledge may have perhaps led to the rapid trajectory of his learning, resulting in his completing school at age 11. This in turn may be linked to his high degree of intellectual curiosity.

Here, it appears that even without parental support and adequately stimulating home backgrounds, Kusum and Vimal, unlike Ganeshan, have been able to sustain their accelerated learning paths, perhaps due to their high need for intellectual stimulation and curiosity. It is possible that in Ganeshan's case accelerated learning stemmed from his motivation and interest in mastering large volumes of information rather than from his curiosity about new concepts. Therefore, it appears that while there are some links between children's early curiosity, reinforcement by parents, and rapid, self-directed learning, this may not be a universal feature.

It would also be interesting to explore whether language development (oral or written) may lead to accelerated levels of intellectual curiosity and rapid learning, or vice versa. This question is worth exploring because **accelerated language development** were observed for most of the children profiled in our study. Vaivret-Douret (2011) has pointed out that gifted children often show linguistic precocity. It would, therefore, be interesting to study the role that language plays in accelerated cognitive development.

The association between interest in reading and curiosity is anecdotally available for several children in the group. For example, Devendra's parents report that by age two he spoke fluently and much more frequently than age peers, and at the same time developed an interest in reading. Devendra's mother reports that he would request his parents to read to him, which she started doing, using second standard textbooks. Devendra also asked many questions at an early age about observed phenomena such as cement mixtures, and herbivores and carnivores at a zoo – which demonstrated not only his ability for observationbut also language development, which should have been adequate to explore these topics via discussion with adults.

Niranjan, too, demonstrated early interest in books, reading about varied topics beginning at preschool and reading books much beyond his age level in his areas of interest. As early as age three, Niranjan's parents report that he selected Brian Holligworth's *Great Book of Trains,* which is a thick volume with technical details in small print – unlike books designed for most three-year olds which would mainly be picture-based.

Another child who demonstrated sophisticated and precocious language development is Manoj. However, in this case it appears that his mother had actively been responsible in increasing his language fluency by introducing him to words as early as 9 months through flashcards. Manoj showed rapid learning and language development in response to his mother's efforts, and by 1 year 3 months showed the ability to form meaningful sentences with the words taught (e.g. ceiling, hand-saw), appropriately using grammatical structures such as participles (e.g., 'sawing wood' after having learnt the action 'to saw'). Presently, at the age of three years, he can sight-read long, complex words such as 'encyclopedia' and already has a vocabulary of 2000 words.

Other abilities associated with intellectual development and rapid mastery include **memory and metacognition**. While not all children in the study demonstrated these characteristics, a majority of them seemed to have specific skills for memorisation and metacognitive self-regulation. Within the context of Indian education, memory has played a historical role both within the ancient Indian oral tradition of learning, as well as in the present learning system which stresses rote learning of large volumes of information. While many children in the sample demonstrated good memory, some children further demonstrated high potential for auditory or visual memory, which may particularly be useful in rapid learning and recall.

For example, Ganeshan's rapid ability to learn, store, and recall information seems to be linked to his exceptional working memory. Johnson, Bolter, and Pascal-Leone (2003) have shown

that gifted children performed better and faster on tasks involving working memory by being able to resist and engage in effortful inhibition of interference processes in memory. Performance on working memory tasks was also seen to be better among older children according to their study. Ganeshan[1] too demonstrated advanced performance on sophisticated memory games such as remembering a large set of randomly associated names and numbers and correctly reproducing them in serial order along with the number associated with each name.

Similarly, in Manoj's case it appears that his large early vocabulary and ability to sight read may be linked to an eidetic or photographic memory. Manoj's ability to learn words as early as 9 months through exposure to flashcards seems to suggest photographic memory. Further, both Manoj and Sandeep have been reported to be able to identify and point to the location of particular texts in familiar books even before they had learnt to read, again suggesting the role of visual memory.

In Manoj's case, it was also observed that when his mother called out a word from an encyclopedia and asked him for its meaning, he continued to serially call out other words appearing after the target word and gave the meaning of each, suggesting a combination of auditory and visual memory, as well as the ability to rote memorise large volumes of information. Manoj's accelerated language development and vocabulary may have also been aided by his large auditory memory, as he was able to spell long words even before having learnt the alphabet. It is possible that he recalled the spellings of words by relying on his memory of the sounds.

Hamsa has similarly been reported to have an excellent auditory memory, is good at remembering tunes and rhythms, and was described by parents as quick at grasping new songs or jingles. Further, both Hamsa and Manoj have been reported to have picked up new languages with brief exposure, as short as 2-3 months, again suggesting at least a partial role played by auditory memory in these children's advanced development.

Along with language development and memory, learning has also been found to be aided by metacognitive abilities. **Metacognition** involves the knowledge and skills for regulating one's own thought processes and it is considered useful and important in directing one's own learning and problem-solving (Helms-Lorenz and Jacobse, 2008). Risemberg and Zimmerman (1992) have pointed out that gifted students spontaneously utilise self-regulatory learning strategies and can easily transfer them to novel tasks when trained. These researchers posit that self-regulation of learning may be a useful trait in identifying giftedness. Metacognitive ability consists of a) metacognitive knowledge – knowledge and awareness of how tasks, situations, and persons interact; and b) metacognitive control, the ability to regulate cognitive processes such as learning (ibid).

Parents' reports suggest that some of the children notably Kusum, Ganeshan, and Sandeep have been able to identify the particular challenges or difficulties that need to be overcome for a task,

[1] who was the second oldest in the group at 15 years.

demonstrating metacognition. Further, in order to surmount these challenges, these children have also been able to choose and apply alternate strategies in order to aid their learning. While Helms-Lorenz and Jacobse (2008) have reported that metacognition emerges around 8-10 years, Devendra appeared to have precocious metacognitive abilities by the age of 7 years as demonstrated by his study skills. According to his parents, Devendra's learning strategy involved reducing the learning material to small units and taking short breaks in between the units. In the literature on learning, this method of part-learning has been identified as an efficient method for acquisition and retention of material. Further, as reported earlier, Devendra also uses feedback to improve the efficiency of his learning. It appears that Devendra is able to use his ability for metacognitive regulation to plan and achieve learning goals systematically. For example, his parents report that he planned in advance to win a national-level Abacus competition at Bangalore, and successfully managed to win it. Similarly, when he had to attend an international Abacus competition in Malaysia just before his exams, he was able to use effective study techniques to achieve 85% marks in his exams.

Reports on Sandeep similarly show his ability to regulate his learning and performance by recognising his strengths and weaknesses, being able to decide which mathematical strategies are best suited to a problem, as well as planning for short-term and long-term goals effectively.

Exceptional metacognitive knowledge and strategies for regulation were also reported for Kusum by her parents, teachers, and friends. Kusum provided an insight into her metacognition, explaining her learning strategies for managing her academic acceleration. (As reported earlier, Kusum, a labourer's daughter, completed Std. X at age seven, and is currently pursuing B.Sc. at age eleven). Her friends and teacher reported that Kusum first tries to simplify all learning material by using mind-maps and life-cycle connectors. Kusum herself reported that she used a combination of text-books and the internet to simplify learning as well as to understand the topic fully – she reports that learning is easier when the material is understood rather than simply memorised. She explained that while teachers, due to the paucity of time, resort to helping students memorise material, she herself makes notes to aid her understanding and learning. She also reported making adjustments to her learning strategies depending on the topic to be learnt. She shared the insight that when topics are interesting they are easily understood. Therefore, she reasoned, one cannot adopt a time-table for studying as one needs to study according to one's inclination. With respect to her attention and concentration resources, she recognises that her attention span lasts only for about a half-hour and therefore that she needs regular breaks.

Another example of metacognition comes from classroom observation of Kushal who tried to compensate for his average artistic ability and shape-sense while copying a model of a motorcycle , by engaging in logical problem-solving. As he started drawing, he observed errors due to which the elements of the composition did not fit together properly. He constantly started using private speech to focus his attention on problem areas, diagnose problems, explore solutions to identified

problems, evaluate solutions, direct himself, recognise when he was on the right track, and to reinforce himself when solutions worked. Thus by metacognition and logical problem-solving beyond his age-level, Kushal was able to compensate for his lack of artistic ability and to generate a reasonably accurate and proportional copy of the model motorbike.

During the case-profiling, Kushal was given the digit span (reverse) activity which required that he listen to a string of digits and reproduce them in reverse order. (this is a test of working memory.) Kushal showed proficiency at this task though his response rate was slow and he took his time before reproducing each digit. Later he sponatenously shared the strategy he had used: he had held the original number in mind, then gone over it to retrieve the next last digit, doing this for each digit in the number. Thus though Kushal's processing speed and memory efficiency may have been average, he was able to compensate for it by spontaneously developing appropriate metacognitive strategies to exploit his cognitive strengths (e.g. effective phonological loop and central executive components of working memory).

From most of these children's accounts, it appears that metacognitive ability is an essential feature of giftedness and aids learning, particularly when task demands are large – for example, in Kusum's case where she had to learn material well above her age level; and in Devendra's case where he had to manage several tasks simultaneously such as performing well on academics, abacus, computers, karate, etc. In such cases it appears that metacognition becomes essential to efficiently regulate and plan's one learning and activities. Further, metacognition was seen in children from both the lower and middle classes, suggesting perhaps that these skills may be less influenced by social factors and parent or teacher influences – since it is a skill that essentially depends on one's ability to understand one's cognitive and learning processes.

In addition to these skills, some children in the group also demonstrated **analytical thinking and synthesis**. Researchers such as Renzulli and Sternberg have noted that there may be differences in the types of intelligences or gifts demonstrated by differences in cognitive processing. For example, Renzulli and Reis (n.d.) have pointed out that there may be a difference among children who demonstrate 'schoolhouse giftedness' and 'creative-productive giftedness.' While schoolhouse giftedness is associated with deductive reasoning, structured learning patterns, and high ability to acquire, store, and retrieve information, creative-productive giftedness is associated with inductive learning, divergent thinking, and solving real-life problems by applying content in an integrated manner. Schoolhouse giftedness also resembles Sternberg's analytical intelligence which is applicable to academic problem-solving; while creative-productive giftedness resembles Sternberg's creative intelligence which involves insightful thinking, ability to synthesise information, and ability to react intelligently to novel situations. The ability to use analytical and synthetic thinking were evident for some of the children in the study, viz. Kusum, Devendra, Niranjan, Naveen, and Kushal. For example, in the case of eight-years old Niranjan, the research team was able to witness his ability to think analytically and apply his knowledge to a novel situation. When he was given a

mental arithmetic problem requiring him to find the difference between the number of planes owned by two individuals: one with 25 planes and the other with 10 planes. Niranjan was quick to convert the problem into part addition and part subtraction to generate the correct answer. This seemed to indicate that Niranjan had independently synthesised his knowledge of addition and subtraction to apply them appropriately in novel contexts to arrive at solutions. (The school curriculum at his age generally does not include word problems.)

Similarly in Devendra's case, his father reported that on viewing a key-hole surgery on television, Devendra had asked his father why such a small incision was used, and why the complicated procedure of camera-guided surgery had been undertaken when a larger incision could have been made. When his father was unable to give him an answer, Devendra reasoned for himself that a small incision might have been selected to reduce the probability of infection and pain and to speed up recovery.

Eight-years old Kushal was also observed to be able to detect underlying, structural similarities between phenomena in the physical world. For example, on one occasion he asked the observer (during classroom observation) why rubbing fine sand on the palms of his hands made them smooth. The observer attempted to explain the concept of friction, but refrained from providing other examples. Kushal was not previously familiar with the concept of friction; however, after considering this new information, he suggested that the sand-smoothening phenomenon was similar to when one places a sheet of paper on the ground and can then slide on it – a perfect example of a low-friction situation analogous to the original phenomenon of sand-rubbing resulting in lower friction between surfaces. Kushal thus demonstrated the ability to understand new concepts and relate them meaningfully to existing experience, an example of sophisticated knowledge structures and analogical reasoning.

Hamsa also demonstrated good analytical ability. She is able to solve 200-piece puzzles independently by the age of 4½ years, by logically reasoning about how pieces can be fitted together not only by shape but also by colour and pattern. Further, it appears that her learning in other areas such as swimming and her knowledge of cricket may have emerged through analysis of patterns and means. For example, her father reported that at age four she was able to reason that if a certain player had been the highest wicket taker in a tournament, he would have been an asset to the team that her father supported – and that her father would therefore have liked this player to be on the given team. Similarly, when it came to swimming, her mother reported that Hamsa resisted her mother's instructions on how to swim, but after observation, independently selected a style to swim in.

These abilities contrast with those demonstrated by, for example, Manoj or Ganeshan, who relied on rote memorisation to acquire large amounts of information. The children described above seem to rely on their logical understanding of topics in order to perform at high levels.

On the other hand, the ability to recall and use large amounts of information to arrive at solutions may perhaps require a **high capacity**

for information-processing, which was noted among some children viz. Ganeshan, Sandeep, Devendra, and Hari. Studies have shown that gifted children may have accelerated information-processing on simple cognitive tasks (Cohn, Carlson and Jensen, 1985; Geary and Brown, 1991). Studies also suggest that information-processing speed can be moderated as a result of schooling, suggesting the role of practice (Duan, Shi and Zhou, 2010). For three out of the four aforementioned children – Ganeshan, Devendra, and Sandeep – it appears that deliberate practice and environmental inputs have aided the improvements in their information-processing speed. While both Devendra and Sandeep have been trained in abacus (which teaches children to perform speedy mental calculations), Ganeshan's father has reported having invested considerable time training him in memory games involving rapid processing and recall of large amounts of information. Hari's father also reported spending time with him discussing science-related activities and other topics, and it is possible that this has had an influence on Hari's ability to information processing speed due to greater exposure to these topics. These findings are interesting since they illustrate the role that the environment has played in accelerating some children's learning paths – which has to some extent helped them stand out from their peers. In line with previous research, the current study indicates that it may be possible to accelerate children's learning levels by appropriate training in efficient and speedy processing and decreased reaction times.

Finally, in addition to these various characteristics, attention and concentration levels and the ability to **observe details** may also be important in accelerating learning paths. In the case of a few children such as Vimal and Suneetha at least, observational ability seems fundamental to their abilities. For Vimal and Kusum, with very little environmental support, observation and self-directed learning seems to have been key to their early completion of schooling. Vimal's father reported that when he was first taken to school at age five, he already knew five languages (English, Hindi, Sanskrit, Urdu, and Bengali) and had above-age level academic concepts that allowed him to be admitted directly to the fifth standard. His father explained that Vimal had acquired this knowledge by observation.

Suneetha, a 5-year old with Pervasive Developmental Disorder (PDD), similarly has knowledge of advanced concepts such as $\sin\theta$ and $\cos\theta$, different chemical formulae such as for water, and the value of pi, and she can also read three languages. PDD is a disorder characterised by reduced social interaction and language development; thus we may assume that Suneetha's knowledge comes from her ability to learn by observation. Parents are unable to explain how Suneetha may have picked up this knowledge.

In Hamsa' case, too, her mother reports that she has mainly learned via observation rather than through guided instruction, which she would resist. For example, without overt training, by observing her brother, Hamsa has learned to skate; by observing her mother, she learnt to swim, and by observing discussions between her brother and her father has also picked up some science concepts.

Learning through observation also requires the ability to **attend to information and concentrate**. Hamsa has been reported to have had an advanced attention span as early as age 2-3, when she could sit for up to an hour to complete large puzzles with 70-100 pieces. Similarly, rapid information-processing may also require harnessing one's ability to concentrate on the task at hand without getting distracted. Therefore, a higher ability to concentrate may also be true for children such as Sandeep and Devendra who showed high information processing speeds.

In addition to these cognitive factors, the case studies also revealed some social and personality factors that in recent times have been identified as important in affecting outcomes for gifted children. For example, in Renzulli's three-ring model, task commitment is an important variable affecting giftedness. In our study it appeared that perseverance or task commitment were present among children who also showed better adjustment and social maturity. The ability to persevere perhaps indicates the ability to overcome frustration and continue with the task. These children have also shown social maturity in peer relations.

Overall, the profiles indicate accelerated learning that is motivated by curiosity and the ability to direct and monitor one's own learning. Along with these characteristics, it appears that children's learning profiles may diverge when the strategy underlying learning is studied. The present study identified two types of learners: one whose primary ability seemed to stem from their rapid ability to learn, store, and recall information, combined with accelerated information-processing speed; and another set of learners whose primary ability was to observe and analyse information that aided their learning, and the ability to synthesise information to make learning meaningful and relevant.

Socioemotional characteristics are also important in the self-regulation of learning. While difficulties with socioemotional adjustment has affected at least one child in the sample (Vimal), leading to drop-out, for other children such as Naveen and Hamsa supportive home environments have offered protection against adverse outcomes. Therefore, more attention needs to be given to the role of the socioemotional characteristics that could influence the learning paths of gifted children.

6
Summary and Recommendations

The NIAS Gifted Children Programme is the first effort in the country to develop a consolidated research base in the area of gifted education. Within this context of inadequate efforts, understanding, or debate on gifted education, the case profiles component of the programme has not only been a unique methodology applied, but has also been important in refining our understanding of the field via an in-depth, retrospective developmental approach. In the absence of contextualised research on giftedness in India, the nature of giftedness, related issues, and the types of provisions and policies that may be useful – these case profiles of potentially gifted children have afforded an understanding of how a number of personal and social variables may affect outcomes of children with potential.

A total of 12 profiles have been completed so far. These have been analysed to understand what role demographic factors such as age, gender, regional location, socio-economic status, and schooling have had on accelerated learning pathways, as well as to understand the particular features or characteristics demonstrated by the various children as a signal of accelerated development.

The majority of the children covered were in middle childhood (7-11 years); the other children were in early childhood or in the period of late childhood and adolescence. Information on the children's age was useful in identifying children with accelerated learning in terms of academic acceleration, advanced attention and concentration, metacognitive abilities, language development, and so on. Since age-related comparisons provide an important basis on which gifted potential can be identified, it is important that parents and teachers are sensitised to the need for maintaining descriptive longitudinal diaries of children. In our study, too, it was observed that many parents had not noted exactly or in detail the early development of potential among their children – an information gap that constitutes a limitation for reliable identification. However, it is important to also note that early milestones were *not* uniformly accelerated for all children, and that some children showed delayed milestones of development.

Socioeconomic status was also found to influence children's performances and orientation. Middle-class parents were more focused on children's present and higher education and exploring avenues for encouraging their intellectual curiosity. This seemed to be given less importance in families belonging to the working classes,

perhaps because of the lack of knowledge regarding higher education opportunities as well as the necessary social and cultural capital to pursue higher education. This suggests that there is a need for the study to focus not only on developing mentorship networks and providing scholarship and educational opportunities, but also on preparing children from different sociocultural backgrounds for participation in higher education. Further, since the current sample includes more middle-class children, many of whom have come to the team's notice through middle-class parents' and scientific networks' efforts, it is important to critically examine the conceptions of giftedness held by the project and to actively pursue gifted children from lower-classes and rural backgrounds. It is also important to examine the channels adopted by the project to publicise its programmes (i.e., publicity through mainstream media, academic journals, linkages with elite scientific institutions, and the composition of teachers invited to the teacher workshops conducted as part of the gifted education project), since this may also have limited lower-class parents' and teachers' efforts at contacting us regarding high-potential children they have encountered. More efforts may be needed to popularise the programme through local and vernacular newspapers and media, by contacting government and aided schools and so on, to study gifted children from less-privileged backgrounds.

The study also has been largely male-biased, though it is heartening to note that among the three girls represented in study, two were brought to our notice by their parents (both were also middle-class). In the case of the third girl, who belonged to the lower class, her parents had shown more attention to her talents than to her brother's, who also showed accelerated potential. However, it is important to undertake a detailed study to understand whether stereotypical notions of girls' lower mathematical and scientific abilities have been responsible for the lower rate of identification of gifted girls by the media, parents, schools, and scientific networks.

The study has also largely covered children from tier-one cities such as Bangalore and New Delhi. Urban children have the advantage of better schooling, access to scientific networks, and more awareness of opportunities. An study of the list of candidates on the Science Olympiad also showed that children from larger cities were more likely to participate in and successfully complete this examination. One reason for this could be unequal opportunities for competing on this and other national-level exams due to lower-quality education in rural areas. This has been the case for at least for two children in the study, whose education has not prepared them to compete on national-level exams. Further, their location in smaller, remote towns – accompanied by language and cultural problems has also made it more difficult to link these children with mentorship networks or to provide them with opportunities to attend special programmes at scientific institutions in tier-one cities. Thus, it is important for the programme to adopt localised strategies for identification through interactions with children and teachers, and observing their performances with interactive material (such as used by the Agastya model) to better identify children from diverse backgrounds. Further, developing these children's capacities to participate in programmes at the national level is also necessary. It is also important to pay attention in the long-term to improving

facilities for children across the country and to take the programme to smaller towns including district headquarters. While one option may be to develop state-wise nodal hubs or centres that can provide resources, counselling, and short-term research opportunities for these children, the children can also be linked with national-level campaigns with a wide reach such as the Sarva Sikhsha Abhiyan campaign in order to sensitise individual schools and to set up school level resources to mentor the gifted.

In terms of learning potentials, common characteristics have been noticed among several children in the group. However, individual children's profiles have also diverged and taken different routes to different outcomes, based on personal characteristics and environmental support systems. Overall, many of the children show great intellectual curiosity and an ability to learn rapidly and to direct their own learning. Children's curiosity has, in many cases, been reinforced by parents' efforts at satisfying their curiosity, which has also enabled parents to identify the advanced potential of their children.

These children have also mostly shown accelerated language development, particularly reading ability. It would be interesting to further explore whether the acceleration in reading ability has resulted from the children's curiosity.

Many children, particularly those with large academic accelerations or multiple achievements, have shown excellent metacognitive abilities. Again, it would be interesting to explore whether metacognition is an essential characteristic required to meet the large task demands that school-accelerated children face. It also appears that unlike certain abilities such as curiosity, language development, and information-processing, metacognition has been less influenced by parental or school influences and is more dependent on internal variables. Metacognition can thus perhaps be used as an important indicator of accelerated learning potential.

It has been interesting to note that while most of the group has shown intellectual curiosity, rapid learning, and self-directed learning, profiles of children have diverged based on learning styles. It appears that one group of children have a high capacity to memorise information and high information-processing speed (particularly those who have received some training such as Abacus), and that another group's accelerated learning is motivated by curiosity, exploratory behaviour, and analysis and synthesis of information. Further, case studies with larger and more diverse samples would help us to understand whether these two routes to accelerated potential are seen within the larger population as well. Further, it may be important to examine whether the emphasis within the Indian education system on reproductive rather than on analytical ability has led to fewer children demonstrating analytical ability, which tends to be less encouraged at school, and to not be observed by teachers when it does appear among children.

Finally, it appears that certain socio-emotional characteristics such as task perseverance and socioemotional adjustment may be related to giftedness and may be important in preventing adverse outcomes for these children. For children who do have socioemotional

difficulties, environmental influences such as supportive home backgrounds are influential in preventing adverse outcomes. The lack of support at home and from the educational system can be detrimental as was evidenced in the cases of Vimal and Naveen, leading to frustration and even dropout (in Vimal's case). This observation calls for immediate action both in terms of generating awareness among parents and teachers as well as in preparing the educational system to accommodate gifted learners through different strategies. Awareness campaigns need to take several forms – such as teachers' workshops (which have already been incorporated into the NIAS gifted education programme); parents' workshops; utilisation of the media (as many parents have access to the media rather than to academic journals); conferences and academic workshops; and through sensitising community health workers and Anganwadi and Balwadi workers who can be important resource personnel for parents from rural areas.

Socioemotional self-regulation may also be influenced by socialisation practices such as providing more opportunities to children for independent action, more emphasis on managing one's own peer relations, etc. These issues require further research. Having said this, it must be added that the majority of the children were found to be well-adjusted and socially mature.

While the case studies on the whole have opened certain areas for research and have presented important directions for a gifted education programme for India, there are certain limitations to be overcome in order to make the study more effective. First, the number of children in the present study is very small, and the findings cannot be generalised. It is important to undertake more such studies, with efforts to represent groups such as the lower class and lower castes, rural children, children from smaller towns and from government schools, girls, children from religious minorities, etc.

Second, in the absence of appropriate mentoring mechanisms, the profiled children have received little help from the programme, a crucial omission especially for children from resource-poor homes. Mentorship is a valuable tool that can ensure appropriate nurturance of gifted children's potential. As was observed in the present study, across class and geographical groups parents had poor awareness of national-level scholarship and research opportunities such as the KVPY, Olympiads, National Talent Search Examinations, and geographically accessible research centres. Parents were unaware of future opportunities for their children. It is important to develop a network of scientists who volunteer as mentors for these children and their parents and can provide guidance with respect to their education and career, provide opportunities for short-term projects and help them access scientific networks that might otherwise be unavailable. Developing parent networks and organising regular peer interactions for these children can also be useful to help them interact with similarly able peers, to gain information, and to provide opportunities to pursue their areas of interest. This last mechanism may be useful in following the development of these children's potential on a long-term basis.

Finally, information and interactions with the children and their families and schools has also

been limited, and therefore the information obtained in these profiles is limited and anecdotal. To develop a better, firsthand understanding of children's learning and development, it is important to undertake a more thorough, longer-term, ethnographic study with in-depth observations and interviews.

These case studies illustrate that, in developing a policy and programme for giftedness, a 'once-size-fits-all' policy will not work. Gifted children and their families have varying needs, experiences, and expectations. In terms of schooling policy, some children benefitted from regular schooling without acceleration, but with other opportunities for enrichment. For other children, acceleration was important, but brought other problems such as difficulties with peer interaction and social development. For one child in the group, an additional psychological problem prevented opportunities for regular schooling; from her case it was evident that opportunities for the 'twice-exceptional' in India are very limited indeed. Keeping in mind these issues, it is important to develop educational strategies appropriate to the very different needs of these different kinds of gifted children.

Future directions for the programme should also explore insights that have emerged from the study. For example, the relationship between learning styles and accelerated potential can be further explored in relation to type of schooling, parents' orientation, etc. Metacognition, which has emerged as an important ability -- particularly in the light of high task demands -- needs to be further explored in other, nongifted children, to see whether metacognition is a characteristic that can be used to identify gifted learners. The relationship between language development and intellectual curiosity also needs to be explored through rigorous developmental accounts of language use and children's efforts to acquire new information. These and other insights that have emerged from the study may help direct research on giftedness in India in the years to come.

7

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8

Appendix

Case Profiles of the Individual Children

While at first glance it may appear that all gifted children stand out from their peers because of their advanced abilities, in-depth one-on-one interactions with the children reveal a different picture. The case studies of the children in the study reveal that the expression of giftedness in each child is unique, the result of the interaction of such factors as personality, environmental influences, illnesses or medical conditions, schooling factors, parental awareness and so on. For each of these children, families, and schools, the expression of 'giftedness' interacted with, and altered, the dynamics within and outside the family and school. Whether it was the constant pressure of media attention as in Kusum's case; or the scramble for resources to provide the child with adequate opportunities in Devendra's case; or the disconnect and misunderstanding between parents and children as in Vimal's case whose parents wanted him to provide for the family while he dreamt of other achievements; or the feeling of pressure due to high demands placed by the child on the parents, like in Hamsa's case -- each family had a different story to tell.

Below, each of the case-profiles is presented in full to offer glimpses into the ways in which giftedness manifests itself in very different ways even when common traits exist across children, as well as to offer a picture of how giftedness alters family and school dynamics.

Kushal Barwe

Eight-year old Kushal was identified via classroom observation as part of the Gifted Education project. He belongs to an upper-middle class urban family with highly-educated parents. He has one sibling, a 3½-year old sister by adoption. The family is trilingual. Kushal attends an I-GCSE school. Parents report no other case of unusual ability or disability in the family.

Kushal attained motor developmental milestones slightly later than normal, but within the normal range. He began speaking late, which is frequent in bilingual families. Once he began speaking, vocabulary developed rapidly. Kushal now seems fluent in all three languages spoken at home – Spanish, Marathi, and English.

In the classroom, Kushal stood out to the observer because of his strong interest areas. In a free period, he requested that the observer play a mathematics game with the class. He appeared motivated to answer correctly and quickly, and

easily outperformed all his peers including two other children who excel at mathematics and have high information-processing skills.

Kushal's most marked characteristic is his curiosity. He is keenly observant of details of his physical environment, and is easily provoked by everyday phenomena, which he then attempts to explore independently. Kushal is fascinated by why things happen and how machines work. On several occasions, he approached the observer posing questions such as "When I rub my hands on sand, why do they become smooth?" "Why do twigs follow a curve (parabola) in the air when I throw them?" and "If I stand in one spot with my arm extended and drop sand from a bucket, why does the sand fall in a spinning pattern?" With some guidance, Kushal demonstrated the ability to reason these problems out on his own, as well as to associate these phenomena with others that he had observed. Kushal thus demonstrated high curiosity, problem-finding orientation, and problem-solving ability. On another occasion, Kushal studied the variety of stones scattered around the playground and spontaneously began to classify them based on their visual and tactile features. (Note that all these problems appeared *outside* the classroom.)

Parents, too, describe Kushal as keenly observant and fascinated by mechanics. He loves watching machines at work and has often attempted to take machines apart and put them back together. He is enthusiastic about learning new concepts. He explores concepts in a hands-on manner and is able to relate them to real-life scenarios. For example, having read about pulleys, Kushal at a later date was able to recognise that this was the mechanism of a toilet flush. On another occasion, when playing with friends, one child remarked, "The sun is gone," and Kushal amended, "No, we are gone," reflecting his knowledge of astronomy.

As typical with bright children, Kushal is strongly interested in novelty, and is easily bored of repetition. He seeks out new and challenging things to learn or to do. His preference for challenge was displayed during the digit-span task, where he performed excellently on the reverse task (the harder one) but seemed uninterested in the forward task (the easier one) and performed poorly.

Kushal has strong metacognitive ability. He can plan how to solve a problem, assess his progress, and correct his course as required, using self-talk. When presented with a new problem, Kushal appears highly motivated to devise a strategy. He is able (and keen) to verbalise the strategy. During the case-profiling process, Kushal spontaneously shared the strategy he had used to perform well on the reverse digit-span test. In a competitive game situation in class, Kushal has often been observed to share his strategy and guide peers in performing the task successfully.

Kushal's information-processing speed appears below-average. He is slow to respond to a new situation, preferring to take his time and answer correctly. Similarly, his speech in English is slow, but is perfectly grammatical and shows advanced vocabulary. Compensating for this is his persistence in arriving at the correct answer when the question interests him. This was obvious during an informal assessment conducted during the case-profile process. Kushal took his time but was persistent in solving

the puzzles presented to him. In psychometric terms, Kushal displayed high power but low speed. He showed above-average performance on unfamiliar logic and maths puzzles.

Kushal is highly imaginative and when in school appears to spend a lot of time in his own world. He often seems unaware of other people, even in the middle of class.

Kushal shows concern with ethical questions. He wants to machine to reduce the petrol consumption of vehicles; he reprimands children hurting animals; and he asks people to save water and switch off lights. Kushal's concern for animals and the environment may have been picked up at school or at home. (Kushal's school strongly emphasises citizenship behaviour and moral education.)

Kushal is a healthy, energetic child. However, his gross motor skills appear poor and he is not athletic. He prefers to spend the games period exploring physical phenomena. This is unusual at his school where sports and physical education are a strong part of the curriculum, and where his peers seize every opportunity for physical activity. Kushal's fine motor skills are average. His drawings lack perspective and show poor lineament. However it should be noted that Kushal does not draw for drawing's sake. His drawings are either exploratory – e.g. when reading about trains, he drew different train models – or imaginative, i.e. narrative drawings.

Kushal entered a Montessori at age 4. He enjoyed the activity-based learning method and amazed teachers by his advanced reading skills.

At age 6, Kushal shifted to his current school, a small institute with students from contrasting backgrounds. This school has an average teacher-student ratio of 1:9 per class. Material is taught via topic rather than via subject, i.e. one topic is selected per month and material across all subjects centres on that topic. Each class has a library and independent reading is strongly encouraged. Games, nature walks, and other hands-on activities (including cooking) are a strong part of the curriculum.

Kushal has not received explicit training at home. He does not discuss his reading with his parents. Most of his learning and thinking skills appear to have been picked up on his own. Parents have always provided a stimulating environment, appropriate learning tools including puzzles, and have encouraged his curiosity.

Kushal's stable and longstanding interests are reading, puzzles, machines, mathematics, biology, physics, and astronomy. He is a voracious reader, spends most of his leisure time reading, and resents school and homework because these activities reduce the time he can spend on his independent reading. Kushal reads and comprehends material beyond his age, including "Tell Me Why?", "How Is It Made?", and National Geographic magazines.

Kushal is an introverted, slow-to-warm-up child who can appear inhibited at first. With peers he is friendly and maintains positive relations, but he does not have any close friends. Outside his family, he shows no interest in social interaction for its own sake; his interactions are centred around discussing a topic or problem that interests him. He is popular with younger children because of the

information he shares and the imaginative activities he generates.

Kushal does not appear motivated by competition. He has a high intrinsic drive to explore and learn. He prefers to learn by independent exploration, being highly curious and able to follow out a train of reason using basic experimental methodology. When engaged in learning a concept or solving a problem, Kushal becomes intensely absorbed and seems oblivious to the environment, including the teacher's call for attention. Kushal's interest in independent learning and his mastery orientation were demonstrated in the classroom. The observer experimentally offered to give the children the answers to a crossword puzzle. While most children seemed to welcome this, Kushal firmly but politely told the observer, "You should not tell me. I have to find the answers on my own."

Kushal does not have any serious adjustment problems, apart from boredom and possible under-performance at school.

Even though Kushal attends an "alternative" I-GCSE school with small class sizes and an emphasis on activity-based learning, he does not enjoy school. He complains that the long school day and homework interfere with his independent learning activities. He absents himself frequently despite good health. In class, he often appears disengaged and lost in his own world. He displays no interest in language classes or in structured physical activity. He shows enthusiasm for individual expressive (art) and problem-solving activities (worksheets) but has trouble paying attention in lecture-type scenarios (e.g. storytelling by the teacher) or when he is not interested in the subject being taught.

Despite his fluency in three languages and his high learning ability, Kushal shows little interest in learning new languages (Hindi and Kannada); part of the reason for his disengagement in Hindi class is that his Hindi reading ability lags behind.

As well, Kushal (like many other bright children) dislikes writing. Parents and teachers have to struggle to get him to finish homework.

Kushal has well-developed and definite interests; it is difficult to get him to do what he dislikes (learning languages, doing writing tasks). As well, Kushal has problems functioning in a structured environment (even the less-structured environment of a tiny I-GCSE class) and sustaining attention in group-based learning situations. He is highly energetic and wants to be constantly exploring things independently. He deals poorly with structured classroom instruction.

While some degree of structured top-down instruction is necessary at Kushal's age, he may benefit from being allowed more space for independent explorations at school. His current teacher seems interested in imposing structure and discipline rather than facilitating the expression of Kushal's advanced learning needs. It may be helpful to allow Kushal to participate in additional problem-based projects conditional to his completion of less-favoured tasks (learning language and writing tasks). Project work may happen after school; additionally, he may be liable for curriculum compacting (i.e. being allowed to cover the regular curriculum in a shortened space of

time, prove his mastery, and then move to advanced tasks) and may meet with a project mentor during school hours. This might be an effective way to get Kushal more engaged in school in general, and in less-favoured subjects in particular – until such time as he can choose to drop these subjects. To optimise his academic performance and school adjustment, it is important to co-opt Kushal into the structured classroom environment while encouraging his scientific thinking ability.

Kushal shows the ability to benefit from guidance and supports, and to learn via dialogue with an older instructor. Given his strong interest areas, high drive for independent or guided learning, intuitive scientific thinking skills, and strong problem-solving orientation, Kushal is an ideal candidate for mentorship. Mentorship should also address the problems Kushal has been having at school. As Kushal may possibly be considered too young for a mentor, his parents should in the meanwhile receive counselling on how to handle Kushal's problems at school. Parents should also be placed in touch with resources to cater to Kushal's interests (e.g. science workshops for children).

Niranjan

Niranjan is an 8-year old only child with another sibling on the way. He is studying in Std. III in a private CBSE school. He belongs to an upper-middle class family with well-educated parents. Niranjan was identified via scientific networks for his interest and ability in some areas of science.

No other cases of high intellectual functioning were reported among family members. Niranjan's uncle is an epileptic, and his father's cousin has mental retardation. Niranjan's father was also interested in science from a young age: he attended science camps at his school, and received a state scholarship in Stds. IV and VII.

Niranjan is an avid reader (mostly of science and technology books) and shows the ability to relate what he has read to his real-life observations. He has a collection of stones, from which he showed the researcher a stone, describing it as a carbon stone. He explained that it had air pockets that made it lighter than other stones. This seems to indicate a good knowledge of geography and physics which he can apply practically.

Niranjan frequently makes careless errors in maths because he works at a high speed; father claims Niranjan is not conceptually strong in maths. However, in a brief informal assessment during the case-profiling, Niranjan demonstrated creative problem-solving ability and a strong conceptual understanding of mathematics.

Niranjan's interest areas, reading comprehension, and memory were demonstrated by his ability to name several fighter planes including Typhoons, Suryakirans, and Sukhois; he can also relate facts about them. When asked what a 'Suryakiran' was, Niranjan made measurements with his feet to demonstrate that a Suryakiran is 19 feet long – demonstrating his awareness of the origin of the "foot" measure. He also showed imagination, comparing a B2 plane to a 'sharp cigar'.

At age three Niranjan began attending a preschool, where he was well-adjusted

and received a lot of encouragement from teachers to explore his interests. In the first year, his performance improved rapidly from "satisfactory" to "excellent." Niranjan was reported to be an independent learner.

He joined his current private CBSE school at age six. He is well-adjusted there, has many friends, and performs at above-average level in academics. However, unlike many peers, he has not enrolled in special classes and has been following the routine curriculum. Niranjan finishes his classwork ahead of peers and is free when the rest of the class is working on a task. He tends to get restless and continuously bombards the teacher with questions. There have been instances where he was punished, as his questioning was disturbing peers who were still working. This suggests that Niranjan probably functions at a higher cognitive level than his peers and does not receive adequate stimulation at school.

Niranjan is active in school extracurricular activities and has represented his school in a national Spelling Bee contest.

Prenatal and postnatal history were normal. Niranjan was born via caesarian section. Birth cry was present and birth weight was normal. APGAR scale score was 9.

Niranjan achieved developmental milestones on schedule. Speech development was normal.

Niranjan enjoys good health overall and seems highly energetic and agile.

At age three, Niranjan started showing an interest in reading. Teachers reportedly did not have to help him much; parents also never regularly read to him. Niranjan was a precocious reader, demonstrating interest in material beyond his age. His reading comprehension is also above-average. Since early childhood, most of his leisure time at home has been spent reading, rather than watching television or playing with peers. Parents facilitate his reading by taking him to bookstores frequently. Niranjan has his own substantial bookshelf at home. His reading seems self-initiated and self-directed.

Also around age three, teachers noticed Niranjan's drawing ability and recommended that he should be further encouraged to draw. Even in Pre-primary I his drawings were found to be very neat, with good clarity, accurate depiction of shapes, and mature colouring. Niranjan draws extensively and appears to use drawings primarily to explore concepts he is reading about, e.g. the structures of trains and ships. His drawings have become progressively more detailed, as well as showing improvement in lineament, perspective, and proportion. He also shows the ability to criticise his past drawings and point out defects, demonstrating positive perfectionism (high standards) and a self-challenging nature.

Niranjan's longstanding interests are vehicles, especially trains and planes; and general science including geology. He has won school prizes in creative writing, recitation, show-and-tell, and science quiz, demonstrating wide interests. Past interests include paleontology.

Niranjan appears to be a cheerful, mature, self-confident, uninhibited child. He is reportedly confident about public speaking and oral competitions. He is well-mannered, manages

his own activities including homework and independent reading, and is responsible about his belongings. He is charismatic and appears highly skilled in showmanship and interpersonal communication. On one occasion he exploited these characteristics to impress his peers and secure the highest marks in a class show-and-tell activity with a simple pencil-box exhibit. His understanding of social relations also seems advanced. He is sensitive to others' feelings; avoids getting into fights and can handle potential aggressors tactfully; and expresses guilt when he upsets his parents. He also reportedly expresses deep concern for plants and animals. On one occasion Niranjan created an advertisement reading "House on rent – only for geckos and their friends". This not only seems to show his concern for animals, but also his imagination and sense of humour.

Niranjan appears well-adjusted and highly-functioning in different environments, apart from slight problems at school resulting from his advanced cognitive functioning.

Niranjan appears under-challenged at school and this may become more of a problem as he grows older. Future mentorship could supplement his independent reading and exploration. Meanwhile his parents could be advised about enriching his curriculum.

Kusum Singh and Vimal Singh

Kusum Singh is an 11-year old child of a day-wage labourer in Lucknow who received media attention for having graduated Std. XII at age 10. She holds the Limca Record for youngest Matriculate in India at 7 years 3 months. During Kusum's case-profile interview, her brother Vimal, age 18, was also identified as having advanced ability – he secured a Bacherlor's degree in Computer Administration at 14 years. Both children were profiled. No other cases of superior intellectual functioning or psychological disorder were reported in the family.

Kusum and Vimal's history was difficult to unravel for several reasons – including poorly-educated parents, linguistic barriers, and differences in social class and position between the researcher and the family that was a barrier for rapport building. Despite attempts to understand how Kusum and her brother developed their abilities, the family repeatedly expressed the view that any child could achieve the same with dedication and effort.

Vimal and Kusum were born at home. Developmental trajectories and early childhood health were reported to be normal. Therse is no medical record of the children's perinatal or early childhood history.

Both children demonstrated preocious language skills. By preschool age Vimal, according to his father, knew five languages: English, Hindi, Sanskrit, Urdu, and Bengali, picked up from the neighbourhood. Father would read and recite the Ramayana at performances at his village. Vimal at age three began doing the same and was noted for his performance. Kusum started speaking at one year and learnt the Hindi and English alphabets at age 1-1½ years. Kusum started reading by 2 years 8 months; she has always managed her studies mostly on her own, using Vimal's notes and available books.

Kusum was admitted at age 5½ to Std. X in a private state-board school; she was home-

schooled till then. The school management was impressed by Kusum's abilities; the school was accomodating and Kusum adjusted well academically and socially, only facing some practical difficulties such as being too small for the desk-chair meant for older students and answering lengthy question papers. Kusum scored 59 percent in the Std. X and 63 percent in Stds. XI and XII. According to her school principal, Kusum should have scored about 70 percent but for her slow writing speed. Currently, Kusum's Zoology teacher at college reports that further improvement in her writing speed is needed for Kusum's exam performance to reflect her subject knowledge.

Vimal was admitted to a private school in Lucknow directly to Std. V at age five. He then progressed through school one standard at a time, and graduated Std. XII at age 11.

Currently Kusum is pursuing a Bachelor's in Science, with Botany, Zoology, and Chemistry from a private degree college in Lucknow. Vimal is not currently enrolled in any course and seems disillusioned with formal education. He cleared the Scholastic Aptitude Test (SAT) and the Test of English as a Foreign Language (TOEFL) and secured admission to colleges in the United States of America to pursue higher education. However, due to financial difficulties, he was unable to go abroad. He enrolled for Bachelor's in Comuter Application at Lucknow University at the age of 11 years and finished the course at age 14. He then enrolled for an Master's in Computer Application at the Indira Gandhi National Open University (IGNOU), but abandoned it due to certain procedural delays. He spends up to 18 hours at home on the computer, reading about various topics as well as trying his hand at some programming and research.

Some of the strategies and abilities reported by the children and other observers that may help explain their intellectual achievements are as follows:

1) Kusum and Vimal claim that all subject curricula are designed in a *step-by-step, graded manner*, making it easy to master the material at one's own pace. They claim that this is a feat all children are capable of, and that the only reason why other children may not actually do so is because they have distractions or have other goals. Kusum tackles material by first *reducing it to a simple form conducive to learning*. She is able to learn efficiently using her own strategies; she can also judge which strategies are appropriate to what kind of material. E.g. Kusum explained that some concepts such as life-cycles can be easily studied using *concept-maps*, while other concepts may be more difficult to represent in this manner and require other strategies.

2) Teachers and Kusum's principal reported that Kusum was *persistent in understanding concepts fully* and *clarifying any doubts* she had on the details of lessons. Kusum's teachers and parents reported that she was very *hardworking*; she would stay up to study up till 3 a.m. Kusum's current Zoology teacher reported that she shows accelerated cognitive development, with *good memory and a long attention span*; and that while Kusum took some time to learn a new concept, she was perserverant in her efforts. Kusum's principal reported that she could learn in three days concepts that took other children fifteen days, despite her age. She adds that Kusum had good memory and

grasping power, and needed to read something just once to learn a concept.

3) Both siblings report that they *learned subjects practically, using models and diagrams, and by observing concepts at work in the environment*. They reported that these methods facilitated their understanding of topics. Kusum's school principal reported that Kusum would bring flowers, roots, and fruits to class, relevant to material being studied in Biology. Kusum would also associate information about the skeletal system with her own body and try to count her ribs. This indicates her high degree of interest in the subject and in understanding it practically. Since early childhood, Kusum has been using music and song to learn at home. Kusum's principal, teachers, and parents reported her novel way of learning the periodic table – using the *dholak* and singing along the elements of the periodic table.

Kusum has a good attention span; early in school, she would become bored or lose interest easily. Due to her age, they would allow her small breaks and teach her in a *play-based method*.

Kusum's principal reported that Kusum preferred to learn concepts via practical application and asked a lot of questions that were difficult for the teachers to answer. Kusum can also draw her own novel connections and associations from material learned. For example, when taught about the food chain and the role of sunlight in food production, Kusum reasoned that human beings cannot produce their own food because they lack chlorophyll.

Further evidence exists of the children's *practical intelligence*. The principal and parents reported that both children were alert to the dangers of ingesting prescribed medications without first understanding their composition and effects. The children preferred not to consult doctors, as many doctors prescribed fake medicines.

4) Kusum reported that the reason she was able to remember so much material was because she learned things by *trying to understand them*, rather than by rote. Kusum reasons that the time pressures on teachers complete the syllabus within limited time is the reason teachers encourage most children learn by rote. Her biology teacher reported that Kusum used conceptual understanding for 80 percent of higher-class material, and rote-learning for the 20 percent of material that was not liable to practical demonstration.

5) Vimal reports that he educated himself about hardware and software (he knows several programming languages) on his own by *observing* students at a nearby computer institute. He judged that the computer institute was not providing adequate knowledge about machine language and codes; therefore he started exploring computers on his own, and has been able to gain a lot of knowledge in this fashion. This course of action suggests that Shailender excels at *vicarious learning and at inferential reasoning* – enabling him to progres rapidly in academics and other areas of interest.

6) Teachers report that Kusum had *excellent reasoning capacity* and could grasp minute details.

7) Kusum reported *making adjustments in her learning strategies* depending on the topic.

When topics are interesting, she claims, they are easily understood. Thus, she reasoned, one cannot adopt a timetable to study: as one needs to study according to what one's inclination. She reported that the strategy of using a timetable to study had failed for her despite several attempts. Kusum has an *astute assessment of her own abilities*, which helps her optimise her learning potential through appropriate strategies. For example, she realises that attention span only lasts about half an hour, and that she needs to take breaks. She was able to identify which topics were difficult for her (e.g. the gastrointestinal system); this knowledge helps her adopt material-appropriate learning strategies.

Another example of Kusum's high metacognitive skills occurred during one of her media appearances. A 70-year old vegetable-vendor, who had attempted the Matriculation exam and failed, asked Kusum how she had managed to pass the exam. Kusum advised him with clear-cut study strategies. She told him to prepare answers for six one-mark answer questions per day while he was selling vegetables. She then calculated the number of questions he would be able to learn in this manner over 365 days, and showed him how this would ensure that he secured the minimum number of marks required to pass.

8) Both siblings efficiently *use multiple sources of information in their studies*. Kusum used a combination of her currently prescribed textbooks, her twelfth standard books, and the internet to study the portions.

9) The children's capacity to grasp knowledge *may have genetic basis*. Both parents, despite being poorly-educated, have been able to grasp some of the children's lessons. The father reports that hearing Kusum recite the periodic table, he too learned it – he demonstrated this by reciting a portion of the periodic table. Mother has learned to read Hindi and English and can now also write certain basic words such as her name. Father astutely remarks that lessons involving around stories are easy to grasp because of common themes and similar patterns.

Kusum and Vimal have received and occasionally benefited from media attention; they have received sponsorship from, among others, the Tokyo Broadcasting Service, Prime Minister Dr. Manmohan Singh, the Shiromani Gurudwara Prabhandak Committee (SGPC), and a collection organised by The Deccan Herald. At the same time, parents appear wary of attention: previous experiences with media have led them to fear exploitation of their narratives for commercial use. Parents also support Kusum's goal of wanting to be a doctor and are cautious about her becoming channelled into other pursuits including research. Parents and Kusum are willing to give up good scholarship opportunities and programs such as KVPY as they have firmly decided that all her efforts will go towards preparing for and obtaining permission for admission into a medical course.

Vimal is ambitious and wants to make a mark through his work, but is wary of joining the research environment. He also shows some signs of unrest and disappointment with himself as he is unable to achieve all his goals, partly due to financial constraints. He reports that he prefers pursue 'passive' research on his own, since in 'active' research one is dependent on funds and is thus in a sense controlled by the funding

organisations. He argued that academic circles are largely dominated by this kind of research, which he felt to be fruitless. Though a loner, Vimal appears otherwise a mature and self-reliant teengaer.

Vimal and Kusum would benefit from a sensitive mentor and fruitful opportunities for research in a conducive environment. Vimal in particular lacks appropriate intellectual stimulation and company. It is important to challenge his abilities in research via an understanding and responsive mentor, as Vimal shows great passion for research.

Hamsa Ajay and Hari Ajay

Hamsa Ajay is 5 years and 5 months old, attending a Montessori preschool. Hari Ajay is 10 years 8 months old, attending a small alternative school. Hamsa and Hari Ajay are from an urban upper-middle class family.

Hamsa was delivered via C-section. Hamsa was reportedly a healthy baby.

Mother underwent a lot of stress during Hamsa's early childhood, as they had recently moved out of a joint family setup, to which mother had been accustomed. Hamsa is a very demanding child who needs a lot of attention. During Hari's birth, by contrast, mother had the support of the joint family. Mother felt that she may have not been emotionally present for Hamsa during her early childhood.

Hamsa's early milestones of development were reported to be normal. Hamsa started walking when she was less than a year old. At about this age, Hamsa once wandered into the kitchen, pulled out some tupperwear boxes, and used them as a ladder to reach the counter to get something she wanted. This seems to indicate precocious gross motor development and physical dexterity as well as precocious problem-solving ability.

Hamsa learnt to use the knife at the age of 2½ years. Hamsa's ability to cut vegetables with a knife at that age indicates advanced fine motor development. Once Hamsa cut her finger while chopping vegetables; however after the wound healed, Hamsa continued to handle the knife without fear, but with care. She was determined to continue her activity of interest.

Parents also reported that her linguistic abilities were advanced; she was able to recite rhymes such as "Johnny Johnny Yes papa" at about 1 year 8 months and had a large expressive vocabulary. She could read short words by 3½ years.

Hamsa also demonstrated good grasping power and comprehension ability. Especially notable was her attention span. She could reportedly concentrate for long periods (up to an hour) by 2½ years to finish puzzles. At age two, Hamsa sat for about one hour in order to complete a 70-piece puzzle. (The standard attention span for 2 -3 year old is about 3-5 minutes on individual activities and up to 10 minutes on group activities).

Parents report that Hamsa was able to solve 50-70 piece puzzles by the age of 2½ years and had graduated to 100 piece puzzles by 4 years, and was able to solve 200 piece puzzles from age 4½ yrs. It appears that Hamsa's spatial reasoning skills and perseverance are advanced.

Hari started reading late. But he is an avid reader and reads widely. He also learnt chess early and showed a keen interest in it.

The children's paternal grandfather was the Director of Treasury in the Karnataka Administrative Service. He was an eminent person, very well-educated and was a man of great integrity, well-networked and good at getting things done (practical intelligence). Their paternal great grand-father was a researcher at the Indian Institute of Sciences in sound engineering. The children's maternal grandmother was a talented musician. There is no pertinent history of medical or psychiatric illness in the family.

Hamsa has attended a Montessori since age 1½. Hamsa is reportedly often bored at school as she had already mastered the tasks.

Hari started school at 1½ yrs and at a private, elite ICSE school till age six. He then joined an alternative school. At this school, teachers pointed out to parents that Hari was an emotionally precocious child. He was extremely quick at adapting to the unusual school routine, which requires that children stay for two days at school at a stretch and return home for two days. Hari may be more independent and adaptive and socio-emotionally mature than peers.

Hari enjoys sharing knowledge. When he was taught origami and how to make paper planes at home, he taught it to many kids at school.

Both children are healthy. Hari had a bed-wetting problem until recently, which his father attributes to his strictness about homework. His mother reports that he shows nervousness and tenses his face, particularly when Hamsa shouts to get her way. Thus, he seems to be a highly sensitive child.

Hamsa shows interest in several activities. She continues to read independently every morning, and wants as many as four stories read to her per day. The books range from Noddy, Toy Story series, Amar Chitra Kathas, to encyclopedias on wildlife, dinosaurs, trains, etc. According to her parents she shows a lot of curiosity and asks many questions, including meanings of unfamiliar words.

She is interested in physical activities, and loves to cycle and skate. She also follows cricket. According to her father she understands the technical aspects of the game well such as how the scoring is done. She knows all the IPL teams, their captains and the colour of their jerseys. As an example of her interest and understanding of cricket, her father reports that she had once commented to him saying "You'll be happy if Malinga is in RCB right? Then they'll get a lot of wickets." This seems to indicate that she may have an understanding of who was a good bowler, and may also been aware of Malinga being the highest wicket-taker in IPL. This may suggest that she has high associative memory and logical reasoning ability.

Parents and preschool teacher report that Hamsa has high ability to learn from observation. Hamsa reportedly learnt to skate and swim by just watching her brother and her mother. Mother reports that this is because she is intensely competitive with her brother.

Hamsa reportedly has excellent memory for tunes and sounds, and is very good at grasping

jingles she hears and imitating different sounds. Hamsa's playschool teacher also reported her musical ability. However Hamsa does not participate in singing or dance at school.

Hamsa is very selective in interacting with people. Hamsa seems to get along better with older children and does not seem to be able to connect with her age group. Parents also report that she has a strong sense of territory and is insistent on her rules being followed during games; Hamsa used to make up her own rules even for board games. Hamsa seems highly assertive and dominant.

Hari too is very physically agile and has a lot of endurance. He reads fiction and encyclopedias avidly. He reported that he enjoyed most subjects at school.

Hari also seems to be good at social reasoning and has good episodic memory. (Episodic memory may also be strong in Hamsa, since her mother reports that she remembers almost all details about her trip to Sikkim when she was just 2½ yrs). Hari's father reported that when he is reminded when he is angry to talk gently or politely, he immediately reasons with him that he too (i.e. the father) had lost his temper on a particular occasion and had not been polite. He also reasons with his parents about their conduct saying "Shall I also send you to the balcony when I'm angry?" Further he has been able to understand that his mother and he don't share the same intellectual rapport that he shares with his father and has so told her that while he is very fond of her he can't "get along" with her (intellectually).

Hari creates stories and cartoon strips.The observer read two of his stories which showed creativity, realism, and imagination.

Hari is reportedly very good with children and handles them very well.

Hamsa's Montesorri teacher reported that she exhibits maturity beyond her age; the teacher claimed that anyone who spent a few hours with Hamsa would see this. She also reported that she had clear understanding about concepts such as death, and about the reasons why religious and secular festivals (e.g. Independence Day) are celebrated. The teacher attributes this advanced understanding to knowledge to training at home. According to her, Hamsa's conceptual understanding is strong, but her learning speed is average.

The teacher reported that Hamsa was not interested in writing or even in performing tasks; she preferred to acquire information orally. In terms of analytical abilities, teachers did not corroborate parents' information regarding Hamsa's speed, perseverance and ability to solve puzzles. However, the school had only very basic-level puzzles (Parts of the Body with thumb-tacks attached); this *may* be why Hamsa's reportedly high puzzle-solving ability had not been noticed at school.

Teacher mentioned that Hamsa's vocabulary was excellent, but again attributed this to Hamsa's privileged home environment and parental training.

Teacher corroborated parents' report that Hamsa is moody and unsociable; however Hamsa has

recently been gaining social skills. She exhibits good managerial abilities when occasionally asked to teach younger children. She also spontaneously helps a physically challenged classmate to move around.

Hamsa was observed at play with a friend. Hamsa liked to set the rules of the game and gave roles to the others involved in the play with her. She was also creative and imaginative and was able to use different toys she had imaginatively to substitute for objects she required for play (for e.g. a small plate as a chimney grate). She also creatively built up a narrative in play (in which she was the 'mother' and had to cook food for her daughter.

During informal assessment, Hamsa showed erratic application of phonetics to spelling unfamiliar words. On maths she showed ability to do addition and subtraction very fast. Though on her own she was not able to solve a sum given in the following format – "7 _____ = 4" – she was able to quickly grasp the logic when asked "to go from 7 to 4 what must we do?" She was then able to answer "We must close fingers", and apply the strategy and arrive at the right answer. This again demonstrates her reasoning ability.

Hari appeared to be a friendly, quiet and cheerful child. Hari was asked to demonstrate his ability in language by spelling "ambulance". Initially he appeared diffident and said he did could not spell it. When encouraged to listen to the sound and spell he was able to spell it. He was also quick and accurate at solving synonyms by relating and examining four words to match words that are the closest in meaning (e.g. 'horrible, good, delightful, big'). This seems to indicate that he may have logical reasoning ability since the words do not directly match (i.e. good does not exactly mean delightful). When given some maths problems to solve, he was quick, was able to mentally solve the problems and was accurate (e.g. comparison of quantities – 48 is less than 16+14; marking quantities on a scale – 175 gm, 200 ml, etc.).

Hari is interested in experiments. He has tried experiments on dynamo, sound, energy, etc. He has a strong interest in nature and wildlife and has spent time with a researcher at Agumbe research centre on his own. He is also interested in strategy games.

Hamsa may benefit from being involved in interactions with children of similar age and ability. Parents have tried in vain to find suitable companions for Hamsa. Hamsa's advanced cognitive development seems to have outpaced her socioemotional development, making this task difficult. Developing a network of children and parents is an area the Gifted Education project should address.

Hari may benefit from exposure to science experiments, visiting environmental and wildlife programmes/stations, and workshops in science and maths. Since his predominant interest seems to be nature, he may also benefit from mentoring by Prof. Anindhya Sinha at NIAS. It is also recommended that he enroll at the weekend science workshops conducted by Dr. Bama at IISc.

Manoj M.

Manoj is 3 years 4 months old, studying in preschool. He is from an urban well-educated upper-middle class family.

Manoj was delivered via caesarian section. He was 15 days premature, and was placed in an incubator for 3-4 days.

Early milestones of development were normal. Birth cry was present; early feeding was normal. Manoj could sit by five months and walk without support by 13 months. Mother reports that at six months he showed early signs of imitating noises such as that of airplanes; speech was present by one year.

At about eight months mother started teaching Manoj using flashcards. Later she used picture-cards to teach him the names of objects and words. At nine months she started teaching him to identify numbers using dots. At this age he was able to associate learned words with pictures, and to identify the flashcard containing the word spoken by the mother. This suggests that Manoj had good memory. His ability to identify the right card for the words spoken may also indicate good early cross-modal memory. By the age of 1 year 3 months Manoj was reportedly using the words taught in meaningful sentences and in context. Mother reports that at present he can correctly use his advanced vocabulary to create sentences (including words such as "ceiling", "glass", and "handsaw" which are not words that parents use with him in daily interaction). Manoj learned quickly, and could correctly use in a sentence a word learned earlier the same day. From picture-cards, mother has now moved on to teaching Manoj using story-books, the Times 2000 Words to Start With, and the Book of Inventions.

Parents also report that Manoj shows felicity with language: he can speak Tamil and English and is now rapidly picking up Hindi since starting school three months ago. During the interview, Manoj demonstrated his knowledge of Hindi and English by interchangeably using the two languages with correct grammar.

Mother reports that Manoj is interested in reading from his storybooks. He appears to be able to 'sight-read' and according to the mother can correctly recall the next word that will appear in the sentence of stories he is familiar with. During the interview, he was able to identify the word 'Encyclopedia' on the cover of a familiar book.

Family history does not seem to be significant. to any disorder.

Prior to commencing play-school, mother taught Manoj at home. She reports that she would teach him for just five minutes, three times a day. She taught him addition, subtraction, and multiplication; the concepts of singular-plural and tenses; places on the map and capitals of countries; world inventions, spellings, the meanings of about 2000 words, important events in world history, important abbreviations, etc. Manoj knows the periodic table up to 7A and multiplication tables up to 7s.

Since starting school, where the emphasis is on letter learning and number recognition, mother reports that Manoj has lost practice in addition, subtraction, and multiplication but that he is still fluent in singular-plurals, past tense,

spellings, word abbreviations, country-capitals, and places on the map. Further, she reports that he can correctly add participles to transform verbs for use in sentences (e.g. 'saw' – 'He is sawing'). She also reports that he knows some important measurements such as 10^{-6} (micro), 10^{-12}(pico), etc. Mother also reports that he loves the 'Encyclopedia of Awesome Nature' that was presented to him by a family friend, and asks her to read to him from it everyday.

Manoj is currently enrolled in nursery at a private CBSE school.

Manoj reportedly enjoys learning. During his free time he makes airplane models and airports with blocks. It was observed that he was also able to create a model of the solar system using a set of coloured balls on a circular tray. When asked about the choice of balls for depicting particular planets he was able to provide reasons such as the biggest ball being Jupiter, the biggest planet; the orange ball being Mars, the red planet, etc. However, mother admitted that she had once previously shown Manoj this model. Once again, Manoj's good visual memory probably enabled him to recreate this model after seeing it once. Manoj has created other models with his toys on his own: such as a model of the Republic Day Parade after seeing it on TV. This is probably indicative of his observational capacity as well as creativity.

Manoj is also fond of sports, particularly cycling. He likes to play with other children, though there are no children of his age near his home.

Manoj was described as being curious and asking questions such as "Why do birds fly" (at the age of two years), "Why is the sky blue", etc. He can now provide answers to these questions and also explain concepts such as the big bang theory. He also asks questions about observed objects or phenomena. For example, on seeing a pylon, he asked his mother what it was. When his mother explained that it was a pylon, he observed that he had seen many pylons in the buildings nearby.

Mother reports that he is also good with locations; he can give accurate directions and can navaigate his way around the neighbourhood. He demonstrates keen interest in airplanes and helicopters; he can identify their components, as well as the logos of different airlines. Mother reports that he has stated his desire of becoming an astronaut, because "astronauts do research in space" which is what he wants to do.

Mother reports that he seems to have good visual memory and can recall personal details such as which clothes he wore on a particular occasion six months ago or more.

Manoj's mother has shared with us several videos of Manoj, in which it can be observed that he is able to recite capitals, inventions, and word abbreviations. However, both while interacting with the child as well as from the videos, it appears that the child has acquired this information via rote memory, as he relies on the sequential order of presentation of the questions. During the observation, when his mother asked him to name the inventor of airplanes, Manoj answered the question and continued to call out a series of other inventions and inventors, which turned out to be the list printed on a page in the book the mother uses to teach Manoj.

Manoj displayed his knowledge of maps by identifying two countries (the United States and India) in the atlas correctly; he made mistakes when asked to identify certain other countries. This may be due to his excitement at having a guest home, and in being more interested in playing with the guest rather than demonstrating his skills. He similarly showed reluctance to demonstrate his knowledge of capitals, singular-plural, and word meanings, and his mother forced him to 'perform' in front of the researcher.

Manoj may have good auditory and visual memory that helps him recall vast amounts of information. Also, he may also have a high ability to note details and to form associations. Parents report that he identifies geometric shapes in objects around him (e.g. the rectangular shape of the table). Another example of his ability to notice details emerged with respect to the aquarium parents have at home. Parents report that Manoj notices details such as when a fish dies, when there are new fingerlings in the aquarium, etc. and brings it to their notice. As well, his associative memory was observed when he pointed to a model of the school building, kept at his school in a glass box, and called it an 'aquarium'.

Manoj demonstrates good social skills and understanding of social situations, such as being able to introduce himself to people, and asking for what he wants at shops. Mother reports that he has told other parents in the park not to carry their children, as their children need to learn to walk and run on their own. When his mother tried to pull away a pen he was scribbling with, and to direct his attention to the work she wanted him to do, he reprimanded her, saying, "What are you doing? You should not do like this. The pen will break!"

Mother reports that social shows no fear of people, heights, or new situations and is not afraid to try new things.

Manoj's pre-nursery teacher reported that compared to other children Manoj is quick at grasping and that he talks a lot. She reported that when he joined the nursery about three months ago, he was unable to recognise the letters of the alphabet. However, he learned to do so within 2-3 weeks, whereas children typically take 2-3 months. She also reported that parents had informed her during his admission process that Manoj was able to spell words and tell the capitals of 90 countries. However, the teacher questioned his spelling ability, asking "How can he spell if he could not (at the time of admission) recognise letters?" As noted earlier, Manoj's spelling abilities may be a result of his excellent auditory memory, allowing him to store the spellings as a pattern of sounds, in the absence of knowledge of letters.

The teacher corroborated parents report that Manoj showed fluency in multiple languages. However, the teacher volunteered her opinion that there were other children in the class who were brighter than Manoj. She reported that Manoj did not have associative thinking skills and that his abilities were probably due to the efforts of his parents in teaching a child with an average-to-above-average IQ. With respect to his social behaviour, the teacher reported that he was friendly and did not get bored in class.

Manoj's school assessment report showed that he had scored A+ in most areas including numbers,

alphabets, object recognition, counting, and action words; an A in General Knowledge (fruits, means of transport, the seasons, the days of the week); and a B+ in colouring. His colouring appears to be hurried and careless.

Manoj is a friendly, cheerful, and energetic child. He mingles easily with people and has a good command over English. He appears to be quick at learning and also demonstrates good auditory and visual memory. He enjoys repetitive activities such as twirling around making airplane noises, scribbling, and repeating words heard. He is socially intelligent; he shows understanding of socially approved behaviour, and adjusts his behaviour according to the expectations of his audience. He enjoys making models of concepts learnt or observed phenomena, thus showing some degree of creativity. He has a large capacity to learn and retain information. He appears to enjoy books and learning. Due to his age, it was difficult to observe or test for metacognitive ability or synthetic ability.

It is important to note that Manoj's learning has largely been directed by his mother rather than from his own interest. Mother reported that she introduced topics to him, and he then expressed interest in them. It appears that parents have high expectations from Manoj, and are keen on ensuring that he excels. They have made several videos of him demonstrating the abilities mentioned above, and have put these vidoes up on the internet. This may be harmful in the long run, putting undue pressure on Manoj and diminishing his natural enthusiasm for learning.

It is important to channelise Manoj's natural abilities of good memory and grasping power. As a first step, it is important to mentor on how to give Manoj the space to express his interests and channelise his abilities without putting undue pressure on him. Since parents' focus is on developing his rote memory rather than associatve or synthetic ability, reasoning, or analytical skills, they may need to be directed on activities to develop these latter abilities. To this end, it may be useful to put the parents in touch with early childhood educationists and academicians conducting research on gifted children such as Dr. Jyoti Sharma, who may provide guidance on designing age-appropriate activities for Manoj to develop his other abilities. Parents can be introduced to the concept of experiential learning to help them foster Manoj's reasoning and problem-solving skills in his areas of interest.

Pallav Singh

Pallav Singh is 13 years old, studying in Std. VIII of a CBSE school in a metropolitan city. Pallav was brought to our attention by his mother, who identified signs of giftedness. She contacted the Gifted Education team because Pallav has recently been having problems at school. Teachers have been complaining of his behaviour in the last two years, especially in the last six months. Pallav belongs to an upper-middle class family with well-educated parents. He has one 11-year old brother.

Pallav appears to be a socially mature and intelligent teenager. He has high critical thinking skills and refuses to accept rules or statements without logical proof. He prefers novelty and tires quickly of repetition. He demands that material learned be of practical relevance. He shows a gift for independent scientific experimentation.

Pallav was assessed using WISC IV by the psychologist his mother consulted. Pallav obtained a full scale IQ score of 126 (superior intellectual functioning) and scubscores as follows:

Verbal comprehension index : 138
Perceptual reasoning index : 119
Working memory index : 138
Processing speed index : 80

Pallav's specific and comparative areas of strength were:

- Verbal reasoning
- Concept formation
- Sequential skills
- Auditory short term memory
- Attention concentration
- Abstract and categorical reasoning
- Social judgement and maturity

His specific and comparative areas of weakness were:

- Processing speed
- Visual motor coordination
- Cognitive flexibility
- Visual discrimination
- Planning
- Short-term visual memory

Apart from his behavioral difficulties, Pallav appears to be a bright and well-adjusted child. Friends admire his humour, which can be biting and sarcastic. He is adaptable and sociable, self-confident and aware of his superior knowledge and ability. He is described by some teachers as arrogant, and has a history of teasing peers who are not as intelligent, or who stand out for some other reason. However Pallav has recently become friends with a weaker students in his maths tuition class, helping him academically. He has formed lasting friendships with several adults. This is typical of gifted children, who are able to relate well with much older as well as much younger individuals.

At preschool age mother trained Pallav intensively at home, including in phonics. Pallav joined kindergarten at age 4 and did well at school in his early years.

Currently, Pallav's performance is average to above-average in most subjects, but still below his potential. He places around 10th in the class, being laidback in his attitude to academics and reportedly spending very little time studying.

His father, an engineer, used to teach Pallav maths at home. Father reports that Pallav has excellent mental arithmetic skills and is able to solve problems mentally, and rapidly, foregoing rough work. (Pallav's above-average working memory skills as tested on WISC-IV would support this skill.) Since father was transferred to another town, Pallav has been attending maths tuitions since last academic year. The tutor describes Pallav as excellent at mathematics, highly able, and aware of his superior ability. He often uses original techniques to solve problems, which she encourages. As in other subjects, Pallav dislikes writing down steps and doing rough work, dislikes following elaborate procedures, and demands an explanation for every step. This could explain his under-performance in maths at school.

Pallav was a healthy infant and achieved motor developmental milestones close to the median. He showed precocious fine motor control, beginning with being able to drink milk

independently from a glass tumbler at age six months. (His younger brother also learned to do this at the same age.) Babbling was delayed but subsequent speech development occurred on schedule.

Pallav enjoys good health.

Pallav's longstanding interests are physics and mechanics, general science, ships, and the keyboard. His scientific curiosity became obvious at age 7. Once around that age, Pallav asked his father what was the speed of an airplane. His father's age-appropriate reply was, "Something like the speed of sound." Pallav countered, "But sound travels faster – if I speak to my grandfather on the phone I can hear him immediately; but if we visit him on the plane it takes much longer." His father then explained to him that in the latter case, sound is converted into electrical impulses and transmitted; Pallav was able to grasp this concept. Pallav demonstrated, at an early age, the capacity to reason, to be critical, and to relate observations from real life to material learned in in/formal learning situations.

At age 8, Pallav studied fluid dynamics using a pair of cylindrical toy magnets in the bathtub. He remarked that magnets spun differently in water than they do in air. Pallav kept spinning both magnets (which are designed to settle after motion at a set angle to each other). After several trials, he was able to understand that in water, the magnets always finished up at a consistently different alignment from when they were in air.

At age 10 Pallav, in a contest with his brother to build a functional boat, successfully built one using accessible materials. He demonstrated his understanding of physics and structural-level analogical thinking by substituting a pedeal for a propeller, reasoning that both behave similarly in water.

Pallav continues to show high curiosity; precocious observation, reasoning, and conceptual understanding; and aptitude for independent experimentation. He is able to relate practical concepts and observations to science material, and approaches his science teacher individually with these ideas. He has attempted to tackle practically relevant problems such as ways to minimise use of fossil fuels. Pallav uses the internet to learn new skills and concepts. He often creates practical demonstrations at home based on science concepts.

Pallav is an avid reader. He is currently reading Horrible Science, a series aimed at young readers explaining scientific concepts in a concise, child-friendly, humorous format. He has also read The Chronicles of Narnia, Artemis Fowl, and P. G. Wodehouse. On television, he usually watches the National Geographic and Discovery channels. He is not interested in textbook biology but enjoys watching programmes on wildlife – because, he says, they not only present phenomena but explain them as well. He becomes engrossed and even watches repeat shows, an unusual behaviour as Pallav tolerates repetition poorly in general. He also watches sitcoms and serials including Friends and The Big Bang Theory. Parents were advised by the psychologist they consulted that Pallav was mature enough to handle watching these serials which are directed at a young-adult audience.

At school, he is interested in maths, especially algebra, and in science; and least interested in Hindi and Sanskrit. He explains that he dislikes Sanskrit as he cannot see its practical utility.

Pallav demonstrated interest in the keyboard and has been attending a class since age 6. Pallav prefers to learn on his own, but has continued his keyboard class because his music-tutor has become somewhat of a mentor. Pallav's music-teacher at school confirms that Pallav is easily able to pick up tunes by ear and by watching fingerings, usually in a day's time. The tunes he can play include "Ill Be Right Here" from the animated film *The Lion King*, songs by Richard Marx, and many others. He describes himself as playing fluently with the right hand but less able with the left, able to learn a new tune in half an hour.

Pallav appears well-adjusted except at school.

In the last six months, teachers have been complaining of frequent disruptive behaviour from Pallav. He has befriended a gang of miscreants in the class, whom he incites to make fun of teachers. Pallav uses his quick wit and sense of humour to provoke laughter at teachers' expense. He picks on his Sanskrit teacher in particular. He explains that he finds learning Sanskrit to have no practical value, and also describes the Sanskrit teacher as "dumb."

Pallav is frequently punished for his misbehaviour by being sent to the principal's room. The principal reports that this punishment has no effect on Pallav: while other children are terrified of this punishment, he does not mind it and it does not affect his behaviour. Pallav's mother is frequently called in to school about his problems. Due to Pallav's recently exacerbated adjustment problems at school, parents have considered a change of school.

Though teachers unanimously describe Pallav as bright and a fast learner – they also assert that he has been under-performing in school. This is primarily due to his dislike of writing and of the repetition of material and tasks, which he views as meaningless; also, he is energetic and finds it difficult to sit still. He often leaves his work incomplete or does it shoddily; he has also lost marks on exams because he leaves answers incomplete. Pallav seems indifferent to his performance and unmotivated by competition.

In his subjects of interest, Pallav has already read and understood the textbook, and is bored in class; his Science teacher recognises that Pallav needs "something beyond the syllabus," and tries to provide further challenge.

Pallav's behavioral difficulties seem to be centred on particular teachers with whom he has poor rapport and in whose subject he is not interested, i.e. Hindi, Social Science, and Sanskrit. In fact, Pallav has developed a reputation for being a troublemaker. Some teachers suggest that the source of Pallav's behavioral difficulties may be that he has been spoiled at home. Pallav's parents appear desperate for help in managing his behavioral problems at school. They consulted a psychologist, who was unable to help. While parents do not explicitly condone Pallav's misbehaviour, but they be implicitly condoning it. Parents, especially mother, are tolerant of his disciplinary issues at school. Mother believes that his teachers do not understand his ability and his motives (a belief which our interviews with teachers partially confirmed), and also

believes that the fact that Pallav is bored in class to some extent excuses the methods he adopts to relieve his boredom. There is an implicit parental sanction of Pallav's misbehaviour at school, with parents sharing Pallav's view that some of his teachers are not qualified enough or intelligent enough to handle a class.

Pallav has developed friendships with several sympathetic and well-informed adults over time. These are his class-teacher in primary school, his music-tutor, and a family friend, a physicist in his 30s. The former presented an interesting account of Pallav's behavioral difficulties: she claimed that Pallav was capable of behaving well if a) his queries of *why* he should or should not do something were answered logically, and b) if teachers took the time to understand Pallav, gain his respect, and establish a rapport with him. Note that this teacher is now the principal of the primary section (to which Pallav no longer belongs) and has a large knowledge-base of children.

Parents are keen to avail Pallav of challenging activities outside school. To a great extent Pallav demonstrates the ability to find challenging activities on his own. However he could benefit by being linked to a mentor to foster his interest in science and further develop his self-regulated learning skills. A mentor should also attempt to understand and address his behavioral problems at school.

Naveen Iyengar

Naveen's early milestones of development were delayed. Mother reported that she realised he was different from other children at age 1½ years. It was around this age that Naveen showed a great interest for learning. He would try to examine switches, plugs, and other electrical and engineering items and frequently got hurt. To keep him safely occupied, his mother would show him picture books and read to him from them. By two years Naveen was sitting at the computer. Though he could not move the mouse, he would indicate what he wanted to do on the computer. He picked up knowledge at a rapid rate and his mother kept moving to new areas of interest to keep him occupied.

Naveen was reported to have always been curious. He would constantly question his teachers on topics above his age level. Naveen was assessed by clinical psychologists, who put him in touch with a psychologist specialising in gifted children. After formal assessments including the WISC (Indian Adaptation) and the Human Figure Drawing test (HFD), the psychologist informed his parents that he was gifted. Until then his mother reported that they did not know about the concept of giftedness. She then began reading about it. On formal assessments his global IQ score was found to be 133, with a Verbal IQ of 135, and a Performance IQ of 130.

Naveen is interested in chemistry, particularly organic chemistry, because it is very systematic. He reported wanting to specialise in cosmo-chemistry. Naveen maintains a file of inventions and has developed concepts such as a eco-friendly car; an air seat; an all-purpose kitchen gadget that combines options for cooking, microwaving, grinding, etc.; and a techno-city. Naveen doesn't like to play outside or to mingle with age-peers. But he enjoys strategy games, such as basket-ball, on the computer. In school during his free time, he was reported

to sit alone and work out formulae or go to the library to read. He is very sensitive, takes criticism to his heart, and does not easily forget criticism. Mother feels that emotionally he is less mature.

Naveen started playschool at two years, and Lower Kindergarten at three years, in a state-board school. By four years he had problems with the state-board school since his linguistic ability was very good and he would write answers in his own words. Since the state board expected rote answers, Naveen would lose marks and would argue with his teachers. Hence, at five years, parents shifted him to another private state-board school. At eight years, in Std. III, Naveen was again shifted to a private school with ICSE syllabus.

He topped his school in the National Cyber Olympiad and placed 4th in the All-India National Science Olympiad. He also appeared for the Maharashtra State Scholarship Exam. Midway through fifth standard, parents shifted Naveen to another ICSE school, due to certain difficulties in adjustment. Naveen's teachers at this school then suggested that his mother to go to the Institute for Psychological Testing for an assessment of his abilities. Naveen was tested on standardised psychological tests and his IQ was found to be 135.

By sixth standard, even though Naveen was doing fine, he was very bored with school. His mother was tired of changing schools. His school itself started the IGCSE syllabus that year, and his mother tried to find out more about it. She was very impressed by the style of teaching in the IGCSE syllabus, and Naveen was shifted there, since it was more practical and less based on rote learning. He was much ahead of his peers and was allowed to skip a grade. Subsequently Naveen was shifted to another international school following the IGCSE syllabus and was placed in the tenth standard at the age of 14.

Naveen was reported to have always been curious. He would constantly question his teachers on topics above his age level.

He excelled at and enjoyed a number of activities such as painting, drawing, craft, music, calligraphy, and sewing. He would spend his holidays learning new things and attending new classes. Only sports took a backseat because of health-related problems. Naveen has been constantly attending different classes to keep himself occupied. He has completed the Trinity College keyboard classes, guitar and violin classes, Carnatic music classes, and computer courses in hardware and software among others. He has also completed the IIT-JEE PACE course to prepare for the IIT-JEE exams. He found the last course most challenging.

He has participated in several Olympiads, and has attempted the Homi Bhabha Olympiad conducted by the Homi Bhabha Centre for Science Education, securing the second rank.

Though Naveen has never had behaviour problems at school, he has always had peer issues. He would not interact with his class-mates as he felt that no one wanted to listen to him. He got on better with younger and older children. He constantly shifted schools, and he had adjustment issues due to his accelerated capacities.

Naveen was always comfortable with his mother and is highly dependent on her.

Naveen is a very sensitive child. His mother said that things have to be put to him very carefully. For example, he hates public speaking and is poor at it. When one of his teachers told him that he was not good at it, he immediately fell ill and came home sick from school.

Naveen has many innovative ideas, which he wants to transform into reality. He would benefit tremendously from mentorship. His mother reports that the family had written about his ideas to Ratan Tata, who initially responded asking for more details, but then the correspondence had stopped midway. Naveen's mother had also tried to contact Infosys and BARC to find mentors for Naveen, but finding mentors for Naveen was difficult. Naveen is reluctant to share his ideas with others as he feels they may steal his ideas. For a child like Naveen, consistent and reliable source of mentoring would help alleviate adjustment issues, and foster his exceptional talents.

Sandeep Iyer

Early milestones of development were accelerated. Sandeep achieved neck control at 2½ months; never crawled; stood without support at seven months; and walked without support at eight months. His mother reported that he never used supports when sitting, standing, or walking. His mother also reported that Sandeep showed no 'baby talk' and was directly naming and asking for objects by one year.

He competently followed three languages at 1½ years – English, Kannada, and Tamil.

Sandeep has always shown keen interest in Maths. He likes to learn new things, and becomes bored with repetition. He is able to complete 70 sums consisting of addition and subtraction of a series of large numbers within five minutes. He had recently won the third place in an International competition in ALOHA and was appearing for another competition in Malaysia in August. Sandeep was also selected among several students by INFOSYS under the 'Catch Them Young' programme for special training in Maths, Science, and Mental Abilities.

During the case-profiling, Sandeep was able to quickly solve three Maths puzzles furnished by the investigator. One puzzle involved arranging numbers from 1 to 8 in a square grid so that no two consequent numbers appeared together. Another puzzle involved arranging numbers from 1 to 9 in a square grid such that all rows and columns added up to the same total. The third puzzle involved using four numbers with a combination of arithmetic operations to get results from 0 to 83. On the final problem, Sandeep was able to get results up to 45. On the Pattern Drawing test, Sandeep was able to solve all the patterns in under a minute.

Sandeep started formal schooling at 4 years, at a private urban CBSE school. Parents reported that since the school and the CBSE board does not allow for early enrollment, Sandeep was not enrolled in school earlier. Sandeep has therefore had no history of acceleration or enrichment within or outside school. Mother reported that the school was not even aware of Sandeep's abilities. Parents have not had an opportunity to speak to Sandeep's teachers about his abilities and progress, since the school did not encourage parents to meet teachers.

Sandeep has always placed within the first five ranks at school.

Sandeep's interest in Maths became evident to parents in UKG, when he was fascinated with addition and subtraction. After he mastered addition and subtraction with ease, his mother taught him multiplication tables. She informed us that he was able master tables from 1 -10 within a day. Currently, Sandeep knows tables up to 10,000. Due to his great interest in numbers, parents put him into the ALOHA Speed Maths programme. Sandeep completed all 8 levels within 2½ years, the typical span for children to complete the course.

Sandeep seems to be a perfectionist. Parents report that from a very early age he has been very particular about order and cleanliness, and about presenting his work neatly. He is systematic and organised and insists on following his own rules of organisation. Sandeep is also extremely self-conscious. He does not like to display his awards at school. At the same time, he feels it is very important to be among the top and to excell at school and in competitions. His mother reported that he becomes upset when he falls short of his own expectations.

In addition to school Maths, he has a knowledge of the ALOHA method and of Vedic Maths. He is able to recite tables up to 10,000 and to solve problems related to cubes and cube roots. He is also able to decide which method to use to solve a given problem efficiently and quickly, and is able to explain his choice of strategy.

His mother reported that Sandeep had a very high reasoning ability. Even if a sum was targeted for older children, he would try to solve it. He is able to analyse an argument from all sides. Sandeep is self-motivated and creates his own timetable for study. He appears to be motivated to learn and does not rest until he has mastered a topic. His mother pointed out that he made an effort to find answers to questions he did not understand. Sandeep is also motivated to pursue sports. Sandeep also seems to have a good memory and can retain large amounts of information. He is a quick learner and uses his visual memory effectively to remember details in his lessons. Sandeep seems to be very curious and asks many questions.

Teachers reported that Sandeep was a slow-to-warm up child, but when pushed a little takes up any activity with enthusiasm. He loved to read and was good at science projects. His teachers observed that he is able to apply what he learns to outside the class.

Even though Sandeep performed above his age level, his teachers reported that he was not disruptive in class and did not have any behaviour problems. However, his present academic coordinator mentioned that Sandeep was possessive about his knowledge and did not share it with others. She also felt that he did not take the initiative to have discussions with his teachers related to his additional knowledge. This may be because of the very formal and strict atmosphere of the school. The coordinator also reported that Sandeep avoids taking relationship responsibilities.

Sandeep appeared to be a calm, level-headed, sociable, and well-behaved child. He has a great interest in numbers and other activities involving analytical thinking. He likes to read, likes to play with numbers, and has a great

interest in biology. He has good logical reasoning ability. He is independent and methodical and makes elaborate and systematic plans. He is persistent, likes to learn new things, is curious, and likes to try out solutions independently. He is well-adjusted with his peers and teachers, and shows no disruptive behaviour. However, he is self-conscious about his abilities and does not want to antagonise others by showing off his abilities. He also does not want to take up responsibility despite having good leadership skills of planning and reasoning. He appears to be socially mature. Sandeep will benefit from more intense exposure in higher level science and maths.

Ganeshan

Ganeshan is 15 years old, and has just completed Std. X.

Prenatal and postnatal history were reported to be normal. No signs of precociousness were noticed by parents.

When Ganeshan was about 9 years old he met with an accident while cycling, suffering temporary amnesia. Because of this incident, parents do not still allow him to go out or to do things by himself.

Ganeshan's abilities were only noticed at age 7, when he was able to learn 40 Thirukurals by rote and placed first in a competition involving same-age children from 42 different schools. This was when his father identified his ability to learn by rote and to retain information, and began teaching Ganeshan all the Thirukurals. Between Std. III and Std. V, Ganeshan mastered all 1,330 Thirukurals. His father also taught him to name all the world capitals by the age of 11 years. His father then taught Ganeshan to identify, for any date given at random from a 10,000-year span, the corresponding day of the week. On this task, Ganeshan and his father reported working together to identify patterns emerging across the years. Both Ganeshan and his father made contributions in developing a technique for the task at hand.

A memory game that Ganeshan has mastered, with his father's help, is to remember a series of names given in random order each with an associated serial number, and to recall the names in serial order. Ganeshan can currently recall up to 50 names. Similarly, he can simultaneously retain multiple lists of misordered items and recall all the lists in serial order -- indicating a high capacity for and speed of information-processing, working memory, and executive functions.

Ganeshan's father is a bus conductor, and his mother is a housewife. Father finished secondary education and mother was educated up to Std. V in a Tamil-medium school. Ganeshan is the third-born of three children.

Up to Std. V, Ganeshan studied at the a government state board school. He then joined a reputed private aided school. Ganeshan and his teachers reported that he always placed first or second at school, obtaining high marks in particular in Tamil and Maths. Ganeshan was not accelerated at school; father reported that as a rule double promotions were not offered by the given school even if a child was very bright. Father reported that when Ganeshan's talent was noticed at various inter-village and inter-district competitions, several other villages

and districts offered to financially support Ganeshan's education for Std. IX and X.

In his Std. X board exams Ganeshan scored 464/500 and received the 6th or 7th highest marks in his school.

Ganeshan is interested in maths and science; particularly in biology. Though the details of topics such as the frog anatomy were not provided at school, he had made independent efforts to read more about such topics, including efforts to learn about the functions of gills in a frog.

Ganeshan reportedly finds maths particularly easy. His teachers also reported that frequently he had generated alternative solutions to problems and discussed the solutions with them. Teachers added that of the alternate solutions he developed, 70 percent of the steps would usually be correct. His Maths teacher added that he showed creative thinking in mathematics.

Ganeshan reported that for topics that he found easy to grasp, he would check whether his classmates had also grasped the topic, and if so then he would recommend that the teacher move on to the next lesson. Ganeshan helped out by performing peer-teaching when his friends failed to understand a topic. Ganeshan's Science teacher reported that he taught his peers and helped them to achieve their best without pushing them beyond their limits.

Teachers reported that Ganeshan normally interacted with them outside and after class, resolving doubts about the material and discussing alternate solutions after class. His Science teacher reported that he would stay after class till 6:00 pm to resolve his doubts.

Ganeshan reported routine study habits. He studies daily from 5:30 am to 7:00 am. Father reported that he was independent in his studies, preferring to manage them alone. According to parents' reports, Ganeshan has good meta-cognitive abilities and can take effective decisions regarding the amount of time he needs to study, the time for study, etc. Ganeshan however attends tuitions for all subjects.

Other extra-curriculular activities in which Ganeshan has participated include debate and music competitions. He has not had any opportunities to participate in Science or Maths competitions. Ganeshan and his Science teacher reported that he participated in a science exhibition at his school with his teacher, jointly creating a home security alarm system. Ganeshan took the initiative to approach his teacher and ask his teacher to enter the competition with him. However, both Ganeshan and his teacher reported that Ganeshan did not grasp the concept behind the design of the security system and only executed the teacher's instructions.

Ganeshan has also attempted and cleared the National Talent Search Examination, for which he was entitled to receive a scholarship of Rs. 6,000. However, his father reported that no scholarship funds have been furnished yet.

Ganeshan reports that he is able to learn by understanding concepts, and that he learns by rote only those lessons that he cannot understand. His Science teacher reports

that he is able to establish cause-and-effect relationships, understand abstract concepts, and that he helps peers to achieve their best by teaching them patiently without pushing them beyond their limits. The Science teacher also reports that Ganeshan is persistent and keeps working till he is arrives at the solution.

Ganeshan's classmates report that he is hard-working and that he teaches them simpler methods for problems. They also report that Ganeshan is cautious and will share his results or his methods only after trying them out a few times.

Ganeshan emphasised his interest in the memory games he plays and stated that his future plan is to improve his memory abilities and master more memory techniques. As well, he likes playing cricket.

Every Sunday, with his father, Ganeshan conducts a small quiz programme and information class for other children from the neighbourhood, teaches them Thirukurals, and shares world news. Also on Sundays with his father he runs a reading centre at home.

Ganeshan's teachers and peers reported that he wanted to become an IAS officer and wanted to pass the IAS exam in Tamil.

At the nanotechnology laboratory at Shastra University, it was noticed that he was able to grasp the gist of the topics and later explain the technique demonstrated. However, he did not show much curiosity or ask many questions – which may have been due to his shy nature or the novelty of the environment.

In order to observe Ganeshan's abilities he was asked to explain concepts learnt at school, including the concept of AC/DC motors. It was observed that Ganeshan was unable to explain the concept due to inadequate explanation provided at school. However, when Ganeshan *was* provided an explanation, he was able to understand the concept better and to express his understanding.

Ganeshan was unable to solve either the KVPY or the Mathematics Olympiad test. However, his teachers, as well as Dr. Srikanth from Shastra University (who is involved in the Mathematics Olympiad) attribute this failure to lack of knowledge and exposure. On the Pattern Drawing task, he completed 4 out of 5 drawings within the given time limit using one or two trials per drawing.

Ganeshan appears to be an intelligent and confident child. He has a high speed of information-processing, a large working memory, and good executive functions. His exposure and knoweldge are both limited and therefore his long-term goals also appear to be limited to improving his memory abilities alone.

Since all information regarding Ganeshan's abilities had to be obtained through parents', teachers' and peer reports, in the absence of demonstrated ability to solve standardised tests, it is difficult to accurately predict his capabilities. Therefore, it is important that Ganeshan receives more exposure and cognitive stimulation that can expand his knowledge and skills and help him develop and demonstrate his full range of abilities.

To achieve this, exposure can be planned at two levels. First, weekly sessions can be provided at Shastra University, where he might be linked to certain research projects. Second, he may be mentored and coached for the Mathematics Olympiad by Dr. Srikanth. Providing access to the library, exposure to research, and interactions with other students via an identified mentor, as well as coaching in basic concepts by experts – can help Ganeshan overcome the lack of exposure and expand his knowledge base.

As another resource, Ganeshan may be given special permission to attend the KVPY summer programme for one month, which will further increase his exposure and put him in contact with other bright students and with mentors.

Since Ganeshan's English teacher reports that his written English skills and grasp of the language is good, and Ganeshan himself appears to be a confident child, he may be able to cope adequately with these new environments. Further, it is important for him to develop spoken language skills in English, for which his teacher will be conducting classes from July. A follow-up is important to ensure that the spoken English classes are in fact conducted.

The strategy outlined above for Ganeshan must keep in mind the need for a secure base from which he may explore new opportunities. Hence it is recommended that he continue at his current school for the next two years, up to Std. XII, but simultaneously gain adequate knowledge to compete at the national level thereafter by being associated with Shastra University and the KVPY programme.

N. K. Devendra

Devendra is 7 years 5 months old, from a lower-middle class family. Father is a taxi driver; mother is a housewife. Devendra has one younger brother, Vishesh, who also demonstrates above-average cognitive development.

Prenatal and postnatal history were normal. No early signs of precociousness were noticed.

Devendra could talk fairly fluently by two years; parents report that he appeared to talk more than other peers. Baby talk was present, and is still present according to parents. At two years, Devendra also developed interest in books; he made his parents read books to him and teach him to read. His mother reports that she read to him from Stds. I-II textbooks and Tamil books.

Due to the difficult circumstances that both parents grew up in, they decided that they would provide the best education and opportunities for their children. Thus, despite the difficulties encountered financially in placing Devendra in various classes and activities of his interest such as Abacus, computers, Karate, Yoga, and Bhajans – parents have still ensured that he gets an opportunity to attend all these classes. They support his participation in various national and international competitions for which he is regularly selected – despite the heavy financial expenditure for which they receive no support. For example, recently Devendra's parents took out a large loan to send him to the International Abacus competition in Malaysia where he placed second. Further, living in an area with no

transport connectivity or facilities such as extra-curricular classes and activities, Devendra's mother takes him to the various classes located 3-5 kms away from home on a bicycle every day.

Both Devendra and Vishesh have received 'scholar badges' from their school for their high academic performance (securing 98-100 percent).

Devendra has been educated in the English-medium. His current school is reputed for an innovative approach to education.

Devendra has been performing well academically and has been scoring 98-100 percent. He always placed within the first five ranks. Both parents and teachers reported that he was interested in academics and asked relevant questions in class. He was among the few in class who were regularly able to answer all questions posed by teachers. Parents reported that Devendra also had a good memory and could recall lessons from previous years; he could also combine academic material, general knowledge, and his own experiences to answer questions. This suggests high associative thinking skills.

During his free time in class, Devendra organised a group of students and taught them academic lessons, abacus, and general knowledge. He was very popular among peers and had friends from the lower classes up to the tenth standard. Further, parents reported that he has a good sense of humour.

Devendra's study habits suggest that he is meticulous, hardworking, and a quick learner. Parents reported that one or two repetitions are enough for him to learn his lessons. Once Devendra had to attend an international competition in Malaysia during his exams and returned on the morning of his exams. He had only one hour to study 15 lessons and 80 general knowledge items. Despite this, Devendra scored 85 percent on that exam.

Devendra showed confidence in his academic ability and had no fear of exams. His learning strategy included hard work as well as metacognitive strategy of using feedback to improve learning. He also used effective study strategies such as rehearsal and writing out material. He organised his study material into 'chunks' and took regular breaks between 'lesson chunks.' Mother reported that after completion of a chunk, Devendra took a break of 5-10 minutes; he then returned to studying without needing to be reminded. (Using spaced learning with breaks between chunks has been identified in the psychological literature as an effective strategy for information encoding. Thus, Devendra's study methods appear to suggest metacognitive abilities.)

Devendra was able to relate concepts learnt in school to real-life, which seemed to strenghten his learning. For example, having learnt about apparent motion at school, Devendra was able to explain this to his mother while travelling in the bus to explain the backward motion of the trees.

Devendra also showed perfectionist tendencies when it came to academics and became upset by the loss of even one mark. He also had good language skills and was able to frequently corrects his mother's grammatical mistakes in English.

Parents and teachers reported that Devendra had a high concentration level and was not easily distracted by the TV or other stimuli. Mother reported that he could multitask, frequently studying with the TV or music – while doing his work accurately. At the same time he would still be able to name the song or programme that was playing.

Devendra showed good logical thinking ability – he could correctly predict theclimax of many films. (Having guessed the ending, it was reported that he would leave to continue with his work, since he felt it would be a waste of time to wait for the end). Another example of his logical thinking skills was reported by his father. His father said that once, after watching a TV documentary on surgery, Devendra asked him why the doctors had made only a small incision. His father replied that he did not know and asked Devendra to think about the reason. Devendra later got back to his father with the response that the small incision had probably been used to minimise patient pain and discomfort.

Devendra's father also reported that he is also good at figuring out new things on his own. For example he had independently learned to use the stopwatch on the mobile phone and figured out the functions of the split timer. He taught his parents to use this instead of the clock as it was more accurate and easier to use when timing his performance on abacus.

Devendra seemed to be highly achievement-oriented and expressed desire to excel in all activities. After watching a 10-year girl on TV who designed websites, he too wanted to design websites and asked his parents to enroll him in computer classes. Mother reported she herself, until she had to discontinue her education for financial reasons, was highly achievement-oriented.

Devendra showed broad interests and was pursuing diverse activities. He had reached up to Level 9 (of 13 levels) in abacus. He could solve up to 100 sums involving addition and subtraction within 4½ minutes. He had attended several national and international level competitions in abacus and has won several awards at the national and international levels. His recent achievements included the 'Champion of Champions Award' at a national-level abacus competition held in Bangalore in June 2010, and the second place at the International Abacus Competition in Malaysia in December 2010.

Devendra aimed to enter the Guinness Book of World Records in Abacus and was preparing for the same. His parents have been encouraging his efforts: they had obtained details regarding how to enter the competition and had been helping him prepare.

Devendra was also learning karate and had reached the blue belt. His karate teacher reported that he is physically fit and the execution of his moves was above average. His karate teacher was also preparing Devendra for several competitions at the national level where he would be competing with older children.

Devendra also attended computer classes. At the computer class, teachers had repeatedly praised him for quickly grasping lessons. Mother stated that he was able to pick up in a few weeks what older students had been working on for a few

months, and that the teacher praised him for this.

In addition to these activities he also attended yoga classes and Bhajan classes.

Devendra informed us that he wanted to become an IAS officer so that he could help the poor. His mother said that he wanted to build a large home with several quarters so that his parents and he could live in one quarter and accommodate the homeless in the other quarters.

Devendra also appeared to be emotionally intelligent; he was able to understand others' emotions and act accordingly. His father reported that when Devendra sensed that he (father) is tense, Devendra would tell him to calm down, reassuring him that they have seen worse days and have overcome them; and that therefore they would also be able to handle the present. Mother reported that he also questioned other people's unjust or morally questionable acts. For example, when he saw other children littering the streets, he asked his mother why other parents don't teach their children to use the dustbin. If the child was someone he knew, Devendra would instruct them to use the dustbin. Mother reported that Devendra wanted to start a community initiative to clean up the neighbourhood.

Devendra seems independent and meticulous. When left alone at home, his parents reported that he tidies the place up in their absence, without being instructed to do so. In Malaysia, his father reported that because he (father) was not fluent in English, Devendra took over the task of communication and guided his father appropriately based on the directions received from others.

Devendra is also reportedly creative. He had created a picture (with a sun and flowers) using colour pencil shavings, taking care to see that the shavings did not splinter into smaller pieces. The idea for this picture was generated by him and he was also able to execute this idea independently: showing manual dexterity as well as precision. She added that despite his interest and creativity he had not been able to engage in science model-making because of lack of time and resources. (His parents could not afford materials for such experiments.)

Parents report no health problems. Devendra is a healthy child and has been trained to bathe in cold water even in winter.

Devendra's English, science, and maths teachers, and the principal of his school were met and interviewed. Teachers reported that Devendra was courteous and well-behaved, that his hand-writing was mature for his age, his vocabulary was advanced for his age, and that his communication skills were excellent. In class he asked many questions, completed his work quickly, could explain concepts in his own words, was a fast learner, and had good skills in observation and in drawing.

He was further reported to be proactive. When teachers tell the class that which chapter would be taught in the next class, Devendra comes prepared to class, having read the chapter at home.

Teachers reported that even though Devendra was frequently away from school on competitions, his work was always up to date. He was humble and did not brag about his achievements or abilities.

Teachers also reported that he had good leadership qualities and takes initiative. He had an altruistic tendency and shared his notes with peers and taught them when they needed help.

Devendra appears to enjoy intellectual activity. The researcher was able to build a rapport with him by offering him maths puzzles (e.g. substituting symbols for numbers and carrying out maths operations; finding, in a jumble of numbers, those that add up to a given sum; and completing a number series). Devendra completed these problems with ease and rapidity. He was also able to finish the pattern-drawing exercise fairly easily (the task being to copy a pattern in entirety without lifting the pencil or going over a line). Devendra enjoyed the task and quickly grasped the concept behind the task. His work was fast, neat, and orderly, and he needed little help. He showed task perseverance, not giving up easily. He appeared to be achievement-oriented and wanted to master new things; he could handle several activities simultaneously. Emotionally, he appeared to be calm and unassuming.

Devendra appeared to be a highly achievement-oriented child with the ability to outperform his peers across domains of activities. It would be important to follow the development of his abilities and talents longitudinally, as at this stage his potentials are still unfolding and developing.

Despite his socio-economic circumstances, Devendra and his parents have been able to make use of technology for gathering information and learning. Parents have been active in encouraging and supporting him. They have stretched their means to support his interests and activities.

Devendra will benefit from mentoring and inputs regarding how to develop his talents further. He is dedicated and may benefit from discussions, meetings, and interactions with more knowledgeable peers. Devendra may also require some financial support. Since he is still too young for most Olympiads and scholarship competitions, at this stage it might be useful to increase his exposure and provide him with adequate stimulation to keep him engaged.

Suneetha

Suneetha is 4 years 8 months old. She is an only child from an upper-middle class well-educated family. She has been diagnosed with autism spectrum disorder with speech delay and hyperactivity and is on medication and therapy for the same.

Mother reported preeclampsia during pregnancy, because of which she had a Caesarian delivery. Motor milestones were reported to be normal. Self-care skills are partially developed (has achieved bowel and bladder control and partially feeds and dresses self). Previous case history undertaken at the All Indian Institute of Speech and Hearing (AIISH) showed that Suneetha had jaundice within the first 3-4 days of birth.

Between 4-6 months mother reports that pointing and joint attention were present. Around the first year two-syllable words such as ‘mamma’, ‘papa’ were present. After 1½ years, regressions were noticed. Mother reports that Suneetha stopped making eye contact and stopped speaking. She would watch TV for

many hours (6-7 hours per day) and showed stereotyped patterns of behaviour such as scattering her toys around and re-arranging them repeatedly. She would avoid socialising.

Suneetha was taken to NIMHANS at 2 years 8 months for delayed speech and was diagnosed with Pervasive Developmental Disorder (PDD-NOS) with speech delay and hyperactivity. After 15 days of in-patient therapy, the family returned to their town. Having found no school or therapist suitable there, they came to the All India Institute of Speech and Hearing when Suneetha was 4 years 2 months. Mother and child have been staying at Mysore and attending speech therapy, occupational therapy, sensory integration therapy, and behavioural therapy there.

Family history does not seem to be significant with respect to any disorder. Parents are dedicated to the child and mother has made every effort to get Suneetha the best treatment. Mother also works at home with Suneetha teaching her to read and write, as well as various concepts; and has also been working with Suneetha on non-academic skills such as exchanging money for goods.

Suneetha shifted pre-schools twice in her home town as she was unable to adjust at school. Mother reports that she learnt nothing at these schools, though it was difficult to ascertain what Suneetha did learn at school and what she gained interest in, as Suneetha shows knowledge of concepts beyond her age.

Presently Suneetha attends a preschool. This is mainly for preparing her to socialise with other children – though Suneetha does not as yet do so. Mother has been advised to teach Suneetha sequentially using the Oxford publication textbooks. Currently Suneetha can perform in maths, science, and language up to the third standard level, according to mother. Suneetha can do addition, subtraction, multiplication, division, Lowest Common Multiple, and Highest Common Factor; has learnt about the skeletal, digestive, and circulatory systems in science; and is able to spell complex words and comprehend written English text. Mother reports that Suneetha was able to perform addition without first having learned counting, and to spell words without having first been explicitly taught the alphabet. Suneetha also knows concepts such as $\sin\theta$ and $\cos\theta$, and the value of π; can tell the formulae of chemical compounds such as water, sulphuric acid, and formic acid; and knows the concepts of parts of speech and active and passive voice sentences. Parents are unable to identify when and how she picked up these concepts and what other concepts she knows. They are unable to report the level of her conceptual understanding and have accidentally discovered these abilities. Suneetha is also able to write in at least four languages – English, Hindi, and to some degree in French and Sanskrit. According to her parents, her teacher at school taught her to write 'My name is Suneetha' in French. The extent of her abilities in these last two languages is not known.

Currently at school the focus is on academic and non-academic tasks such as stringing beads, sorting, and creating stories using picture cards. The school has indicated to parents that they will design a separate curriculum for Suneetha because of her advanced abilities – even though it is a special school for autistic children.

Suneetha showed interest in television and in fast music from infancy. She likes to watch fast-moving visuals and to look at brightly-coloured pictures; she shows interest in books with pictures; she performs repetitive stereotypic activities; requires sensory and visual stimulation; and loves to run, jump and climb about.

Suneetha appeared to be an intelligent and restless child. She had poor eye contact and showed no interest in socialising. She was able to follow commands such as stopping an activity when told, understanding (though not complying with) commands such as 'give' and 'take'.

Suneetha shows advanced academic skills. She was tested for multiplication. Despite having learnt to multiply numbers row-wise, when asked to multiply the same number column-wise, she was able to perform. However she was not able to do column-wise multiplication for a new set of numbers. This perhaps indicates that Suneetha has a very good memory and is good at learning patterns, rather than understanding concepts such as multiplication. She was also able to do a simple word problem.

Mother reports that Suneetha observes and recalls details, such as being able to discriminate at a glance between two different snacks packages from the same brand – there being just minute differences between the packages, so that mother herself cannot discriminate between them. Suneetha also reportedly recalls details such as the name of her mother's brother-in-law who she has seldom heard spoken about. Suneetha was also able to make associations between her experience and learnt lessons. When asked during the interview to indicate where her digestive system was, Suneetha was able to point first to the mouth and then to the stomach region, even though she has reportedly never been asked before to relate the concept to her own body. Suneetha was also able to type an answer to the question 'Where do you live?' She correctly answered and spelled 'Mysore'.

Mother however reports that Suneetha has no interest in learning academic activities and has to be forced to do so. This may be because she has not been challenged enough – as, because of her developmental disorder and hyperactivity, it has been difficult to identify her level of cognitive functioning and thus to devise an appropriate learning strategy for her.

Suneetha seems to have some personal awareness, as mother reports that she is able to answer personal questions such as 'Do you like spicy food' and similar questions with Yes/ No flashcards. When asked once 'Do you know everything?' she apparently answered 'No'.

Suneetha fine motor skills are poor and need to be improved. Her handwriting is scribbled and difficult to read due to poor grip on the pencil.

Suneetha demonstrated basic computer knowledge. She knows how to turn on the computer and type a word. Her mother reports that she has not been exposed to surfing the internet.

Suneetha appears to be a 'twice exceptional' child with autism, hyperactivity, delayed speech, and cognitive abilities above her age level. However,

assessing her true potential is difficult due to her psychiatric and psychological conditions.

Suneetha is currently receiving speech therapy, occupational therapy, and sensory integration therapy. In this programme, behavioural issues are minimally addressed. It is recommended that after a substantial improvement in speech, sensory integration, and motor abilities, socio-emotional and behavioural training be undertaken so that therapists and parents can better communicate with her and can set about assessing her intellectual and cognitive needs. An appropriate curriculum can then be developed accordingly. Under present conditions, home-schooling may be the best option as neither her intellectual abilities and socio-emotional abilities are age-normative. Parents have been advised to maintain a iary and to closely record her behaviour, so as to offer a more detailed insight into Suneetha's abilities. Further, parents have been advised to systematically test her knowledge, in grade order, to ascertain her level of academic ability before introducing new learning topics. Since repeating topics that she may already know may frustrate her and reduce compliance, parents have been advised to carefully plan her curriculum in consultation with a trained psychologist or educator. Using multimedia or hands-on material may also be appropriate given Suneetha's high need for stimulation. It is also recommended that parents read and understand the literature on high-functioning autisitics; towards this end, the NIAS Gifted Education team has offered to share with them any relevant readings and other information.

A well-known and characteristic feature of autism is the ability to observe minute details and patterns without understanding the conceptual or global picture. In Suneetha's case too, while her ability for observing minute details and pattern learning is evident, her ability for conceptual and global understanding is unknown. The detailed diaries parents maintain may be useful in understanding this aspect of her ability; to this end, it would be useful if parents shared Suneetha's diaries with us.