An ecological approach to understanding highly able students' experiences of their academic talent development in a Singapore school

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DECLARATION

I, Theresa Poh Sin Thor confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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ABSTRACT

This study seeks to understand highly able students' experiences of their academic talent development in a Singapore school, why they choose to do what they do in their talent development, and why some students thrive in their talent development while others do not. It uses an ecological approach that highlights the central role of the overall environment as it interacts with students. A working ecological system model drawn from Bronfenbrenner's (1979) ecological systems theory provides a framework to describe the environment of the students.

Based on qualitative methodology, a case study research design was used to examine the experiences of students in an advanced talent development programme. The students belonged to the top 3 per cent of the national age cohort. The study employed semi-structured focus group interviews, individual in-depth interviews and document analysis. Thematic analysis was used to analyse the data.

The findings of this study suggested that the characteristics of students and their multi-level ecological system environments are inextricably intertwined in the talent development process. Individual characteristics affect students' experiences and their responses to experiences and these are themselves formed through interactions with environmental conditions. Immediate settings connect directly to students through their capacity to elicit participation and progression in the talent development process. Moreover, congruent messages within overlapping immediate settings amplify the developmental effects of individual settings, thereby sustaining the talent development process. Further, more distal influences such as the systemic and structural arrangements of schooling and talent development as well as national macro factors such as meritocracy and a highly competitive education system affect students' decisions and interactions in their immediate settings. An important implication of this study is the need to reconceptualise talent development more holistically as nurturing the life of the mind rather than having a narrow focus on nurturing elite students.

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

Bio	Biology
CCA	co-curricular activity (referring to sports, uniformed groups, clubs and societies)
Chem	Chemistry
Exco	Executive committee (e.g., of Prefectorial Board, CCA group)
FG	focus group
Geog	Geography
Hist	History
H3	Higher Advanced A-level Subject
Lit	Literature
Maths	Mathematics
MOE	Ministry of Education
NUS	National University of Singapore
Phy	Physics
Prog	Programme
PSLE	Primary School Leaving Examination
SBGE	School-Based Gifted Education
TD	talent development
TIMSS	Trends in International Mathematics and Science Study
Y1-4	Year 1 to Year 4
Y5-6	Year 5 to Year 6

REFLECTIVE STATEMENT

My reflective statement touches briefly on my motivation towards an EdD before moving on to experiences in my EdD journey, and the impact on my professional practice and development.

Motivation

My reasons for enrolling in the EdD were three-fold. I wanted professional development of a more rigorous nature and I wanted to learn how to do research in a deeper way. My motivation also emerged from context-based concerns and a desire to be more well-informed in my practice. These motivations were primarily linked to my desire for advancement in professional knowledge and practice. I elaborate below.

The EdD was a natural continuation in professional development following my MEd which proved useful to my work as Head of Science at that time. When I enrolled in the EdD, I was an academic dean and later a deputy principal with key leadership responsibilities for the academic curriculum. As demands in the school became increasingly complex, I felt a need for theory. With the larger role in school, there are knowledge needs pertaining to my interactions with students and diverse stakeholders within and beyond the school. Education, in the context of globalisation, also puts increasing pressure on practitioners to be equipped with advanced professional knowledge. For instance, there are more opportunities for cross-border collaborations between schools and higher institutions; critical engagement in these efforts requires deep understanding of one's professional practice.

My EdD journey

Developing a scholarly mindset. My EdD journey began with the professionalism module where I attempted to understand the nature and meaning of professionalism in educational settings, how it has changed over time, and the social and political contexts in which professionals work. In retrospect, I was functioning very much in the role of a practitioner whose modus operandi was to find ways to implement directives and to make things work well; it was never to question directives or ask for justifications. My tutors commented that my assignment was

"too much like government-policy speech" and that claims were made as if self-evident. This was my first awakening to critical reading and thinking, and scholarly writing.

I gradually understood why scholarly writings are different from the writing that I do in school. Critical examination and in-depth engagement with literature require one to develop one's own independent critical thinking and voice. This was crucial to my development as a researching practitioner and for any kind of contribution to scholarly work. I became more deliberate in self-monitoring the way I read, think and write. Looking back at the assignment on professionalism, I could have drawn from my readings to develop a theoretical framework to understand teacher professionalism in the Singapore context more deeply, and develop critical arguments for how educational reforms have impacted teacher professionalism.

Similarly, in the course on internationalisation, I was overly focused on the new subject matter encountered, such as comparative education research, and globalisation and the challenges posed to education policymakers. Adopting a scholarly mindset did not come naturally but I learnt from each assignment. I realised that in trying to be comprehensive, I often ended up squeezing too many ideas and concepts into an assignment. It became apparent that it was more useful to focus on establishing a few key points and explicating them rather than having many ideas that cannot be fully addressed. As my tutor rightly pointed out, packing too many ideas into a paper leads to work that "does not appear critical or scholarly".

The earlier courses in the EdD highlighted to me the skills required for critical reading and academic writing as well as how to choose and draw on relevant literature. Time and again, it drove home the point that reading without critical reflection and engagement achieves little for the mind. I began to think critically about how ideas and concepts from the academic literature may be applied to an issue in question, or argue a point of view. I also thought about assumptions and whether they are justifiable. Rather than read every paper I came across, I learnt to scan literature more effectively and was more selective on what I close-read. Exposure to extensive academic literature provided me with models for academic writing. I started to find greater ease in academic writing during the thesis stage; the comments from my supervisor helped me to become increasingly confident. Instead

of dismissing or silencing my inner voice when reading academic literature, I now actively engage this voice to negotiate critical understandings of these readings. In short, I learnt the demands and expectations of a scholarly community, and what adopting a scholarly mindset entails.

Doing research. Coming from a science background, I had a narrow perspective about the process of knowledge generation initially. I regarded the scientific method to be *the* way, totally objective and therefore superior to other ways of knowing, without questioning my assumptions. In my MEd research, I had thought only about what data collection method to use and assumed a study to be quantitative or qualitative, based on the data collection method employed. The courses on Methods of Enquiry changed all that.

In Methods of Enquiry 2, I was introduced to the philosophical assumptions that a researcher must make in the research design process, and the practical implications of the assumptions. I consider this to be my most significant learning from the research coursework. It led me to interrogate my philosophical assumptions about reality, how I know, and the reality that I try to know. It also impressed on me how a researcher's ontological and epistemological perspectives have a major impact on what he/she considers productive enquiry. Importantly, it helped me to see where to situate my IFS and thesis. In my IFS, I was interested in how highly gifted students perceived their learning experiences. For this, my choice of a qualitative study was premised on the philosophical assumption that reality is subjective, as seen by participants in the study. The perspectives of the participants matter and the researcher conducts the study to know what they know. I appreciated better how a researcher's worldview shapes research. All these helped me to interrogate and clarify my research methodology, data collection methods, and analytic framework for my thesis.

I found the research assignment on *Subjectivity Statement* to be particularly useful. It drove home the point that pure unbiased observation is not possible and that qualitative researchers position themselves in a study by actively reporting their values and biases (Creswell, 2013). It led me to think about and make explicit the assumptions and biases that I would bring to my research. I also became more aware of how such subjectivities may be addressed in research. For example, holding up

biases for scrutiny allows readers to evaluate what impact these biases may have on findings. The issues of power relations and insider research, and how to address them were aspects of research that I continue to learn during my IFS and thesis.

In all, the Methods of Enquiry assignments and IFS prepared me well for my thesis. They each contributed towards my deeper socialisation into the qualitative research tradition.

Thesis. With the exception of the courses on professionalism and international education, I focused my research methods assignments, IFS and eventually my thesis on highly able students and talent development (TD). As academic dean and deputy principal, I was interested in the development of these students. There were also context-based concerns such as highly able students who languished and fell off track. Thus, it was the desire to be more well-informed about practices in TD and the experiences of this group of students that directed me to focus on this area in my EdD.

As research is not a linear but an iterative process (Merriam, 1998), the continuity in focus allowed me to go back and forth between the questions in my mind and the research literature to shape my thesis. For this reason, the insights gained from the thesis are particularly pertinent to my professional practice as I explain further below. The process itself was powerful as it struck me that researching one's own practice inevitably leads to immersion in the school setting in quite a different way.

Impact on professional practice and development

There are notable constants as well as shifts in my thinking, arising from my thesis. The continuities are in the unique characteristics of highly able learners, and the elements known to be useful to their TD such as a programme that is matched to their increasing level of competence, and skilful teachers. The central shift in my thinking has to do with TD and how it has been conceptualised and implemented in the school. My own assumptions and views of TD have been equally narrow, influenced by the wider narratives at the national level. A strong focus on the goal of elite graduates and elite positional achievements led to unintended outcomes – those

of deep but narrow experiences for the best students while others were deprived of real opportunities.

As a school leader, the implications and insights from this study have much relevance to my practice, particularly at a time of rising concerns over declining student diversity in top schools (Davie, 2014). To position the research findings with sensitivity, I took advantage of the current agenda of large-scale curriculum reviews in the school, thereby navigating possible tensions with my colleagues. I have also started working with my colleagues on widening access to TD opportunities especially at the earlier year levels; my interactions with teachers and other key personnel have focused on promoting or developing more diverse learning opportunities for a more holistic approach to TD.

I believe that the EdD journey has had a vitalising effect on my professional practice and development. My new understandings of the social world and ways of knowing have literally transformed how I view human relationships and interactions. I have learnt new ways of thinking and doing that are different from what I know from the physical sciences. In professional practice, I now draw from my practitioner experience and the academic world to develop new ideas or to understand alternative perspectives, thus moving beyond the narrow boundaries of my own lived or situated experiences. This has given me a stronger sense of my professional self as well as greater personal satisfaction. There is a knowledge base and a community that I know I am able to engage with more critically than before to find a way of examining a problem or improving practice. The academic discourses that I now have access to can generate more dynamism at work. Thus, personally and professionally, I am experiencing greater meaning in what I am doing, which has contributed to the vitalising effect mentioned earlier.

I have immersed myself in the research journey in my IFS and thesis. Both the research process and product are important to me. The journey has definitely led me into deeper learning on how to do research. I have a firmer grasp of research skills – design, conduct and dissemination of research – and understanding of the range of approaches to research as well as what is achievable. There are also other benefits professionally, for example, the new knowledge and skills put me in a better position to (a) provide direction for the research education curriculum in my school;

(b) play a more prominent role in fostering research in the school or cluster of schools; and (c) undertake collaborative research with other schools or institutions.

To conclude, although the EdD has provided the induction and socialisation into research and the academic world, and therefore bridged the divide that I once experienced between research and educational practice, the identity of a "researching professional" (Brown, 2008, p. 9) can become embedded and eventually lost in the manic and intense world of day-to-day work. The EdD has broken down the barriers to the academic world for me. I am, therefore, intent on keeping myself engaged in and with research, for example, through dissemination of my thesis as well as the possibilities mentioned in the previous paragraph.

CHAPTER 1

Setting the Scene

Introduction

The field of gifted education has constantly been debated. As a field, there are serious issues and challenges such as the lack of consensus on the definitions of giftedness, and criticisms that identification procedures disadvantage the minority and low socio-economic groups (Borland, 2004; Gallagher, 2000). In the US, support for gifted education has risen and waned since the late 1950s as policymakers and educators debate intensely about the need to educate the brightest on the one hand, and a strong egalitarian imperative to provide the best quality education for all on the other (Gallagher, 2000). Opposition from the Australian teachers' unions against gifted education remains strong, based on the belief that gifted education is elitist (Gross, 2004). In England, teachers similarly struggled to align their own philosophical positions with a policy that gives particular children extra resources (Koshy, Pinheiro-Torres, & Portman-Smith, 2012); initiatives such as the National Academy for Gifted and Talented Education and High Performing Specialist Schools could not be sustained, leaving school leaders to decide on provisions for their most able students with no funding (Smithers & Robinson, 2012).

The challenges facing countries like Taiwan, South Korea, China and Singapore are not dissimilar. These countries deal with issues of giftedness and identification in a context that is dominated by extensive and pervasive examination systems (Phillipson, et al., 2009). Despite similarities in the challenges faced, the "solutions" are unique – different countries adopt different policies and practices in educating their brightest, depending on their social and political contexts, priorities and availability of resources. For example, Singapore's approach to gifted education was shaped by recognition of the central role of education in the city state's continued survival and success. Being resource-scarce, it is critical to nurture every child, including the brightest so that they can contribute more effectively to Singapore's success. However, the Singapore Gifted Education Programme has evolved since its inception in the mid-1980s as the Singapore education landscape

changes in response to challenges that the country faces such as new demands for economic competitiveness.

To reflect the sensitivities in each socio-cultural context, the language used in discourses on gifted education is often nuanced, for example, the term *most able students* is used in the English context rather than *gifted* or *highly gifted* (e.g., Ofsted, 2013)

Statement of the Problem

This study centred on the perspectives and experiences of highly gifted 19- to 20-year olds in their talent development (TD) journey while they were in a top Singapore school. I explain my focus on the *highly gifted* and *talent development* in the next paragraphs.

Within the gifted education field, there is minimal research attention on the *highly gifted*, a term used by some scholars to describe students at the high end of the giftedness continuum (Gross, 2004). This is because educators tend to think of the gifted as a relatively homogenous group (Gross, 1993; VanTassel-Baska, 2005; Winner, 1996). Also, the egalitarian ethos simply has not encouraged research into the highly gifted, a hierarchical division seen to be even more elitist by critics of gifted education (Gross, 2004). However, one might argue that if research on gifted youths in regular classrooms has shown that they are likely to experience boredom, frustration and decreased motivation (Ofsted, 2013; Robinson, Reis, Neihart, & Moon, 2002), develop maladaptive beliefs about ability and effort, and face stereotype threats that can lower performance (Moon, 2009), then the situation is likely to be more serious for the highly gifted since their pace of learning has been described by scholars (e.g., Gross, 2004; Silverman, 1995) to be significantly beyond the norm of the gifted population. Equity is an issue that has been passionately debated in education. If equity is the opportunity to maximise capacity for all learners (Tomlinson, Coleman, Allan, Udall, & Landrum, 1996), do highly gifted students deserve less attention?

The concept of TD grew in popularity in the 1990s with broadening conceptions of giftedness (Olszewski-Kubilius, 2009). In Singapore, this, together with recognition of the challenges the country faces in a global environment,

provided the impetus for expanded educational provisions in different domains to cater to students of different aptitudes or talents from 2004. A variety of programmes and routes was implemented, for example, specialised schools in science and mathematics, visual and performing arts, and sports; and school-based gifted education for intellectually gifted learners. In such a scenario, when faced with resource challenges, it may be expedient for policymakers to ignore the highly gifted as a group with special educational needs. The popular myth that the most able students will be successful in life regardless of the kind of school experience they receive does not help (Moon, 2009). Therefore, research is needed to inform and promote understanding of highly gifted learners as well as the educational practices to meet their needs (Gross, 2004; Winner, 1996). As important, understanding our most able learners who are at one end of the education continuum can lead to a better understanding of learner needs across a broader education continuum, thereby opening up channels of collaboration among all educators in support of TD for all children.

There is a robust literature on TD. For instance, researchers on expertise (e.g., Ericsson, 1998) emphasise the role of deliberate practice in TD. Others (e.g., Neihart, 2006; Subotnik, Jarvin, & Rayhack, 2007) argue that TD is a confluence of many factors such as domain-specific abilities, psychosocial characteristics, quality of teaching, and appropriate interventions. VanTassel-Baska (1998) and Gardner (1997) pointed out that the process of TD is not only lengthy and arduous but that it needs support from others to be successful. In this regard, many researchers have reported the important role of parents (e.g., Albert, 1994; Bloom, 1985; Csikszentmihalyi, Rathunde, & Whalen; 1993; Davis, 2014), peers (e.g., Csikszentmihalyi et al.; Gagne, 2004; Horvat & Lewis, 2003; Tannenbaum, 2003), teachers and mentors (e.g., Bloom; Csikszentmihalyi et al.; Gagne; Piirto, 1999), and appropriate educational provisions (e.g., Gross, 2004; Kulik & Kulik,1992; VanTassel-Baska, 1989a; Winner, 1996). In Singapore, studies on TD (e.g., Garces-Bacsal, Cohen, & Tan, 2011; Ho & Chong, 2010; Quek, 2005) similarly reported the importance of these environmental influences, that is, parents, teachers, peers and educational provisions. However, other studies (e.g., Arnold, 1995; Ochse, 1993; Olszewski-Kubilius, 2000) have also suggested that different kinds of interactions and different environmental variables may yield different outcomes for children that

are more or less supportive of TD. For instance, findings about the role of adverse family circumstances in the childhoods of accomplished individuals seemed contradictory (Subotnik, Olszewski-Kubilius, & Arnold, 2003).

Furthermore, studies of TD in gifted education tend to focus on the psychological views of individuals on the environmental factors that influence TD. Few studies have discussed what the individuals themselves bring to their environments or to the *interactions* between the individuals and the environment although the importance of personality characteristics (e.g., motivation, risk-taking, perseverance, resilience) has been acknowledged (e.g., Bloom, 1985; Csikszentmihalyi et al., 1993; Gagne & St Père, 2002; Neihart, 2008). For example, Kagan, Snidman, and Arcus (1998) suggested that a child's temperament can have a profound effect on the teachers and classmates in school. In such an encounter, the child brings something to the situation that changes it. Additionally, the interaction between the child and the situation does not happen in a vacuum. Children and the multiple environments in which they are situated form a complex system (Lerner & Lerner, 1983). In a TD context, a student brings personal attributes into a range of situations requiring a direct role, and to other situations not requiring a direct role; these attributes influence thoughts, behaviours and actions of the students. As such, research is needed to illuminate the dynamic interplay of factors shaping TD experiences.

Models of TD in gifted education such as Gagne's Differentiated Model of Giftedness and Talent (DMGT) are useful in identifying the factors crucial to TD. However, such models do not delve into the *reciprocal* interactions between the developing student and the multiple contexts and influences the student encounters. For instance, Gagne (2011) simply acknowledges the complexity of the TD process by describing it as a complex choreography of outstanding natural abilities, intrapersonal catalysts, environmental catalysts, and sustained systematic developmental activities. A clearer understanding of the reciprocal interactions between students and their multiple, layered and interacting environments will provide some insights into this "complex choreography".

Purpose of the Study

This study has examined the complexities associated with TD, in particular, how highly gifted students in a top Singapore school experienced and navigated their multiple environments during their school years. The study delved into what the students made of their interactions in the multiple inter-related contexts in which they were situated, and the meaning underlying the choices they made, the events that built on each other, and the contingencies operating between them. It also gave the students voice about their experiences, their progression and transitions, triumphs and struggles in their TD journey.

This study built on my Institution-Focused Study (IFS) which reported key intrapersonal and environmental catalysts that were important to highly gifted students in their academic TD, notably, passion and persistence, like-minded peers, skilful teachers, and a curriculum that was matched to an increasing level of competence. But, rather than focus on individual factors, this study has focused on understanding the reciprocal interactions between students and their immediate and wider contexts. It examined how events in what Bronfenbrenner (1979) refers to as the "exosystem" and "macrosystem" impact on their interactions in these contexts.

In this study, I decided to use the term *highly able* in place of *highly gifted* in consideration of the discomfort shown by participants in my IFS, some of whom participated in this study. This approach also addresses potential sensitivities that readers in other socio-cultural contexts might have to the use of the latter term.

Theoretical Framework

Bronfenbrenner's Ecological Systems Theory

This study draws upon Bronfenbrenner's (1977; 1979) ecological systems theory to develop a theoretical framework for understanding the interactions among factors influencing TD.

Bronfenbrenner's ecological systems theory delves deep into a student's development within the context of the system of roles and relationships that form the student's environment, each having an effect on his/her development. The theory, later called the bio-ecological systems theory to emphasise that a child's own

biology is a primary environment in his/her development, acknowledges that interactions between factors in the child's maturing biology, immediate environments and the societal landscape influence his/her development. Therefore, to study a student's academic TD, we must look not only at the student and his/her immediate environment but also at the interaction with the larger environment.

Bronfenbrenner's theory provides an opportunity to capture and explain the numerous environmental factors and persons in intertwining relationships, roles and processes. As such, the researcher is able to probe deeper and to have a better understanding of the TD experiences of highly able students in the study.

Figure 1 presents the theoretical framework in the form of an ecological system working model for describing an environment as well as clarifying the roles and functions of the different elements and relations within the environment of the students.

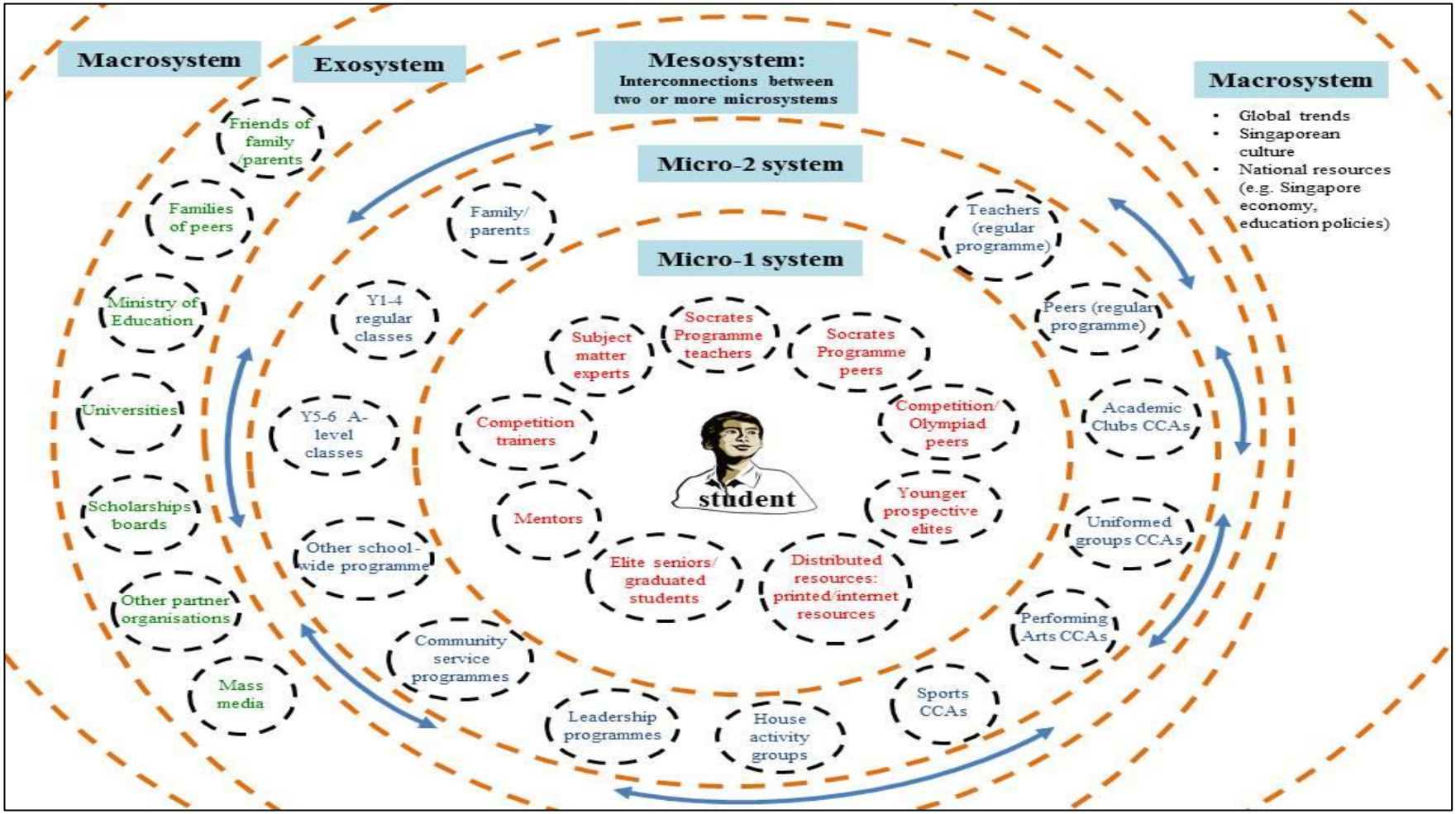

Figure 1. Working model of ecological system

The environment is viewed as an ecological system with a structure, functions and elements. The main function of an academic TD environment is to help young prospective academic talents realise their potential. This happens when they make a successful transition from a promising junior student to a top-level or elite graduate. The young prospective elite academic talent is at the centre of the model; his/her development is influenced by the context in which development takes place. Other elements of the model are organised into Bronfenbrenner's ecological systems comprising the *microsystem*, *mesosystem*, *exosystem* and *macrosystem*.

Microsystem. The microsystem is the first layer of Bronfenbrenner's nested ecological systems. According to Bronfenbrenner (1979), the microsystem is "a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given face-to-face setting with particular physical and material characteristics" (p. 22). Students spend a large part of their daily life in microsystems. They meet and interact face-to-face with other people such as teachers and peers, each with their distinctive characteristics of temperament, personality and belief systems. Such characteristics sanction, invite, or inhibit interactions and activity in the immediate environment (Bronfenbrenner & Morris, 2006).

In this study, the modification to Bronfenbrenner's ecological systems occurs at the microsystem level: the *micro-1 system* level comprises specialised academic TD elements while the *micro-2 system* level comprises regular academic classes, co-curricular activities and other school programmes. This gives each case analysis a holistic treatment as it includes both the academic and non-academic aspects of a student's everyday life.

At the micro-1 system level, the school's specialised TD environment directly surrounds the student. This environment involves highly able peers in TD programmes, selected teachers, competition trainers, mentors, and experts in the field. It also includes younger prospective talents and highly successful or elite senior students or graduates who may serve as role models and trainers for the highly able students. Beyond the micro-1 system level, the micro-2 system level includes the larger school, family as well as peers and teachers in regular programmes. It also includes related groups which may be perceived as opportunities for enriching interactions such as cognitive-based co-curricular activities or programmes on

leadership and community service.

Although the distinction between the micro-1 system and micro-2 system levels does not exist in Bronfenbrenner's ecological system, the micro-1 and micro-2 levels have been recognised as distinctive levels in the literature on sports TD ecological systems (Henriksen, 2010). Such distinctions have also been seen in other Bronfenbrenner's settings, for example, Hodgson and Spours' (2013) exo-1 and exo-2 system levels in their ecological analysis of the dynamics of localities in England as well as in Finegold's (1999) work on skills ecosystems. As in Bronfenbrenner's settings, the elements of the micro-1 and micro-2 systems may transcend levels. For example, family belongs to the micro-2 level but may have a strong involvement in the TD of a student and permeate into the micro-1 level. The permeability and interdependence of the various elements are indicated by encircling them with dotted lines in Figure 1.

Mesosystem. Although development occurs through direct experiences in immediate settings, each student experiences many settings, activities and roles (Bronfenbrenner, 1979, 2005). Thus, beyond the immediacy of the microsystem is a more diverse and complex set of relationships between two or more microsystems in which the student participates. This is the mesosystem, the second layer of Bronfenbrenner's ecological systems. Put another way, mesosystems are connections across the microsystems of the developing student (Bronfenbrenner). This is the space where there are overlapping relationships, messages, objects, and symbols filling a student's life. The totality of the student's experiences here determines his/her educational dispositions, behaviours and aspirations (e.g., Hodgson & Spours, 2013; Arnold et al., 2012).

In relation to students in this study, the mesosystem will include direct relationships between microsystems such as the family and school, academic classes and co-curricular activities, and academic TD programmes and House, leadership, sports or community involvement programmes. These microsystems within the mesosystem may not be of equal importance to a student, and this may be manifested by the varying amounts of time and energy he/she devotes to each. For example, a student's investment of time training for a sports competition or undertaking leadership responsibilities means less time available for pursuits in the academic

domain. In addition, the microsystems a student chooses or finds himself/herself in may not comprise highly able students. This has implications for the relationships and messages he/she experiences in relation to academic TD. Furthermore, one microsystem can change another. For example, parenting practices might predispose students to choose particular peer groups (Steinberg, Darling, & Fletcher, 1995) or families might reinforce or contradict messages (e.g., about academic achievement behaviours) in the school (Villalpando & Solorzano, 2005).

Exosystem. The third layer of the ecological model, the exosystem, is formed by settings not containing the developing individuals but in which events occur that affect their lives (Bronfenbrenner, 1979, 2005). This is the level of the environment where systemic changes occur and where the ground rules for the opportunities, experiences and environments that students encounter are set.

Exosystem elements may include the parents' workplace or network of friends, families of peers, universities, scholarship boards, and the Ministry of Education (MOE). A student's immediate experience may be affected by his parents' employment in that educational decisions are driven in large part by the parents' incomes; the parenting styles and practices in the families of the student's friends can also affect his academic achievement (Steinberg, Darling, & Fletcher, 1995). Messages on university admission criteria and requirements of scholarship boards influence the decisions students make in their microsystems. The scholarship awards of MOE and other agencies, such as research institutes, affect students' daily lives in terms of where they dispense their time and energy and to what extent. They influence their decisions in microsystem settings and shape their behaviours and experiences in school. MOE policies on TD influence resources allocated to schools which, in turn, influence the opportunities and experiences students eventually encounter in their micro-settings. The mass media and messages communicated on what is valued and rewarded can influence what students do in school too, for example, messages on the relationship between educational credentials and what university or scholarship boards value.

In this study, the exosystem merits attention because it is where policymakers and educators design structural and programme interventions for the purpose of academic TD in schools. Change can occur when exosystem factors find their way

into students' microsystems. However, the effects will differ according to the way in which a student engages with a particular environment and how that interacts with the other microsystems in which the student engages. Thus, an exosystem analysis will need to take vertical and horizontal interactions into consideration.

Macrosystem. The aforementioned systems are embedded within the outermost layer, the macrosystem which comprises the larger cultural patterns of society and societal values (Bronfenbrenner, 1979). As such, the macrosystem affects everything from national policies to individual aspirations. Often, it ends up framing both the overall structure of schooling and the opportunities and perceived possibilities for different students. For example, meritocracy, a key principle of governance and educational distribution in Singapore (Lee, 2000; Tan, 2008) resulted in a highly competitive education system that upheld the ideology of accountability and the belief that higher education is a private good. These ideologies have led to the unintended consequence of social stratification in Singapore as in countries like the US. Students from higher socio-economic groups have better educated parents and are better resourced. In a meritocratic world, these students continue to get the lion's share of opportunities. For students from lower socio-economic groups, they start out having less and perceive themselves to have less. Who participates in a TD programme might seem to be an individual or family-based decision but the conditions that govern the decision-making may be located in the macrosystem. In relation to this study, how do students perceive these wider factors and how do they influence interactions at the lower ecological levels? Can macrosystem factors be mediated at the intermediate ecological levels as suggested in the study by Hodgson and Spours (2013)?

Thus, although the macrosystem is the most distal source of environmental influence on the student, this outermost layer has a strong influence throughout the interactions of all other ecological levels, including the microsystem. Bronfenbrenner (1979) explains that the macrosystem may be thought of as "a societal blueprint for a particular culture or subculture" (p. 40); the interactions between all of the systems are defined by and define this outer layer.

Local Learning Ecology

In relation to the ecological model, Hodgson and Spours' (2013, p. 217) concept of "local learning ecology" (LLE) is interesting because it offers a way to describe and analyse the condition of the learning environments of students. Defined largely by the actions, practices and perspectives of the individuals in the microsystem in response to wider influences at the other ecological levels, the LLE essentially constitutes a complex dynamic of factors played out in the students' multi-level environments. Moreover, an LLE may be viewed on a continuum, ranging from "low opportunity progression equilibrium" (LOPE) to "high opportunity progression ecosystem" (HOPE). Depending on the mediations of stakeholders, professionals and other social actors, an LLE may be moved from a condition of LOPE to HOPE. These concepts are potentially useful in understanding how the various levels in the ecological model function in a LOPE and HOPE, and can shape our thinking about TD needs and strategies.

Personal Perspectives

As an educator, it is hard for me to imagine an objective world that is inherently meaningful. My personal experiences have shown me that things and processes in school have meanings that are dependent on our engagements in them. Individual persons make meaning as they interact with reality. These meanings are dependent on the perspectives of each person or group; there are no laws or truths waiting to be identified. Coming from a background in the physical sciences, I struggled with this idea. Now, what seems more real to me is that knowing is very much embedded in people's historical, cultural and social contexts (Creswell, 2013). This social constructivist perspective guided and shaped my research.

Besides awareness about his/her theoretical framework and philosophical assumptions, a researcher must be aware of his/her life history in relation to the study undertaken because background, experiences and values invariably shape the research process and interpretation (Creswell, 2013). Therefore, I offer some autobiography as context for my study.

My decision to examine the experiences of highly able students in talent development (TD) is influenced by my encounters with many of them throughout my

work life, especially as a teacher and academic dean. Some I knew personally, while others were observed from afar; all of them seeded in me a desire to understand more deeply their decisions, triumphs and frustrations in school. The best performing students were often sleep-deprived, pushing themselves relentlessly, while the saddest cases included disengaged students struggling with school refusal issues and disillusionment. Such students had no known socio-emotional issues, and had apparently, strong family support. I was deeply struck by a few most able and promising students who languished and fell off track.

Such experiences led me to this study. As a teacher, I had closer interactions with these students; as academic dean and now deputy principal, I oversee their academic programmes as well as their well-being.

Research Questions

This study was designed to understand highly able students' experiences of their academic talent development in a very selective school. It seeks to answer the following research questions:

1. What are the experiences of highly able students in an academic talent development programme in a Singapore school for academically able students?

2. Why do the students choose to do what they do in their talent development?

3. Why do some students thrive in their talent development while others do not?

Definition of Terms

The following section serves to ensure readers' understanding of key terms used in the study.

The term *highly able students* in this study refers to students who were in the top 3 per cent of their age cohort in Singapore based on national tests of intellectual and academic abilities, such as the selection tests administered by the Gifted Education Branch, Ministry of Education or the Primary 6 School Leaving

Examination. In addition, these students demonstrated high-level domain-specific ability based on commonly used identification tools such as school academic achievement tests, off-level subject-specific tests, enrichment activities and teacher recommendations (VanTassel-Baska, 2005). They were participants in an advanced academic TD programme in the site school. These students would be described by some scholars (e.g. Gagne, 2004; Gross, 2004; Silverman, 1989) in the gifted education literature as *highly gifted*.

Talent development refers to the transformation of a student's abilities, potential or aptitude into achievement. It involves a systematic process of learning and practice where organised activities are pursued regularly over a stretch of time (Gagne, 2004). Achievement is viewed in the context of the development of the student, and the life of the student that is guided by a desire to realise oneself (Grant, 1995). It includes achievement in the form of good grades and high test scores, as academic achievement continues to be measured and valued for progression to higher levels of studies. But it also includes self-realisation in other forms, such as creative works in the area or application of one's academic knowledge and skills in serving others in a desire to be one's best self (Ginzburg, 1985).

In a secondary school, students who have high potential and performance may be identified on the basis of normative tests and off-level tests. These students demonstrate rapid learning compared with their age peers. They also often show consistent interest in an area of the curriculum and may demonstrate creativity in the way they think about ideas and issues in the area (Cross & Coleman, 2005). TD of highly able students in school is about fostering the advanced development of these students so that over time there are significant changes in the students within the chosen area of study. The school sets the opportunities for development to occur, modifying both curriculum and school organisation to provide for this. As the students move through the grade levels, is there evidence of advanced ability and achievement within the chosen area of study? Educators want to know the connection to later behaviour for each student. Whether a highly able student thrives or not in TD is of interest because the central focus is nurturance. The word *thrive* follows the dictionary meaning of the word, that is, a person thrives in TD if he/she flourishes or develops vigorously (Concise Oxford English Dictionary, 2011).

Academic TD refers to development in the academic domain as opposed to non-academic domains such as sports or the performing arts.

Ecological system refers to the set of nested contexts or systems, each inside the other (Bronfenbrenner, 1979).

Significance of the Study

This study seeks to understand highly able students' experiences of their academic TD using an ecological model based on Bronfenbrenner's (1977, 1979) ecological systems theory. Its significance rests on several reasons. For one, it will fill the void in the existing literature on an ecological systems approach to studying academic TD. The majority of the literature on academic TD examines the factors acting in the microsystem level (e.g., Bloom, 1985; Roe, 1953; Zuckerman, 1977). There are few studies on how these experiences intersect in the various sub-environments, level of environments, and the students themselves. The ecological model used in this study offers a way to make sense of the complexity of TD by providing a framework for focusing on the interactive and mutually constitutive environments of the student.

In addition, the model allows educators, policymakers and mediating partners to better understand how interventions can be conceptualised more holistically in support of TD. Each level in the ecological model represents a potential area of intervention. Interventions may be more impactful as the focus shifts to influencing the students' environments in a more comprehensive way.

This research is also potentially beneficial to students themselves because the ecological model may be used as a tool to empower each school-age student experiencing his/her unique multi-level environments to make better sense of the complexity of their experiences.

Finally, this study's in-depth look into the experiences of highly able students in a Singapore school with an established gifted education programme allows us to better understand TD from the voices of highly able students themselves. It contributes to what is a very scarce literature base in a country with more than 30 years of gifted education experience.

CHAPTER 2

Literature Review

Introduction

This study is an inquiry into the experiences of highly able students in a talent development (TD) programme in a Singapore school. As such, a significant portion of the literature I use to frame the study is drawn from research on the gifted population. I include definitions and conceptions of giftedness, empirical studies on highly able students, person characteristics, interpersonal relations, and provisions for their development. I also provide a background on larger contextual factors that frame students' experiences in school, in particular, the culture and contexts in Singapore, and globalisation effects.

Definitions and Conceptions of Giftedness

The definition of giftedness has practical and political purposes in any education or school system as it forms the basis of official policies and guidelines as well as identification and programming. It thus plays a pivotal role in the overall structuring of gifted education services in a school (Renzulli, 1986).

Although there has been no agreement on the definition of giftedness, conceptions of giftedness have evolved over time with our understanding of what intelligence is and what it is not (VanTassel-Baska, 2005). In his landmark study, Terman (1925) identified gifted individuals as those in the top two percent on intelligence (IQ) tests (Colangelo & Davis, 2002). Fifty years later, the Marland Report (1972) in the US, proposed a broader definition:

> Gifted and talented children are those identified by professionally qualified persons who by virtue of outstanding abilities are capable of high performance. These are children who require differentiated educational programmes and services … to realise their contribution to self and society. (p. 5)

Several ideals in the Marland definition remain at the core of contemporary ideas regarding support for gifted learners, for example, in the provision of differentiated educational services, and the realisation of potential, both personal and societal.

Since then, many other definitions of giftedness have been proposed by various theorists. In 1983, Gardner introduced the concept of multiple intelligences, advancing that a theory of multiple intelligences must capture "a reasonably complete gamut of the kinds of abilities valued by human cultures" (Gardner, 1993, p. 82). Gardner's original list of intelligences – linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, intrapersonal, and interpersonal – has grown since then.

Renzulli (1986) identified two separate, yet often interactive types of giftedness: *schoolhouse giftedness* attributed to students who are strong academically and are successful test-takers and *creative-productive giftedness* which focuses on the creation of original material. In his Three-Ring Model, he views giftedness as the interaction of above-average ability, and high levels of task commitment and creativity.

Gagne's (2004) Differentiated Model of Giftedness and Talent (DMGT), views giftedness as natural ability in at least one domain that places a child in the top 10 per cent of his/her age peers. On the other hand, talent refers to systematically developed knowledge and skills that correspondingly place the child's achievements within the top 10 per cent of age peers. His assumption is that there is natural ability or aptitude to begin with, and intrapersonal and environmental factors are catalysts in the TD process. The debates on his distinction of gifts and talent, however, have little consensus. Like Gagne's DMGT, Tannenbaum's (1997) Sea Star Model addresses the relationship between ability and achievement – "the links between promise and fulfilment" (Tannenbaum, 1983, p. 95) – and identifies five contributing factors: superior intelligence, exceptional special aptitudes, a supportive array of non-intellective traits, challenging and facilitative environmental influences, and the element of chance.

As one considers this small sampling of conceptions of giftedness, it is evident that there is a much broader view of giftedness since the days of Terman, facilitating new approaches to identifying and developing gifted individuals. Few people today believe that general intelligence is everything, or that gifted abilities are solely the result of genetic endowment. Instead, there has been growing attention on the role of external factors and a shift towards understanding the TD process.

As views about intelligence and giftedness evolve, so do methods of identification. Today, the use of multiple sources of information including measures of intellectual aptitude, achievement measures and teacher observation is a more common approach to identification. In this respect, Gross' (2004) caution on the need to distinguish between *gifts* and *strengths* is pertinent. According to her, every student, regardless of ability has strengths relative to self but these strengths are not necessarily gifts. For example, a student may be stronger in English than Mathematics but cannot be said to be gifted in English unless this strength goes beyond the norm of his/her age peers. This brings to mind Borland's (2004) argument that all children have gifts if one adopts defensibly broad criteria in the identification of giftedness. The problem with this perspective is that focusing on the development of gifts of all children can be interpreted to be synonymous with strengths and interests instead of areas of performance above the norm of age peers. This compromises the principle of excellence for gifted students who are highly able in one or more areas (Gross, 2004; Winner 1996).

Every programme for the gifted will include students who barely meet the established identification criteria, along with others who are extraordinary or exceptionally able. Benbow (1992) advanced that ability range does matter in the gifted population, citing that the top 1 per cent contains one-third of the ability range. Silverman (1989) described the highly gifted as those whose advancement is significantly beyond the norm of the gifted; advancement is taken to mean aptitude or potential rather than only school performance. The students in this study may be said to be highly gifted because they were in the top end of the giftedness continuum based on established identification criteria both at the national and school level. Chapter 3 provides details on how they were identified.

Empirical Studies on Highly Able Students

Gross' (2004) 20-year longitudinal study traced the school years, academic achievements and socio-emotional development of 60 exceptionally gifted Australian children. Most participants were educated in regular classrooms; a small minority had educational programmes such as accelerated classes. Her study revealed that underachievement was normal among students from the regular classrooms. Many of the students deliberately underachieved for the sake of peer

acceptance. A number of students experienced moderate to severe depression. As young adults, they lacked the love of learning and tended to face the future with deep uncertainties about what they should do with their lives. On the other hand, students from the accelerated classes reported high degrees of satisfaction. The accelerated classes provided them with intense academic challenge and the opportunity to work and socialise with like-minded students. A considerable majority of these students moved on to do research degrees at leading universities. Where accelerated classes had not been possible because of the school system, the students isolated themselves socially, preferring the intellectual stimulation of their own thoughts and pursuits.

In a 10-year follow-up study of 320 adolescents identified as having exceptional mathematical or verbal reasoning abilities before age 13, Lubinski, Webb, Morelock, and Benbow (2001) reported that 95 per cent of the adolescents took various forms of acceleration in high school or earlier. The students reported satisfaction with their accelerative experiences. The most positive responses involved personal growth, including general academic progress and interest in learning. They also felt positive about their social and emotional development. At the close of the study, over half of them were pursuing doctorates and all were attending the best universities worldwide. Both the Gross and Lubinski studies supported the value of accelerative options for highly able students. However, there was no mention of whether there were any students who struggled or dropped out of the special provisions.

Winner's (1996) study provided insights into how children with high giftedness are qualitatively different from moderately gifted children in their interests and proclivities. Most of the children in her study could not find schools which could readily accommodate their high abilities and needs. Winner found that the children were not only highly precocious but had an intrinsic and unquenchable "rage to master", that is, an intense interest and ability to focus sharply, and an insistence to march to their own beat (Winner, 1996, p. 3). When engaged in learning in their domain, they would be so focused as to lose sense of the outside world. This state of *flow* has been described by Csikszentmihalyi (1993) and his colleagues in their work on talented teens. Their independent and self-directed dispositions allowed them to choose to work in their talent area over hanging out with their peers.

Many of Winner's (1996) findings about character traits are consistent with what Cox (1926) had reported about the childhood traits of the eminent individuals in her study, for example, intellectual energy and persistence. However, Cox also reported that while her subjects had many good traits, there were also occasional liabilities such as the tendency to extreme depression.

Roe (1953) and Zuckerman (1977) both focused their studies on scientists. In Roe's study on eminent physical, biological and social scientists, she noted that the groups differed in their mathematical and verbal test scores, as well as their characteristic modes of thinking, interests and abilities. Although the subjects often spoke of feeling isolated during their youth, most of them had intense interest in something. The social scientists, for instance, exhibited more concern with interpersonal relations than the other two groups from an early age. The groups frequently had a strong desire to arrive at personal mastery of the environment, which Roe suggested may be linked to deep insecurities in their childhood and an extra striving for independence. Roe pointed out that her subjects may have had more opportunities to rely on their own initiative than most children in the process of growing up. On the other hand, in Zuckerman's retrospective study of Nobel Laureate scientists, she noted a process of early self-selection into the scientific network by her subjects. They went to great lengths to apprentice themselves to outstanding senior scientists, including Nobel Laureates. Thus, her subjects learnt via modelling of the masters, embedding their training in a process of socialisation.

Bloom's (1985) seminal study involving talented individuals such as mathematicians, research neurologists, concert pianists and Olympic swimmers is interesting because it reveals that no matter the field, children seem to go through three phases in the TD process. The first is the romance phase during which the children fall in love with a domain. They play, explore and discover, often with parents who made sure to expose their children to additional activities. Their motivation is extrinsic, that is, praise, attention, and the chance to be regarded as special are important. The children's willingness to work hard set them apart from other children.

During the second phase, the children work at learning the structure, rules and techniques of the domain. It is a time for practice, discipline, and acquisition of

expertise. They start moving towards intrinsic motivation: work becomes much more than a requirement; it is no longer necessary to win every competition. They become increasingly competent or skilled, and start to identify themselves in terms of the domain.

In the third phase of the development process, the individuals work towards mastery. They may go beyond the rules and regulations of the domain to develop their own styles, strategies or interpretations. They work at "finding the larger meaning, making the learning personal and worthwhile" (Bloom, 1985, p. 433). Motivation for learning becomes intrinsic. They spar with experts and compete against other equally able young people. They enjoy the demands and become dedicated to what they are doing.

The Bloom study also suggested that being very good in one phase of learning may not have a high relation to being very good at a later phase. There are changes in the substance and style of learning and instruction, and many years of increasingly difficult stages in the TD process before the mature and complex talent will be fully attained.

Clearly, the most able students display special aptitudes and characteristics, and need advanced instruction and high level challenges. Scholars have called for appropriate and systematic provisions for these students (e.g., Gagne, 2007; VanTassel-Baska, 1989a). This will be discussed later in this chapter.

Process-relevant Person Characteristics

The empirical studies on highly able individuals have distilled many characteristics of gifted individuals which are recognised as invaluable assets in developing talent with some entering into the definition of giftedness (e.g., Renzulli, 1978; Tannenbaum, 1983). On the other hand, there are characteristics that are developmentally disruptive. For example, the multi-potentiality of some gifted students may lead them to immerse themselves in diverse activities, leading to high stress or inability to cope. These characteristics are "process-relevant person characteristics" that are the "precursors" and "producers" of development because of their capacity to influence the emergence and operation of processes of development

(Bronfenbrenner & Morris, 2006, p. 810). In the next section, I focus on interest and self-efficacy because they are relevant to this study.

Interests

Broad and intense interests are commonly observed among intellectually gifted children (Janos & Robinson, 1985). Interest has been conceptualised as an individual disposition and as a psychological state that is characterised by focused attention, increased cognitive and affective functioning, and persistent effort (Renninger, 2000; Schiefele, Krapp, & Winteler, 1992). Various theorists have distinguished individual and situational interest (e.g., Hidi & Baird, 1988; Renninger). Individual interest refers to an individual's disposition to attend to certain objects and to engage in certain activities (Krapp, Hidi, & Renninger, 1992). This behaviour is associated with a psychological state of positive affect and persistence; it tends to result in increased learning and is more enduring over time. Students usually have not just one individual interest but many interests that may or may not be closely related to the goals of classroom learning.

In contrast, situational interest is elicited by environmental stimuli (Hidi & Baird, 1988). The focused attention triggered tends to be more momentary and situationally bound (Hidi & Baird, 1986). According to Hidi and Renninger (2006), a situational interest can be transformed over time into individual interest. It involves three factors: knowledge, positive emotion and personal value. As an individual learns more about a topic, he/she becomes more knowledgeable. This can bring about positive affect as the individual feels more competent. As he/she invests more time, he/she may experience greater personal meaning and relevance in the activity. Furthermore, an individual's goals can contribute to the development of interest by directing the person to become more engaged in the learning in multiple ways such as seeking additional resources.

Research has demonstrated that both situational and individual interest promote attention, task persistence and effort (Ainley, Hidi, & Berndorff, 2002; Hidi & Renninger, 2006). Individual interest has been found to have a positive correlation with academic performance (Schiefele, Krapp, & Winteler, 1992). In a study on talented high school students, Rathunde and Csikszentmihalyi (1993) found that

above average goal-directed interest and undivided interest (i.e., excitement, openness and involvement) while doing talent-related activities was positively correlated with performance.

Self-efficacy

Self-efficacy refers to beliefs about one's capabilities to learn or perform behaviours at designated levels (Bandura, 1986, 1997). Much research shows that self-efficacy influences academic motivation, learning and achievement (Pajares, 1996; Schunk, 1995). With regard to TD, highly able students may interpret failure or doing less well as an indication that they are not as intelligent, thus influencing their sense of self-efficacy.

Self-efficacy is grounded in social cognitive theory. According to the theory, when individuals believe that their actions will produce the desired outcomes, they are more motivated to act in ways that are more likely to be efficacious (Bandura, 1997). Learners often obtain information to gauge their self-efficacy from their actual performances or experiences (Schunk & Pajares, 2002). Self-efficacy beliefs influence students' interests, effort, persistence and achievement (Bandura; Schunk, 1995). A student who feels high self-efficacy for his/her learning capabilities will be more ready to work harder and persist longer in difficult situations (Schunk & Pajares).

Schunk and Pajares (2002) identified factors that can influence the development of self-efficacy. Beginning from infancy, parents provide experiences that differentially influence their children's self-efficacy. Home influences that help children interact effectively with the environment build self-efficacy (Bandura, 1997; Meece, 1997). Peers also influence children's self-efficacy. For example, observing similar others succeed can raise the observer's self-efficacy (Schunk, 1987); the converse may occur too. The likelihood of influence by modelling is enhanced in peer networks where students tend to be similar to one another (Cairns, Cairns, & Neckerman, 1989). In school, factors such as greater competition, less teacher attention, and stresses associated with school transitions can weaken academic self-efficacy (Schunk & Pajares). Processes that inform students of their capabilities and progress in learning such as learning goals and performance feedback can influence

self-efficacy; learning goals that are viewed as challenging but attainable enhance students' self-efficacy; the perception of progress strengthens self-efficacy and motivates students to improve (Schunk, 1995).

Interpersonal Relations

Interpersonal relations play an important role in the TD process (Gagne, 1995; VanTassel-Baska, 2001). Two groups of individuals that are salient in this study are family and peers.

Family

Family demographics. Many gifted individuals such as eminent scientists, mathematically talented adolescents or top scorers on the Scholastic Admission Test (SAT) were first-borns (Albert, 1980a; Roe, 1953; VanTassel-Baska, 1983). First-borns are thought to have more opportunities for interaction with parents than middle-born children, a situation which can facilitate direct teaching and role-modelling (Pfouts, 1980), as well as communication of educational aspirations (Smith, 1982, 1985). Birth position may also determine the psychological role assumed by a child within the family (Albert). However, one might speculate that this, together with a child's special talent and family expectations, can increase the pressure on the first-born.

Various studies show that gifted children tend to come from intact families (e.g., VanTassel-Baska, 1983) and parents are better educated (e.g., Gross, 2004).These factors can add up to a more psychologically and financially stable home where parents are in a better position to facilitate their children's education. The most successful individuals from Terman's study came from well-educated and stable families where parents provided more supervision and psychological support to their children for pursuing their interests (Oden, 1968). On the other hand, research has also yielded retrospective accounts of family environments characterised by stress and traumas such as parental loss or dysfunction (Albert, 1971; Ochse, 1993; Roe, 1953). These difficult childhood circumstances can engender powerful motivations to succeed, with individuals compensating for what they fail to obtain from their families (Ochse; Rhodes, 1997), or they may seek refuge in intellectual activities as emotional outlets (Ochse; Piirto, 1998).

Family climate and values. Bloom's (1985) study of gifted individuals indicated cohesive families with close relationships between the individuals and their parents, especially mothers. The child's interests were frequently at the centre of family activities. VanTassel-Baska (1983) observed that even though the mothers of top SAT students were well-educated, most were homemakers, focusing their time and energy on their children. Roedell, Jackson and Robinson (1980) contend that parents are likely to foster psychosocial maturity and adjustment when they spend time with their children, facilitate their interests, and provide a supportive base for intellectual exploration. On the other hand, Albert's (1978) study indicated that parents of creative individuals did not have children as the centre of family life but that they had their own interests and activities. He suggested that parents and children who are involved in their own pursuits may engender an atmosphere that promotes independence and emotional autonomy, enhancing creative growth in the process.

Although different kinds of parenting styles and family dynamics may be more or less supportive of TD (Arnold, 1995), it is worthwhile to note that what is valued in society counts. For instance, in Garces-Bacsal's (2013) study of artistically talented teenagers in Singapore, she noted that despite the strong parental support that her subjects experienced in their talent area, the parents nevertheless emphasised academic achievement. Kao and Hebert (2006) suggest that this is because "Asians have been persuaded that education is the avenue to high socio-economic status" (p. 92). In the same vein, Asakawa and Csikszentmihalyi (2000) observed in their study that although there was distinct valuing of the students' talents in the arts, the parents of Asian American students placed a high premium on academic achievement, maintaining that their children's academic work should not be compromised.

Research on family structure and routines in the homes of gifted children reveals that there are expectations and rules in the home, with parents checking their homework, monitoring practice time, and choosing their activities (e.g., Bloom & Sosniak, 1981). Parents of gifted individuals not only espouse the value of certain activities but also model attitudes that foster success and direct the interests of their children to these areas (Albert, 1980b; Bloom & Sosniak). Landau and Weissler (1993) compared the home environment of families with gifted children and

children-not-identified-as-gifted. They reported the presence of more environmental stimuli (e.g., more books) in the homes of gifted children. They linked this observation to the parents' positive "attitudes towards the promotion of intelligence, causing them to purchase 'stimuli' and to use them as a means of enhancing their children's development" (p. 138). Moreover, these families differed from other families in their emphasis on winning, excellence, persistence and achievement (Bourdeau & Thomas, 2003), consistent with Bloom's (1985) findings. Sloane (1985) noted the strong value of achievement among families in the Bloom study across the different talents. As the child became more competent, parents invested much more resources and turned the child's work into high priority in the family. Ho and Chong's (2010) study of a musically gifted adolescent in Singapore revealed similar findings.

To conclude this section, the family is an interactive system where children and parents mutually influence each other with the interweaving of family values, characteristics of individuals in the family and family events. Yet, it is pertinent to note that it is a system that is embedded within larger systems that subject the family to diverse influences.

Peers

Research has consistently shown that the interaction of ability with high levels of effort brings about outstanding performance (e.g., Ericsson & Linder, 1997; Gagne, 1995). However, decisions about the level of one's commitment of effort are often made during adolescence (Csikszentmihalyi, Rathunde, & Whalen, 1993; Patrick et al., 1999), making the role of peers an important consideration when discussing TD. This is because adolescents tend to value less parents' opinions as peer pressure takes on more salience in their lives (Tierney & Colyar, 2005).

Need for acceptance. Astin (1993) defines peers as a "collection of individuals with whom the individual identifies and affiliates and from whom the individual seeks acceptance or approval" (p. 400). This definition throws light on why not all students necessarily feel connected with other students in a class. Peers are situated through shared participation in particular activities and the time spent together (Gibson, Gandara, & Koyama, 2004). The shared identity unites students in

a peer group (Tierney & Colyar, 2005). However, since students can be part of multiple peer groups concurrently, they might receive contradictory messages from different peer groups. For example, students might simultaneously feel pushed to achieve in one peer group but receive messages from their closest friends that academic achievement is not valued. Csikszentmihalyi (1993) and his colleagues found that the talented adolescents in their study spent significantly less time socialising with peers. Their study highlighted the concerns of adolescents that acceptance in their peer groups may interfere with the commitment necessary for TD.

Support. Students' success can be shaped by their peer groups (Tierney & Colyar, 2005). For example, some students belong to peer groups that have access to more resources. The resources may reside directly within the groups, or as Stanton-Salazar (2004) argues these peer groups can serve as mediating influence by facilitating access to institutional agents (e.g., coaches) or by helping students become embedded in multiple networks.

The study by Patrick (1999) and his colleagues indicated that both social goals and talent goals are significant in influencing TD. When their adolescents had satisfying peer relationships within their talent activities, those relationships bolstered their enjoyment of, and commitment to the activities. However, when they felt that developing their talent was in conflict with engaging in peer relationships, their commitment to their TD was typically undermined. It is interesting though that not all the adolescents who felt the conflict between continuing with their TD and feeling satisfied with their social life quit their TD. These individuals found ways to balance their competing social and talent goals.

Identity and ideologies. The opportunities for comparison within a peer group can contribute to the adolescents' identity development, assisting them in differentiating their own identity from those of others around them (Harter, 1990; Savin-Williams & Berndt, 1990). In addition, explicit and implicit messages between peers in a group can become incorporated into adolescents' self-image (Cooley, 1902, in Harter, 1990) or affect their sense of self-worth and self-esteem (O'Brien & Bierman, 1988) that, in turn, can encourage or discourage commitment to talent activities (Patrick et al., 1999).

Moreover, peer groups can serve as a mediating influence by promoting certain ideologies among students. For instance, Tierney and Colyar (2005) suggest that schools can foster an academic identity that encourages all students to focus on specific goals by intentionally creating groups of students. In such a setting, students enter into communities in which they not only have access to information and resources, but are also granted an identity that presumes that the expected outcomes are in their future. The social and emotional connections established can enhance a sense of group solidarity that upholds expectations for members.

In sum, peer relationships can be expected to be associated with adolescents' commitment to developing their talent because they have been found to be related to adolescents' use of time, perceived support and satisfying relationships, and identity development.

Provisions for Highly Able Students

The role of quality provisions is central to TD (e.g., Bloom, 1985; Gagne, 2015). In the literature, various labels are used to describe provisions, for example, "pull-out", "after-school" and "summer" programmes. In the paragraphs that follow, I discuss provisions under the broad categories of competition and non-competition provisions.

Competitions

Olympiads. In many countries in Europe, Asia and the US, academic competitions are used as a tool to identify and challenge the most able students. Of these, the Olympiad competitions especially in mathematics and the science domains stand out as the provision that stretches students' continuing development (Campbell, Cho, & Feng, 2011). These competitions use multiple levels of demanding tests to identify a small national talent pool (typically 20 students) who move on to a national training camp to prepare for the international competition. At the end of the camp, the top five or six students are identified for the international competition where 30 to 40 teams from other countries compete for medals (Stanley, 1987).

To excel in the Olympiads, students must accumulate extensive subject matter knowledge and be able to analyse current research problems in the domain, a process that allows participants to leapfrog their age peers (Campbell & Walberg, 2011). Yet, critics assert that the Olympiads require a lot of memorising (e.g., Davydenko in Subotnik, 1995). They also dismiss the Olympiads because there are too few winners (Campbell & Walberg) although proponents argue that non-winners benefit by acquiring in-depth subject knowledge (Campbell & Verna, 2010).

A series of parallel retrospective studies involving Olympians in six countries – the US, Germany, Taiwan, China, Finland and Russia – reported that the Olympiad programme had significant positive effects on the participants (Campbell, Wagner, & Walberg, 2000). Many Olympians had modest goals initially but the Olympiads built their confidence and aspirations towards higher goals such as enrolment in elite universities. At the training camp, the Olympians interacted with highly intellectual peers and experts in the field.

A striking finding from the Olympiad studies relates to family influence: a conducive home atmosphere with availability of books was consistently viewed by the Olympians as *more* influential to their development of talent than other factors (e.g., Campbell & Feng, 2010; Tirri, 2000; Lengfelder & Heller, 2002). In the US study, Campbell and Feng found that the less successful Olympians came from families of lower socio-economic status where there were less stimulation and less recognition and encouragement of their talent.

Other competitions. Other types of competitions that have been used in the TD context include those that target teams of students (e.g., *Future Problem Solving*) and those that encourage students to do independent research projects (Campbell, Wagner, & Walberg, 2000). The second type involves projects with scientists or scholars that usually culminate in a research fair. Students become apprentices in graduate research teams. In the US, these projects are entered in competitions such as the Intel Talent Search. Scholarships are awarded to the top finalists, and US universities compete for outstanding participants. Intel finalists are known to have won awards such as Nobel prizes in their adult lives.

Yet other competitions may involve testing of select groups of students, for example, the National Merit Exam and Study of Mathematically Precocious Youth

in the US. These talent search programmes also come with incentives such as scholarships or opportunities to participate in talent programmes. Other countries such as Germany and the East Asian countries similarly organise competitions for school children at different levels.

Campbell, Wagner and Walberg (2000) concluded from their study of academic competitions in the US and Germany that they activate and strengthen students' inclination for the subject matter, enhance the abilities of working autonomously, and provide opportunities for students to meet like-minded peers. Moreover, prizes serve as incentives. In sum, competitions have served the purpose of identifying children with talent and motivating the development of their talent (Campbell & Wu, 1996) although the number of students who actually gain access to competition programmes can be small.

Non-competition Provisions

Non-competition provisions include long-term courses that may take place outside regular school hours, and residential programmes that typically last a few weeks. Both long-term courses and residential programmes aim to stretch the intellectual potential of students to their limit and provide role models through interactions with highly inspiring teachers and experts in the field. Students meet equally intellectual peers in a unique atmosphere of heightened enthusiasm and intense discussions. Research has shown long-term courses to reflect high attendance rates and positive student feedback (Wagner & Zimmerman, 1986) while residential programmes show positive effects on motivation and self-efficacy as well as collaborative and communication skills (e.g., Olszewski-Kubilius, 1997). Examples of long-term courses and residential programmes are the Johns Hopkins University Centre of Talented Youths Programme and the residential programmes run by Duke University in the US.

According to Campbell, Wagner and Walberg (2000), effective measures to support TD in young people should take into account learner characteristics at each phase of development. For instance, the characteristics of curiosity, quest for knowledge, and interest in learning observed in highly able students have to be incited by easy access to a variety of attractive options. The level of challenge built

into learning activities needs to ensure that students exert considerable effort to reach the learning goals; the experience of success or recognition needs to be incentivised too (VanTassel-Baska, 2001). Campbell and his colleagues advanced that in a TD context, every effort should be made to provide a variety of measures to meet the learning needs of these highly motivated students. This is desirable rather than a system of early identification and a closed system of support programmes. Easy access could be achieved by allowing admission based on self-identification as proposed by Brandwein (1995). Such an approach can serve both TD and identification of the most able over the longer term.

Culture and Context in Singapore

Culture

Singapore has a history of provisions for gifted students that goes back more than 30 years. To understand Singapore's approach to gifted education requires some understanding of the culture and the social, political and economic contexts of Singapore which shape beliefs and values concerning ability and TD.

Many Singaporeans hold Confucian beliefs and values, due in large part to the founding Prime Minister, Mr Lee Kuan Yew's philosophy on running Singapore that has transformed the nation miraculously from a third to a first world nation in just thirty years since its independence (Lee, 2000). Mr Lee believed that family is the backbone of society, and that society must maintain a culture of hard work and respect for scholarship and learning (Lee, 2000). Thus, parents tend to have an incremental view of ability where talents can be developed to a high level through hard work and persistence. Children are expected to work hard on academics from an early age. Schools and families have the moral obligation to develop every child to their fullest potential.

Singapore has an education system that relies heavily on high-stakes examinations to determine secondary and postsecondary educational placement (Anderson, 2015). Despite criticisms (e.g., Hong, 2014), it is a system that has gained global recognition (McKinsey, 2007), not least because Singapore's students are widely recognised for their outstanding academic achievements (e.g., TIMSS, 2011). The MOE, as a central body that oversees the development of the education

system, has the mandate to help students discover and make the most of their talents and to develop a passion for learning (Ministry of Education, 2015a).

Gifted Education Context

When Singapore started the Gifted Education Programme (GEP) in 1984, the rationale was two-fold. First, there was recognition of the needs of intellectually gifted children for increased mental stimulation and challenge. Second, as a small nation with no natural resources, Singapore could count only on its people for survival and advancement. It became crucial therefore for the nation to nurture the ability of its most talented children. This is evident from one of the articulated goals of the GEP which is to prepare talented youths for "responsible leadership and service to the country and society" (Ministry of Education, 2015b).

Driven by the MOE, the GEP was introduced as self-contained classes. Students in the top 0.5 per cent of their cohort in Primary 3 and Primary 6 were grouped in classrooms in two primary schools and two secondary schools in 1984. The teachers selected to teach these children not only had outstanding academic and professional qualifications but held shared beliefs about the special needs of gifted children. By 2001, the programme had extended to nine primary and seven secondary schools. The curriculum and pedagogy were shared with mainstream teachers as a result of the positive feedback received. Today, the primary GEP remains vibrant in the primary schools catering to the top 1 per cent of each age cohort, while the secondary GEP has evolved into the Integrated Programme (IP) which is a school-based gifted education programme, providing for students in the top 1 to 5 per cent of the age cohort. With broadening conceptions of giftedness, Singapore has also expanded its TD efforts to include specialised schools for talents in the arts, sports, mathematics and science.

In addition to providing cognitively challenging core academic curricula, the GEP offers a wide range of enrichment opportunities to gifted students. These include camps, fairs, field trips, competitions and seminars. Many of these provisions are run in partnership with the universities, research institutes, industry or community. Students are provided with mentoring opportunities in their areas of interest. Examples of special programmes include the Creative Arts Programme,

Moot Parliament Programme, Science Research Programme, and overseas programmes that provide opportunities for students to meet other highly able students.

Globalisation, Educational Reforms and Meritocracy

Globalisation

Globalisation is commonly understood as "the rapid acceleration of cross-border flows of capital, goods, services, people and ideas" (Green 2007, p. 23). This process of global interconnectedness and its effects are intensified by rapid advancements in communication and technological innovations. Faced with massive structural changes in the global economy, states are often confronted with immense pressure to reconfigure their roles in economic and social policies in order to remain economically competitive and socially cohesive (Gopinathan, 2007).

Within the education sector, the effects of globalisation can be seen in greater internationalisation, the commodification of education, more choices, intense competition, and greater involvement and burden for parents, to name a few (Gopinathan, 2007). Moreover, when global and national economies change, new types of workers are needed – the ideal citizen is someone who is not only adept at critical and creative thinking and information-communication technology but is also a multi-culturally effective problem-solver who has the drive to innovate and learn continuously (C. Tan, 2008; OECD, 2010). In order to stay economically competitive, educational reform is an imperative. For example, in many countries, reform proposals have stressed the need for greater attention to process-focused learning, higher order thinking skills, better utilisation of technology, changes to assessments, and devolution of power to schools while maintaining central control over curriculum and key performance targets (Gopinathan). In the next section, I provide examples of educational reforms in the Singapore context.

Educational Reforms in Singapore

As a small city-state with no natural resources, Singapore's economy relies heavily on external trade, making economic openness to global economic forces crucial for its survival. Since its independence in 1965, education has played a

central role in transforming the city-state into a global city. In fact, educational reform was and still is Singapore's way of "retooling the productive capacity of the system" (Gopinathan, 2007, p. 59). The current educational landscape in Singapore is the result of the government's strategic efforts to invest in human capital for the purpose of economic growth and nation-building (Gopinathan, 1974).

To illustrate, following Singapore's independence, the government focused its efforts on building social cohesion and producing trained workers for its export-led industrialisation efforts. This was done through the introduction of standard education content and syllabus to schools. The purpose was to develop students from multi-ethnic groups into good citizens, robust, well-educated and skilled for the work force. Technical education was emphasised with the development of post-secondary technical and vocational education at polytechnics. This was essentially the survival phase of Singapore's educational reform (C. Tan, 2008). The next phase may be described as an efficiency phase where the system was fine-tuned to produce skilled citizens for the economy in the most efficient ways. This was the period when streaming was introduced in secondary schools based on the Primary 6 national examination. The recession in the mid-1980s catalysed further educational changes. One of these was the Independent Schools initiative in 1987 which represented efforts to decentralise control and introduce greater choice and school autonomy.

With globalisation processes intensifying in the 1990s and new demands for economic competitiveness, the government launched the Thinking Schools, Learning Nation initiative in 1997 to position Singapore to compete and stay ahead. Traditional education that was dominated by teachers and standard syllabuses was considered inadequate. Instead, the government read that Singapore schools needed a much higher threshold for experimentation and innovation. The knowledge-based economy needs individuals who are able to apply higher order thinking skills to solve problems; capable of being creative and innovative; ready to take risk; able to work independently and in groups; and are lifelong learners. To face the challenge of preparing students for innovation-driven growth and unpredictable changes in the social-economic environment, changes were made in the education system to bring about greater breadth and flexibility in learning as well as to nurture diverse talents in schools. This included changes to the school curriculum as well as the

establishment of Integrated Programmes in a number of secondary schools in 2004. The Integrated Programmes enable the top 10 per cent of the primary school cohort to skip their O-level examinations and move directly to the A-level years. The time "saved" from not preparing for the O-levels would be spent on broader learning experiences, project work, leadership programmes and a range of co-curricular activities. In addition, specialised schools were set up, for example, the Sports School and the Science and Mathematics School.

The educational reforms briefly introduced here illustrate the central role of the Singapore government in directing reforms in schools, that is, the state steers the education system in both policy matters and structure. As Green (1997) rightly pointed out, education was instrumental in Singapore's miraculous economic development since independence.

Meritocracy

The urgency for development in the early years of Singapore's nationhood gave legitimacy to the exceptional emphasis that the government placed on individual merit, talent and hard work (Chan, 1991) and the meritocratic principle. Meritocracy – broadly conceived as a "practice that rewards individual merit with social rank, job positions, higher incomes, or general recognition and prestige" – would "give all potentially qualified and deserving individuals an equal and fair chance of achieving success on their own merit" (Tan, 2008, p. 8). Today, meritocracy remains a core principle of governance in Singapore and is deeply entrenched in the psyche of Singaporeans.

The promise of social mobility in the meritocratic principle has led to a situation where families place high premiums on education and educational achievement (Ng, 2011). This is not surprising because the Singapore education system has indeed contributed significantly in transforming class stratification, particularly in the post-independence years. For example, a former top diplomat, Kishore Mahbubani reflected on his life chances:

> In my life, I have lived a meritocratic dream . . . . Through unusual good fortune, Singapore had remarkably wise leadership . . . . These leaders decided that Singapore's only resources were human resources. None should

> be wasted . . . . Hence, with financial aid and scholarships, and through a merit-based promotion system, I escaped the clutches of poverty. (in Tan, 2008, p. 18)

Yet, meritocracy as practised in Singapore has brought about intense positional competition in schools (Gopinathan, 2007). The meritocratic system pushes students to outdo one another; individuals who possess the "right" attributes are sorted and rewarded. Consequently, students are encouraged or pressured by their parents to push their limits and excel. Parents feel the pressure to help their children accumulate various social and cultural capital that will give them an edge. Tuition is viewed as necessary to get ahead in the competitive education system (Hio, 2014). Further, the emphasis on all-round development in schools poses additional demands as students strive to outdo their peers in co-curricular activities as well. All these have contributed to a pressure-cooker environment for students and parents.

Another criticism that has been levelled at meritocracy today is that it offers the promise of equality of opportunity but does not deliver. This seems to be because the process of merit-based selection that hinges on the principle of non-discrimination may, in fact, perpetuate inequality because it treats people with unequal backgrounds as the same when they may not be (Lim, 2013). The greater resources that well-to-do families have for tuition and enrichment programmes will clearly provide students from these families with a competitive edge to get ahead – an example of how meritocracy practised without consideration of a student's background might contribute to inequality and lower mobility. However, Tan (2008) has argued that the contradiction between the principles of non-discrimination and equality of opportunity in an unequal society may be resolved by thinking of meritocracy as a competition with a clear "before" and "after" (p. 8). Before the competition begins, opportunities could be equalised by intervention to remove restrictions or discriminations that limit access to competition. Resources may be re-directed to those who are disadvantaged because they lack the initial environment and opportunities. After the competition begins, the individuals are on their own to prove themselves. In this way, meritocracy may be more valued for giving individuals the incentive to do the best that they can. It promotes competition and

competitiveness which can bring out the best in people. Models of meritocratic success such as social mobility can continue to inspire aspirations towards higher goals.

In addition, there is the issue of what counts as merit and who decides. Elitism sets in when merit is defined only by meritocracy's winners who actively promote their definition in order to gain widespread consensus and support. In such a situation, the winners continue to win and the losers go on losing, further obscuring the egalitarian aspects of meritocracy. In an education system, this can reproduce and reinforce how individuals can be systematically excluded from opportunities that are seemingly open to all. Several researchers have written about Singapore's use of meritocracy to legitimise maintenance of the ruling elite in government (e.g., Lim, 2013; Tan, 2008; Wong, 2013). The issue of defining or measuring merit also comes up in high-stakes examinations such as the Primary School Leaving Examination (PSLE) taken by 12 year olds (A. Lee, 2016). The PSLE score determines what stream and secondary school a child moves on to. Many parents see entry into top schools as critical to their children's future. There are concerns over whether the PSLE score is a good measure of merit, and if a single examination taken at a relatively young age is too powerful in determining a young person's subsequent opportunities and educational outcomes.

While meritocracy as an ideal is shared by many Singaporeans, questions have been raised about how well it is working in current times. With fierce positional competition, the upholding of meritocratic principles becomes more problematic. The greater structural differentiation in the school system and the creation of alternate pathways with differential opportunities can produce the unintended consequences of a hardening of social class divisions and a weakening of social cohesion (Gopinathan, 2007). The form of meritocracy practised imposes potential costs on society and raises the need to find ways to mediate the effects encountered in the everyday experience of individuals. Additionally, although the Singapore education system has become more flexible and there are more choices as a result of reform efforts, there are still considerable rigidities caused by streaming at the secondary level. High-stakes examinations such as the PSLE, and the O- and A-levels remain. As observed by Gopinathan, the fundamental assumptions about

ability and its identification, definitions of success, and availability of learning opportunities including second chances are some of the issues that policymakers and educators must continue to debate and engage in as they work towards educating students who will be ready for an innovation-oriented, risk-taking workforce.

Global Mobility in Higher Education

Push and Pull Factors

With globalisation, the landscape of higher education has changed dramatically. Students' educational mobility, traditionally limited to local education, has expanded in volume internationally. Using a push-pull model to examine the flow of international students, McMahon (1992) suggests that student outflow is dependent on economic wealth, the priority placed on education, and availability of educational opportunities in the home country. It also depends on the interconnectedness of the home country to the world economy. Difficulty of gaining entry to a university at home and an intention to migrate are other push factors (Mazzarol & Soutar, 2002). On the other hand, student attraction to a host country is influenced by factors such as its social-political-economic links with the home country and its support of international students (McMahon). When it comes to selecting the institution, institutional reputation and range of courses are some factors that make a particular institution more attractive than its competitors ((Mazzarol & Soutar). In Park's (2009) study on Korean high school students, he found the students dissatisfied with local higher education while there was a high demand for study in the US. The students perceived the university entrance examination system in Korea to be excessively competitive, the quality of Korean higher education to be unsatisfactory, and the university qualification to be less recognised. The students also viewed universities in the US to be associated with curriculum excellence and creative learning environments.

State Sponsorships

At the macro-level, many nations have become interested in student flow across borders in the past few decades. Governments recognise the need to provide their young people with a global consciousness and with experience in other countries in order for them to compete in the global economy (Altbach, 2004).

Access to a wider range of options in universities abroad, especially world-class institutions can serve as a source of future talent in government and the general workforce as economies grow and prosper. In Singapore, state-sponsored scholarships enable students to travel overseas for an elite education and acquire knowledge and skills for the labour market, in particular the Civil Service. Although there are scholarships from statutory boards, banks or private institutions, the Public Service Commission (PSC) scholarships are considered the pinnacle of scholarships and are among the most tangible of meritocratic instruments in Singapore (Tan, 2008). Through a series of high-level interviews and tests, individuals are selected from a pool of candidates with top examination results and outstanding co-curricular achievements. The most popular destinations for recipients are the Ivy Leagues in the US and Oxbridge in the UK.

In relation to PSC scholarships, Ye and Nylander's (2015) research into state sponsorship and Singapore's Oxbridge elite revealed interesting findings. They noted that Singapore which has a population of just 5.5 million was the third-largest source of international undergraduates at Oxford. Their analysis of in-depth interviews with Singaporean undergraduates studying at Oxbridge and a dataset of the institutional origins of 580 PSC scholars from 2002 to 2011 illustrated how students were matched from elite schools to Oxbridge and back to the higher strata of the Singapore Public Service. Their findings emphasised the preparatory function of elite schools and the informational capital students gained by studying there. The interviewees from elite schools related that the resources they had for university application included a dedicated tutor, a higher education advisory centre that organises preparatory activities, and interactions with Oxbridge alumni and faculty members. However, the interviewees from other non-elite schools recalled that they had little support.

Ye and Nylander's (2015) study suggested that student mobility arrangements to Oxbridge are related to the reproductive functions of the Singapore state that sponsors overseas education through government scholarships. Upon graduation, the recipients are obliged to work for the Singapore government under a contractual bond but they are promised rewarding careers especially in the elite Administrative Service where they may be fast-tracked to leadership positions. For

instance, a PSC recipient noted to be of high potential in the Civil Service may be invited to join Singapore's ruling party, and when elected into Parliament may be picked to serve in the Cabinet (Tan, 2008). These findings seem to run parallel to the criticisms on meritocracy discussed earlier.

Conclusion

Developing an understanding of highly able students' experiences of their academic TD requires more than a grasp of factors in their immediate environments. Importantly, it requires an understanding of the interplay of wider factors, including national and global. The literature review highlighted the need to synthesise what we know from the gifted education literature with influences beyond students' immediate environments. The proposed ecological model in Chapter 1 provides an approach that reaches across student settings to focus on multiple interactions of individuals, groups, culture and contexts; it promises a perspective for understanding TD that promotes connection of the multi-level elements influencing TD and thus suggests where interventions may be made to improve outcomes for students.

CHAPTER 3

Methodology

Introduction

This study seeks to understand the perceptions and experiences of highly able students in a Singapore school and their interactions within their immediate and wider contexts in school. The students construct their own realities and have unique experiences of their education and talent development programme. The central aim is to give them voice so as to draw out, describe and interpret their experiences. This chapter discusses the methodological design and research methods employed to gather and analyse data to answer the research questions.

Research Design

Qualitative Approach

A qualitative methodology and case study research design were used in this study. There are two key reasons for my choice of a qualitative study. First, the philosophical assumption of qualitative research which is that reality is constructed by individuals interacting with their social worlds (Merriam, 1998) is consistent with my relativist ontological and constructivist epistemological perspectives. I am interested in understanding the realities that students construct about their world and the experiences they have in it. My concern is directly with the students' experiences because meaning is embedded in these experiences (Merriam, 1998). Second, qualitative research provides a means for gathering in-depth information by talking directly to the students to explore and probe the meaning that they ascribe to their experiences (Creswell, 2009). This makes it possible to develop rich, thick descriptions of each student's experiences in context (Merriam, 1998; Patton, 2002).

Case Study Design

I selected case study as the most appropriate design for addressing the research questions because I am interested in insights and discovery from an in-depth understanding of the students and their experiences. A case study design is suitable as it is concerned with process rather than outcomes, context rather than a specific variable, and discovery rather than confirmation (Merriam, 1998). As Yin (2009)

observes, case study is a design particularly suited to situations in which it is impossible to separate the phenomenon's variables from their context. In this study, each student and his contexts constitute a case; it is impossible to separate a student from his contexts.

Thus, I seek a rich account of the experiences of each student that will offer insights and meanings that expand readers' experiences. The qualitative case study strategy allows a deep investigation into the dynamics of students' thoughts, emotions and interactions with their environment, making possible an intensive, holistic description and analysis of each case (Merriam, 1998).

Research Context

As context is crucial in qualitative case study research (Stake, 1995; Yin, 2003), a detailed description of the research site and my motivation for selecting the site and participants are provided in the sections that follow.

Research Site

The study was conducted in a very selective school in Singapore. The school, known as Sunnyrise School in this study, offers the School-Based Gifted Education (SBGE) Programme. As an independent school in the Singapore education landscape, Sunnyrise School enjoys greater autonomy in curricular, administrative and student admission matters than other schools. Although the school is government-funded, parents pay much higher school fees than for other government-funded schools.

The school only takes in boys from Year 1–4 (age 13 to 16); girls are admitted in the senior years in Year 5–6 (age 17 to 18). Of significance is that Sunnyrise School receives the top 3 per cent of the Primary School Leaving Examination (PSLE) cohort in Singapore. The PSLE is a compulsory high-stakes national examination for Primary 6 students (age 12) before they are streamed into different secondary schools and academic pathways (e.g., special, express or normal streams). Additionally, the school attracts the most able students from the primary school gifted education centres. These students belong to the top 1 per cent of their cohort based on their academic achievements and tests of scholastic aptitude.

Students with outstanding achievements in academic areas such as Mathematics are also admitted based on stringent general ability and subject-specific tests. Hence, Sunnyrise School comprises very high ability students who may be deemed to be gifted learners insofar as gifted education programmes in many parts of the world cater to the top 3 to 5 per cent of each age cohort.

The six-year SBGE Programme that Sunnyrise School offers culminates in the Singapore-Cambridge General Certificate of Education Advanced Level examination (A-levels). It by-passes the O-level examination usually taken by 16-year olds in Singapore, giving the students more time to pursue their interests and develop themselves holistically. The school-wide SBGE Programme aims to provide enriched learning and opportunities for all students of Sunnyrise School to excel in their pursuits, passions and abilities. Enrichment is offered at two levels: (a) expansion within subjects to make learning richer and more intellectually demanding; (b) an increase in the number of curricular subjects. Additionally, there are opportunities for research, mentorship and competitions at regional and international levels.

Within the SBGE Programme, Sunnyrise School later introduced the highly differentiated Socrates Programme to cater for students who show exceptional interest and ability in subject-specific domains. Customised for advanced talent development, the Socrates Programme aims to provide unique environments for scholarly pursuits at the highest possible level in each subject discipline. To do that, the school works with tertiary institutions to support the Socrates Programme such that the best theoreticians and practitioners in disciplinary fields guide and mould the students. The best teachers are selected to teach these classes. Thus, the Socrates Programme is designed to catalyse a process of enculturation and advancement into each of the intellectual fields. Figure 2 shows Sunnyrise's SBGE Programme and Socrates Programme within the context of the larger Singapore Education System and the UK Education System.

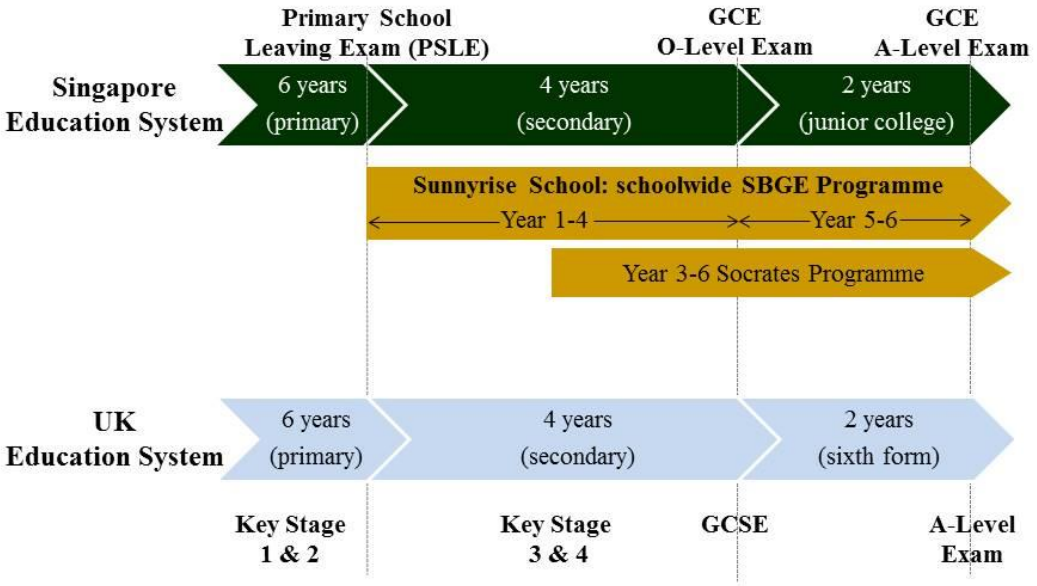

Figure 2. The Singapore and UK education systems: Locating Sunnyrise School.

To provide opportunities for international benchmarking and to cultivate aspirations towards higher levels of performance, the very best of the students are given opportunities to participate in international events. This kind of exposure provides the students with the opportunity to sharpen their intellect against the very best in the international arena. Examples of international events include the Academic Olympiads, International Winchester Symposium, and International Science and Engineering Fair.

As the Socrates Programme is a provision for advanced talent development in specific subjects, Socrates Programme students join a "pull-out" class that is distinct from the regular SBGE subject class (e.g., a Socrates Maths class as opposed to a regular Maths class). The selection process comprises two stages and takes place at the end of Year 2 (age 14) and Year 4 (age 16). The first stage involves screening of (a) general academic ability as evidenced by a baseline grade point average of 3.60 on a 4-point scale; and (b) an 85th percentile rank in the subject. In the second stage, eligible students apply, providing evidence of achievements, a personal statement, and teacher recommendations. The students then sit for a subject-specific selection

test and attend a panel interview. Girls who join the school in Year 5 are also given opportunities to participate in the Programme.

In addition to the provisions for advanced talent development, student development programmes in the school focus on involvement, leadership and community engagement. These programmes include sports, clubs and societies, community involvement programmes, and leadership programmes. Thus, Sunnyrise students are provided with opportunities for all-round development and are challenged to excel in their pursuits and passions.

To summarise, the academic provisions in Sunnyrise School may be organised into four levels much like Treffinger's (1998) Levels of Services. *Level 1 Provisions for All* comprises the SBGE core curriculum and enrichment activities that provide a base in which all students participate, and can discover and develop their strengths and interests. The SBGE classrooms build strong foundations in a broad range of subjects. Within each subject, there are enrichment activities such as talks and field trips. *Level 2 Provisions for Many* provide further learning experiences to stimulate and engage students in active learning. The provisions are available to all students though not all will choose to participate in them. Admission criteria if any are less stringent. Here, the school focuses on creating opportunities for development and expansion of experiences. *Level 3 Provisions for Some* focus on creating opportunities to deepen learning. Such opportunities provide high level challenges and complexity, and are based on demonstrated ability and potential to perform at a particular level. The Socrates Programme is a Level 3 provision and it offers advanced talent development in the Sciences, Mathematics and Humanities subjects. *Level 4 Provisions for a Few* cater to a small number of students and are based on stringent selection criteria. These students typically represent the school or country at international events. Figure 3 provides a schematic representation of the four levels of provisions in the academic domain.

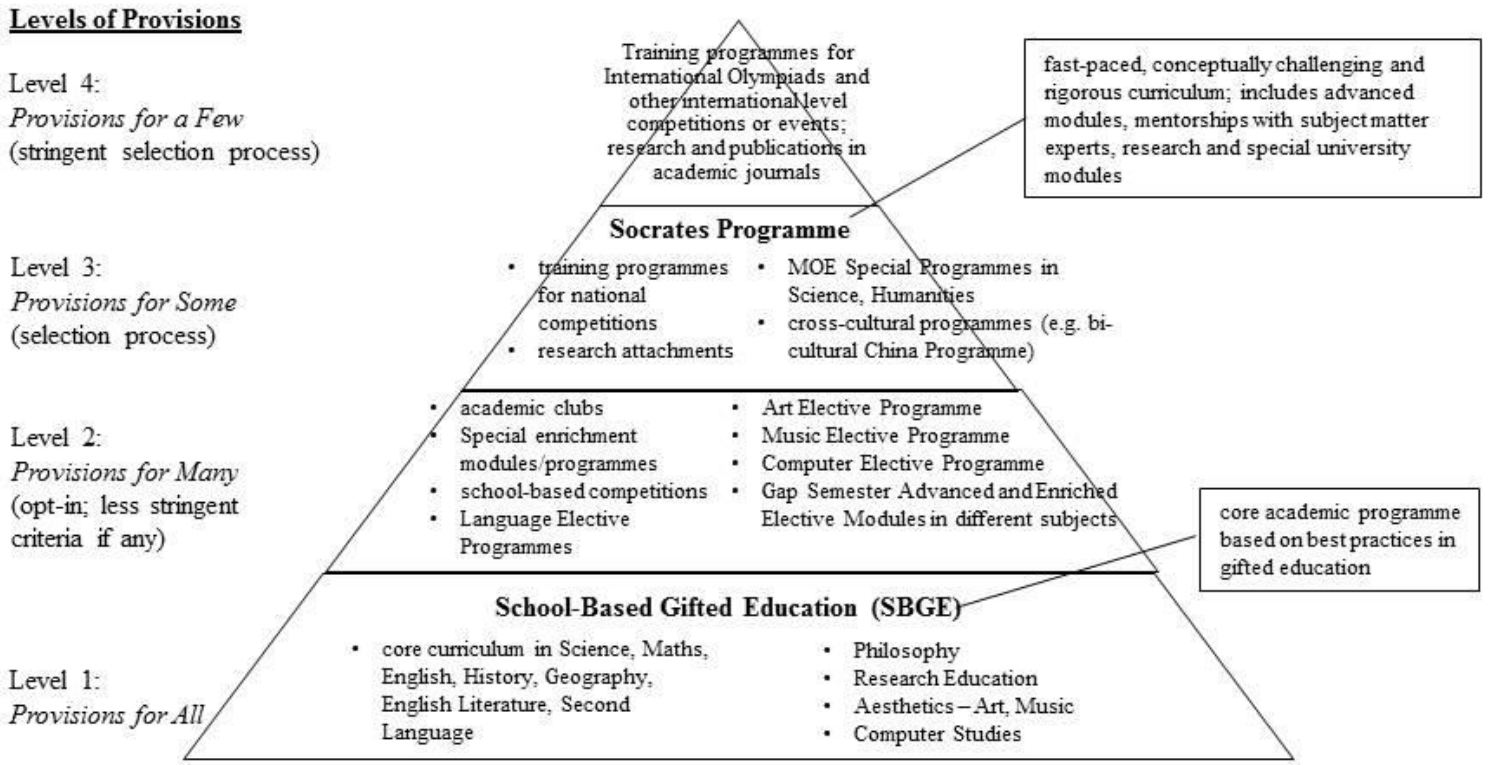

Figure 3. Levels of Provisions in the academic domain.

Rationale for Research Site

I chose my research site for the following three reasons. First, Sunnyrise School is a suitable site for this study based on its student population and its strong background in gifted education programming. The school attracts a large percentage of students identified at the national level to be in the top 3 per cent in terms of intellectual and academic abilities each year. The school offered the Singapore Gifted Education Programme (GEP) when it first started in 1984 and the current school-based gifted education (SBGE) programme that it offers is grounded in the GEP. Moreover, the Socrates Programme in the school is an advanced talent development programme that caters specifically to academically outstanding students who demonstrate a readiness for highly enriched and accelerated learning in particular academic subjects.

Second, as a practitioner, I felt the need to explore and understand better the perspectives and experiences of highly able students in their talent development journey in my school. Drysdale (1985) wrote that administrators find themselves in a position where they desperately need readily available intelligence of a kind, which among other things, may be provided by research. Having spent more than 20 years as a teacher and now as a deputy principal in my school, a study conducted in the school would provide insights that challenge the way practitioners think about students and school provisions, and could potentially influence the decisions made in the school. The research and its findings would facilitate reflection and a more informed view of the educational process and talent development (Hitchcock & Hughes, 1995). As Hammersley (2000, 2002) suggests, research provides resources that practitioners can use to make sense both of the situations they face and of their own behaviour.

Third, there were practical considerations that informed my choice of research site such as the benefits of understanding the context, histories, culture and events, processes, and organisational structures. Such information can prove valuable to a researcher in knowing where and what to probe (Johnson, 1994). However, I was mindful of the challenges of undertaking insider research from various literature (e.g., Drake & Heath, 2008; Mercer, 2007). For one, my biases and problems of familiarity with the context can lead to blind spots or be an obstacle to "objectivity"

(Wellington, 1996). To manage this, a critical friend who is involved in education and educational research, acted as the outsider who played the role of making the familiar strange to me. In addition, I searched within myself to be "meaningfully attentive" (Peshkin, 1988, p. 17) to my subjectivities, assumptions and decisions throughout the study by making notes in my research journal.

Selection of Participants

I used criterion-based selection (LeCompte & Preissle, 1993) to identify the participants. Merriam (1998) advised that in order to ". . . discover, understand and gain insights, one needs to select a sample from which one can learn the most" (p. 48) while Patton's (2002) recommendation for qualitative researchers is that cases at the extremes of a distribution are more likely to contain rich information. Based on these considerations, the criteria used were:

(1) students in the top 3 per cent of the national age cohort in academic achievement;

(2) students in the Socrates Programme for at least two years; and

(3) students in the 20th or 90th percentile in academic achievement in the Socrates class at the end of Year 4.

The choice of students who had at least two years in the Socrates Programme ensured that they had substantial time in the advanced talent development learning environment in order to be able to share their experiences in an in-depth manner. The 20th percentile criterion was revised from the initial 10th percentile criterion as participants had to be replaced in the course of data collection due to their non-availability. The criteria were finalised in consultation with the Dean of the Socrates Programme who had taught in the programme for several years. The subject teachers who taught the students identified the participants by adhering to the criteria, and later chose the final participants based on their knowledge of the students' attitudes, aptitudes, achievements, and ability to contribute to the study.

The participants were selected from two different cohorts in order to increase the pool of students from which to draw upon. At the time of the data collection, the two cohorts were the most recent graduands of Sunnyrise School. A retrospective

study with students who had recently graduated was likely to yield richer data as the students had completed their six years of secondary and post-secondary education and had had some time to reflect on their experiences and encounters in school. Moreover, it addressed the ethical issue of power differential between the students and the researcher to some degree.

Data Collection Methods and Procedures

The data sources for this study comprised four focus group interviews, eight sets of individual interviews (a student interview followed by an interview with his parent and teacher) and school documents. This is in keeping with case studies where researchers collect data from multiple sources to inform and construct the cases (Creswell, 2009; Patton, 2002) as well as for triangulation (Rowley, 2002). Merriam (1998) also pointed out that the intensive, holistic description and analysis characteristic of qualitative case studies mandates both breadth and depth of data collection. The data collection methods and procedures are discussed next. Appendix A provides an overview of the data collection and timeframe.

Focus Group Interviews

I included focus group interviews as one of my data sources as it worked well with the 90th percentile students in my Institution-Focused Study (IFS). What was learned from the focus group interviews, which were undertaken first, was used for both triangulation and stimulus for the individual interviews. I found that the interaction in focus groups encouraged the students to talk to one another and to explain points of view. In the process, it helped them to clarify their own understandings of specific experiences (Kitzinger, 1995). Bender and Ewbank (1994) wrote that when participants discuss or clarify one another's responses, they are more likely to be concerned with the validity of their answers than with socially or politically correct answers. Such an empowerment was useful in this study as it helped to mitigate issues of power differentials between the participants and researcher (Morgan & Krueger, 1993). The advantage of greater breadth from focus group interviews also offered a range of experiences and perspectives from the participants (Morgan, 1996), which I found useful for the purpose of informing the individual interviews.

Morgan (1996) described segmentation as a sampling strategy of focus group research that "consciously varies the composition of groups" (p. 143). As in my IFS, I grouped the participants according to their cohort year to obtain insights across the different cohorts. Each cohort group comprised seven students, which is within the range of ideal group size of four to eight participants for focus group discussions based on balanced considerations for level of participant involvement and range of potential responses (Kitzinger, 1995; Morgan, 1996). The students in each group had shared experiences in the Socrates Programme and were comfortable with one another, thus increasing the likelihood for experiences to be revealed in the interaction (Kitzinger, 1995). Table 1 provides a description of the focus groups.

Table 1

Focus Group Description

FG	Percentile group	Phy	Chem	Bio	Maths	Hist	Geog	Lit	FG size
G90-1	90th	1	1	1	1	1	1	1	7
G90-2	90th	1	1	1	1	1	1	1	7
G20-1	20th	1	1	1	1	1	1	1	7
G20-2	20th	1	1	1	1	1	1	1	7

Note. FG = focus group.

Each focus group interview lasted about 90 minutes and was audio-taped. The interviews with focus groups G90-1 and G90-2 were conducted in my IFS by a moderator, while I conducted focus groups G20-1 and G20-2 in the timeframe of this study. The IFS focus group guide (Appendix B) was used since it had proved useful for this purpose. At various points during each focus group, tentative themes were summarised and presented to the participants for confirmation (Kidd & Parshall, 2000). Each participant was also provided with a short free-response questionnaire (Appendix C) at the end of the interview to record any private thoughts (Kitzinger, 1995). These were collected for analysis.

To explore the participants' perspectives and experiences in more depth, I conducted face-to-face individual interviews with some participants.

Individual Interviews

Case study participants. A total of eight primary case studies were selected from the four focus groups. Students with interesting or contrasting viewpoints and students who seemed to have much to share during the focus group interviews were identified. The subject teachers were also involved in determining the final case study participants as they know the students well. Table 2 provides an overview of the case study participants. Within each percentile group, there were two participants each from the Science/Mathematics and Humanities clusters to investigate if there were differences in the experiences of students across contrasting discipline clusters. Each participant chose a pseudonym.

Table 2

Individual Case Study Participants

Participant (Pseudonym)	**Percentile group**	**Socrates Programme[1]**	**Age**
Alex	20th	Science/Maths	19
Gibbs	20th	Humanities	19
Knight	20th	Humanities	19
Michael	20th	Science/Maths	19
Jay	90th	Science/Maths	19
Mark	90th	Humanities	19
Matthew	90th	Humanities	20
Zach	90th	Science/Maths	20

Note. [1]Science comprises Physics, Chemistry or Biology; Humanities include History, Geography or English Literature.

Interview guide. I chose semi-structured interviews as the purpose was to allow the students to reconstruct and describe their experiences in their own words, and to allow responses to be probed further (Kvale, 1996). To gain an understanding of the interactions and experiences of the case study participants in their multiple contexts, I used Bronfenbrenner's (1979) ecological model as a guide to develop the interview guide (Appendix D). For example, open-ended questions were asked about the students' microsystem interactions with teachers, their interactions in the mesosystem as well as their experiences as a result of the vertical interactions between ecological system levels. Further, questions were asked about the continuity of proximal processes, and the patterning of environmental events and transitions over time (the chronosystem aspect of the Bronfenbrenner model). The themes from the focus groups served as stimuli for inquiry in the interviews. I reviewed the interview guide with my supervisor and a graduated student of Sunnyrise School who was not involved in the study to hear his views on possible reactions to the questions.

Interview process. Each interview lasted about 90 minutes and was conducted at a place convenient for the students. The interviews were audio-taped. At the beginning of the interview, I focused on building rapport with the students. I realised after the first interview that participants could be uncomfortable about providing information about their home or parents' educational background in a face-to-face manner. This prompted me to develop a demographic information sheet, which I then gave to the students at the end of the interview, explaining the purpose and use of the information in the context of the study.

Due to the emergent nature of qualitative inquiry, I obtained the students' consent to return to them for clarification post-interview when necessary. I found this to be useful: in a few instances, I emailed or sent text messages to the students to seek clarification.

Interviews with parents and teachers. Following the individual interview with each case study participant, I conducted face-to-face individual interviews with their parents and teachers (see Appendix E: Parent Interview Guide; Appendix F: Teacher Interview Guide). A total of six parents and eight teachers were interviewed. There were two parents who preferred the interview questions to be emailed to them.

The teachers identified for the interviews were based on suggestions by the case study participants and were teachers who had taught them in the Socrates Programme. Each interview with the parent or teacher was about 60 minutes and was audio-recorded. The perspectives of parents and teachers were included because of the important insights they can provide, particularly in relation to the ecological levels. Numerous studies (e.g., Albert, 1978; Bloom, 1985; VanTassel-Baska, 2001) have reported the positive roles that these adults can play and the importance of their involvement in the talent development process. The data collected also allowed for triangulation in the inquiry process.

Gaining access. I contacted each participant via telephone or email to invite him/her to participate in the study. In the case of the parents, some students preferred to convey my invitation to their parents, which I went along with. However, in all cases, I subsequently established contact with the parents either through email or telephone. An information sheet on the study, and consent forms were given to the participants. The signed consent forms were then collected.

After transcribing the interviews and writing up the case studies, the students had the option to read their case study description. One student chose to do this.

Documents

I collected the academic and co-curricular activities' records and school testimonials of the case study participants before the individual interviews because the information may prove to be useful as stimuli for inquiry in the interviews. This was done with permission from the school principal and the participants themselves. As the school testimonial is a document that Sunnyrise School gives to a student upon graduation and is intended to support the student's application for university or work in the future, I noted the possible built-in biases, for example, a focus on the student's strengths and omission of aspects less favourable to the student (Burgess, 1982; Merriam, 1998). Despite this limitation, I found the school documents to be a valuable resource for corroboration of information and a stimulus for inquiry in the interviews (Merriam, 1998; Patton, 2002).

Data Analysis

Analysing Data During Collection

Following Bogdan and Biklen (2007) and Merriam (2009), I conducted data analysis simultaneously with data collection to avoid unfocused or repetitious data. I transcribed each interview before moving on to the next one. Where it was not possible due to the interview schedule, I relied on interview notes, which I made following each interview session. This rudimentary data analysis allowed me to use insights gained from one data collection activity to inform the next data collection activity.

Each audiotaped interview was transcribed over several sittings. I listened to the interviews using the software *ExpressScribe* and checked each transcription carefully for "accuracy", bearing in mind the logistical and interpretive challenges to transcription quality such as problems with sentence structure and mistaking words (Poland, 2002). Although tedious, I found the process helpful as it allowed me to note salient themes or ambivalent comments that helped to focus subsequent interviews.

Managing Data

The data analysis involved two categories of data sets: (a) focus group data set, and (b) case study data set (see Appendix G: Overview of Data Sets). Each focus group data set comprised the interview transcription and individual free-response questionnaire. I analysed the focus group data sets first – FG90-1, FG90-2, FG20-1, FG20-2 in turn – before examining the codes and themes across the G20 and G90 datasets.

Each case study data set consisted of transcriptions of the interviews of student, parent and teacher; student records; and the demographic information sheet. Following Stake (1995), each case study was organised and analysed to stand as a unique, holistic entity with the context for understanding the case.

Thematic Analysis

My priority was to describe and interpret the participants' perspectives and experiences as opposed to formulating substantive theory as in grounded theory or

seeking the participants felt meaning as in phenomenology. As such, I chose Braun and Clarke's (2006) thematic analysis as my analytic method. Thematic analysis can be used to analyse most types of qualitative data including interview transcriptions, participants' journals and site documents (Braun & Clarke, 2006). It was thus suitable for this study that has multiple sources of data, that is, focus group interviews, individual interviews and documents. As an analytic method, a key advantage of thematic analysis is its theoretical flexibility, that is, it is not tied to any rigid methodological requirements (Braun & Clarke, 2006; Clarke & Kitzinger, 2004). However, its flexibility is one reason that some researchers consider thematic analysis lacking in clarity for unambiguous replication (Mills, Durepos, & Wiebe, 2010). Despite the critiques, thematic analysis is widely used in qualitative data analysis in many fields such as psychology, health and education (e.g., Fereday & Muir-Cochrane, 2006; Ponsford & Lapadat, 2001).

To ensure rigour in the analysis process, I adhered to Braun and Clarkes' (2006) key phases of thematic analysis. I first familiarised myself with the data by reading and re-reading them, noting down initial ideas in each data set. I then generated initial codes by labelling interesting features of the data relevant to the research questions systematically across each data item in the data set, using highlighters to mark out data extracts and relevant surrounding data to preserve the context. Next, I collated the codes into potential themes and gathered all data segments relevant to each potential theme. This required cutting out the data extracts into separate slips of paper, labelling, and sorting them into initial categories. I did this for each data set. I reviewed the themes by checking if the themes worked for the coded extracts; sometimes two themes were collapsed into one or a theme broken down into separate themes. I then reviewed the themes across the entire data set. This was an iterative process involving re-reading and review of the codes and themes. I sketched thematic maps to consider how the different codes and themes fitted together. In the last phase, I considered how each theme and its collated data extracts could be organised into a coherent account, and how this fitted into the overall account in relation to the research questions. I provide examples of coding and thematic maps in Appendix H.

Inductive and Deductive Approach

I adopted a more inductive approach in analysing the four focus group interviews, that is, the themes were not decided prior to coding the data but allowed to emerge from the data during the analysis (Ezzy, 2002). To do this, I drew on Patton's (2002, p. 454) idea of "indigenous concepts" to bring focus to the inductive analysis. First, this involved looking at key phrases and terms used by the participants to describe their perceptions and experiences (similar to in-vivo coding). The idea was not to impose labels but to use the terms from the participants to capture the essence of their experiences. Subsequently, I developed terms to describe patterns for which the participants did not have labels or terms.

The analysis of the eight case studies was deductive to the extent that it involved the ecological model developed for this study. The model was applied as a frame to identify and organise meaningful units of transcribed text into the different ecological system levels for description and further analysis. The within-case analyses (Merriam, 1998) led to eight rich case study descriptions.

Cross-case Analysis

Once the case study description phase was completed, I proceeded with cross-case analysis. I found the use of matrix displays of condensed and distilled data from the case study descriptions to be most effective as they permitted simultaneous viewing of data in one location. As advanced by Miles, Huberman and Saldana (2014, p. 108), "you know what you display." The matrix displays required systematic and coherent organisation of distilled data of interest to the research questions. In the process, the matrix displays allowed careful comparisons and detection of differences, patterns or themes across the case studies. I used this matrix approach to analyse the interactions of the students in the various ecological levels across the case studies. I provide illustrations in Appendices L to R.

Trustworthiness

In a qualitative study, the researcher is the primary instrument of data collection (Bogdan & Biklen, 2007). In order to enhance the credibility and trustworthiness of my research, I used a complement of techniques (Creswell &

Miller, 2000) to address issues such as researcher orientation, insider research, validity of data and ethics.

As an insider in this study, my views are shaped by my interactions in school including with students and colleagues. To manage subjectivity issues, I employed member checks, a technique which Lincoln and Guba (1985) described as "the most crucial technique for establishing credibility" (p. 314) in a qualitative study. After transcribing the focus group interviews, I invited the students to read the transcript and comment on the "accuracy" (Creswell & Miller, 2000). I also invited the case study participants to read their case study descriptions. One focus group participant and one case study participant accepted the invitation; both felt that the representations were fair. These member checks provided the participants with the opportunity to react to the data and initial interpretations, creating a sense of trust in the process (Creswell, 2009).

In addition, I drew on the lens of peers who are themselves in educational research and who have some knowledge of my area of study and qualitative methodology. These interactions provided me with some opportunities to interrogate the research process, and question my assumptions, decisions and interpretations. Although this strategy of peer debrief increased the credibility of findings (Lincoln & Guba, 1985), there was a need to maintain confidentiality of participant information.

Gathering data through different methods allowed me to compare the different forms of data against each other (Denzin, 1978; Gibson & Brown, 2009). Data from the focus group interviews, individual interviews (including with parents and teachers) and school documents were compared. This technique of data triangulation facilitated validation of data across the multiple data sources in this study, contributing to the trustworthiness of findings (Denzin, 1978).

Finally, although some degree of researcher's bias is always present in qualitative research, a researcher's awareness and acknowledgement of personal bias can limit the influence he/she has on a study (Denzin & Lincoln, 2000). As such, I provide a description of my background in Chapter 1 in order to allow readers to understand my position. Throughout the whole course of my research, I reflected critically on the influences that shaped my interpretations. I found the ongoing

conversations with my research peers and "outsider" critical friend to be helpful in maintaining a reflexive stance in the research process.

Ethical Considerations

There were a number of ethical considerations in this study. Firstly, ethical approval was obtained from my school and the Institute of Education. Secondly, to protect the confidentiality of the data collected, all interview recordings, transcribed data, and student documents were password-protected and locked in a secure place in the school. As the sample for this study was a very specific pool of students, I took special care to protect the students' confidentiality: all recognisable elements of the students' identity were anonymised in the interview transcripts and thesis, including masking interview extracts or references to specific events or individuals that could identify the students (Morgan, 1998). Thirdly, prior to the interviews, informed consent was obtained from the participants; they were assured that participation was entirely voluntary and that they could withdraw from the study at any time. The purpose of the study was also explained to them. In addition, I offered the students the opportunity to read and amend any part of the interview transcripts they were uncomfortable with.

Conclusion

This chapter has established the qualitative case study approach as appropriate to the research questions driving the inquiry. Collection of data from multiple sources that prioritised the voices of students made it possible to construct eight case studies with dense, detailed descriptions of the students and their interactions in their ecological environments. These case study descriptions served as primary data sources for further within-case and cross-case analysis in the study.

CHAPTER 4

Individual: Person Characteristics and Talent Development Outcomes

Chapter 4 consists of three main sections. It begins with a brief description of the eight case study participants and then expands into person characteristics relevant to the talent development (TD) process. The last section discusses the TD outcomes of these students.

Summary Description of Case Study Participants

Providing full details of each case study description would take up more space than this thesis affords. For this reason, this section provides a summary description of each case study participant. I provide an example of a full case study description in Appendix I. Alex, Gibbs, Knight and Michael were in the G20 group while Jay, Mark, Matthew and Zach were in the G90 group.

Alex

Alex was an inquisitive and self-motivated nineteen-year-old who had a reading speed of more than 900 words per minute by the time he was eight. A precocious learner, he had a lot of time to play, explore and read in primary school. He was also rather goal-oriented as a young boy, setting his mind to go to Sunnyrise School because it was the best school to him.

Alex displayed an interest and ability in Maths when he was four. His mother was attentive to what interested him and supported him with resources such as IQ puzzles and books that he enjoyed. By the time Alex got to Sunnyrise School, he knew how to search the internet for Maths puzzles to entertain himself. His Year 1-2 Maths teacher found it difficult to keep up with him, and introduced him to Maths Olympiad and Maths Club activities. She also recommended him for the Socrates Maths Programme. However, Alex did not go beyond pursuing his Maths interest for enjoyment. His sloppy work habits and apparent inattentiveness frustrated his Year 3-4 Socrates Maths teacher who then left him to his own devices.

Alex was put into a special class ("Enhanced Class") for low achievers in Year 5-6 because of his low Year 4 Grade Point Average. Instead of getting bored in his new class, Alex found a meaningful role playing tutor to his classmates who were

struggling in every subject. However, for intellectual stimulation in Maths, he joined his closest friends from Year 3-4 who enjoyed challenging Maths.

Alex obtained an A-grade for Maths and other subjects in the A-level examination. Although he won two awards in the Singapore Mathematical Olympiad in Year 4, there was no mention of his high ability in Maths in his school leaving testimonial in Year 6 or other school documents. At the time of the interview, Alex expressed his desire to pursue his interest in Maths at a top US or UK university in a business course, but settled for one at a local university eventually.

Figure 4 represents the empirical model of Alex's ecological system. Alex's environment for TD in Maths offered him low opportunities as he moved into the last years of Sunnyrise School. Despite a promising start, he ended up focusing on activities that had little to do with advancing his abilities and interests in Maths, as evident from the rich micro-2 environment.

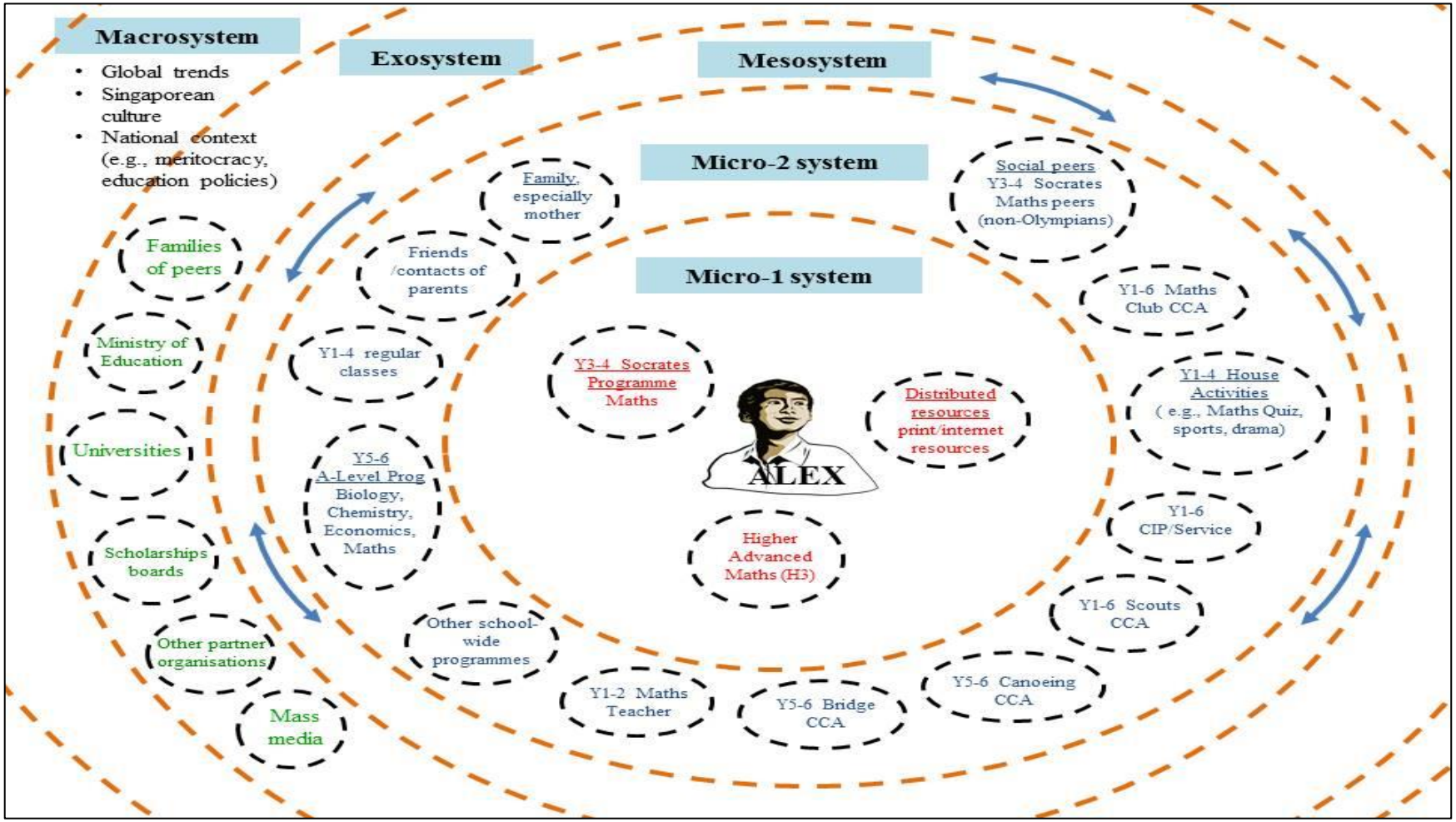

Figure 4. Empirical ecological model: Alex.

Gibbs

Gibbs was a bright and cheerful nineteen-year-old who set high expectations for himself. He worked hard and was the only student from his primary school to be admitted into Sunnyrise School. Gibbs' mother was supportive of him but felt that she couldn't do more than "be there for him." She allowed Gibbs the freedom to work things out himself while Gibbs, on his part, secured his mother's trust by being a responsible student.

Gibbs grew to believe that academic performance was about effort. He was always confident of his ability to do well. Keen on leading since his primary school years, Gibbs took on several leadership roles by the time he was in Year 2. In the Prefectorial Board, he came to know peers such as Nai and Theo who were passionate about serving the school. A close bond developed among them. Gibbs found his new friends keenly interested in History and Literature, and began to enjoy their intellectual conversations. At the same time, History and Literature classes became more interesting to him than other classes because they were about human nature and the human condition. His interest grew; he worked harder because he felt he wasn't naturally good in these subjects like Nai or Theo. He went on to join the Year 3 Socrates History Programme and later the Year 5-6 Humanities Programme.

Gibbs had to work doubly hard to keep up with his Socrates peers. In class, he was earnest about being heard but he also listened to others. However, outside class, he never studied with his high-performing peers because he found them too intellectual; he couldn't always connect with them. On the other hand, his teachers inspired him and created an environment where he felt safe to venture.

Although Gibbs was in the Socrates Programme, he invested much more time and energy into his leadership roles. His successes led him to believe that leadership was his forte; his commitment intensified. However, in Year 5, his failed bid for the top post in a co-curricular activity left him doubting his leadership capabilities. He said, "Suddenly I stepped into Year 5 and the same way of behaving [as in the secondary school] didn't work." Gibbs lost confidence and felt that the incident hindered him in his development because it took away opportunities from him including scholarships.

At the time of the interview, Gibbs felt himself a failure, thinking about his Socrates peers such as Nai who won a prestigious scholarship to Cambridge University while he merely got a place in a local university. Figure 5 represents the empirical model of Gibbs' ecological system. In contrast to Alex, Gibbs' micro-1 environment shows continuity in the TD classes from Year 3 to 6. However, like Alex, his micro-2 environment is rich in non-academic roles and relationships.

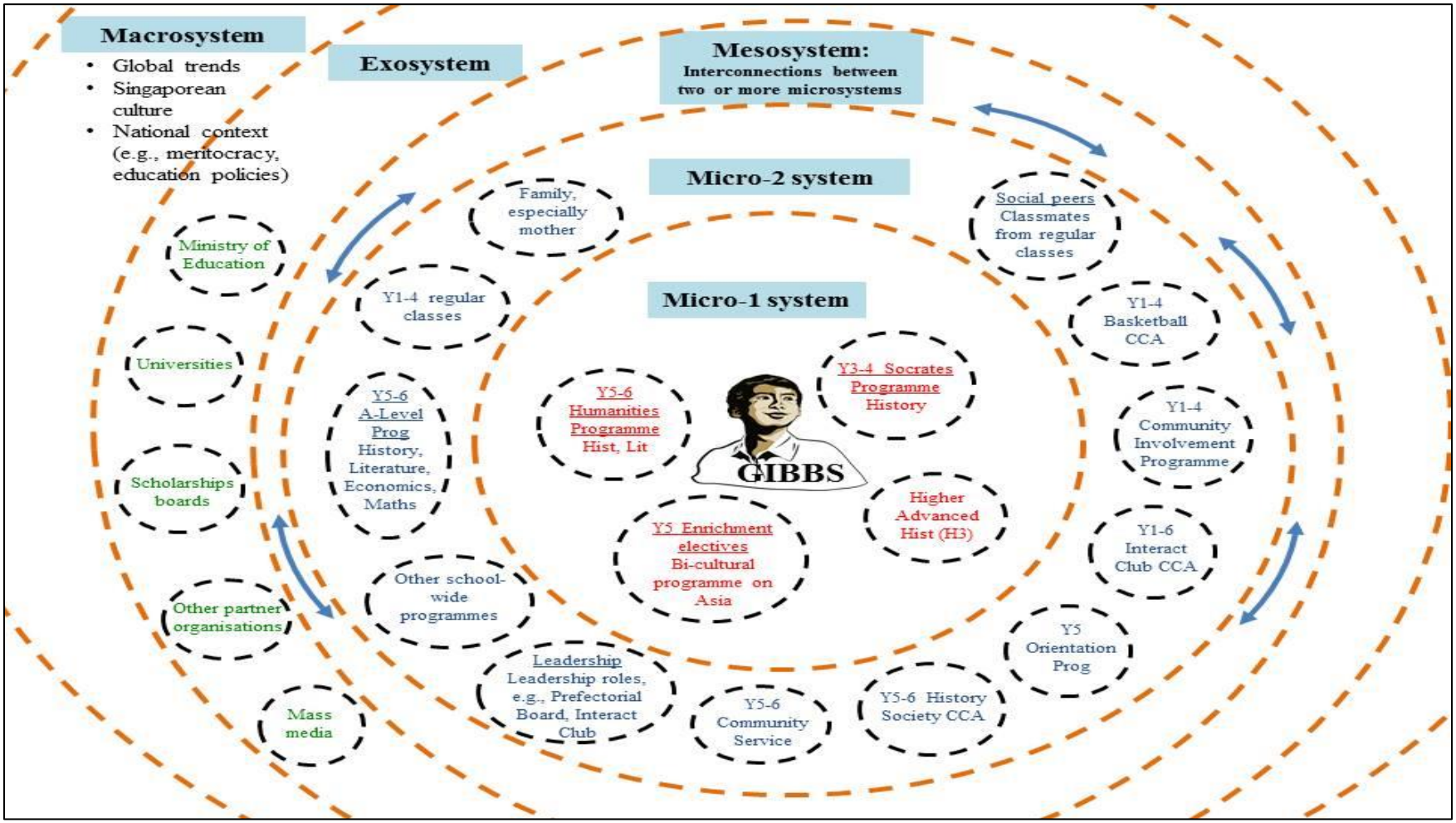

Figure 5. Empirical ecological model: Gibbs.

Knight

Knight was a responsible and determined nineteen-year-old with a passion for leadership that started in primary school. As a young boy, he did his schoolwork diligently under the watchful eye of his mother but his leisure time was spent on computer games and TV. In secondary school, he started doing things on his own as his mother was no longer able to keep up with the pace and complexity of secondary school work. Knight became increasingly involved in co-curricular activities and leadership roles.

Although Knight excelled in the Primary School Leaving Examination (PSLE), he perceived himself as an "average" student. He entered Sunnyrise School with little sense of his academic strength and interest. As such, he viewed classroom lessons as exposure that might help him find his strengths and interests. Despite finding limited opportunities to explore, Knight reckoned that his strength and interest were in the Humanities subjects. Inspired by his Year 1-2 Geography teachers and following his peers, he applied for the Socrates Geography Programme at the end of Year 2.

Knight's experiences in the Socrates class, however, did not help his interest grow. He felt that his teacher's expectation of the class was too high. The lack of student-teacher rapport and trust undermined his motivation to undertake challenging work. Moreover, he perceived that he was left to learn on his own prematurely in the TD process. While Knight valued the interactions in the Socrates class because his highly able peers took discussions to a higher level, he had difficulty finding his own voice. Socially, he preferred spending time with peers from the regular subject classes because he found them "more down to earth" and easier to talk to.

In Year 3-4, Knight took on larger leadership responsibilities. He enjoyed much success in the projects that he led, and became inspired to take on even more leadership challenges. Meanwhile, his academic work suffered; often times, Knight was too tired to do any productive studying. Knight's weak performance in Year 4 led to placement in the Year 5-6 Enhanced Class, like Alex. He was subjected to restrictions on his A-level subjects and other activities; he felt "disadvantaged". He also faced difficulties coping with his Maths and Science subjects. Despite being weaker in these subjects, he had switched to a Science subject combination in his A-

level years. Knight eventually graduated with A-level results that were not good enough for university admission.

Figure 6 represents the empirical model of Knight's ecological system. The sparse elements and relations in his micro-1 environment suggest low opportunities and progression in his talent subject, similar to Alex. In contrast, his micro-2 environment shows high opportunities and progression in leadership development.

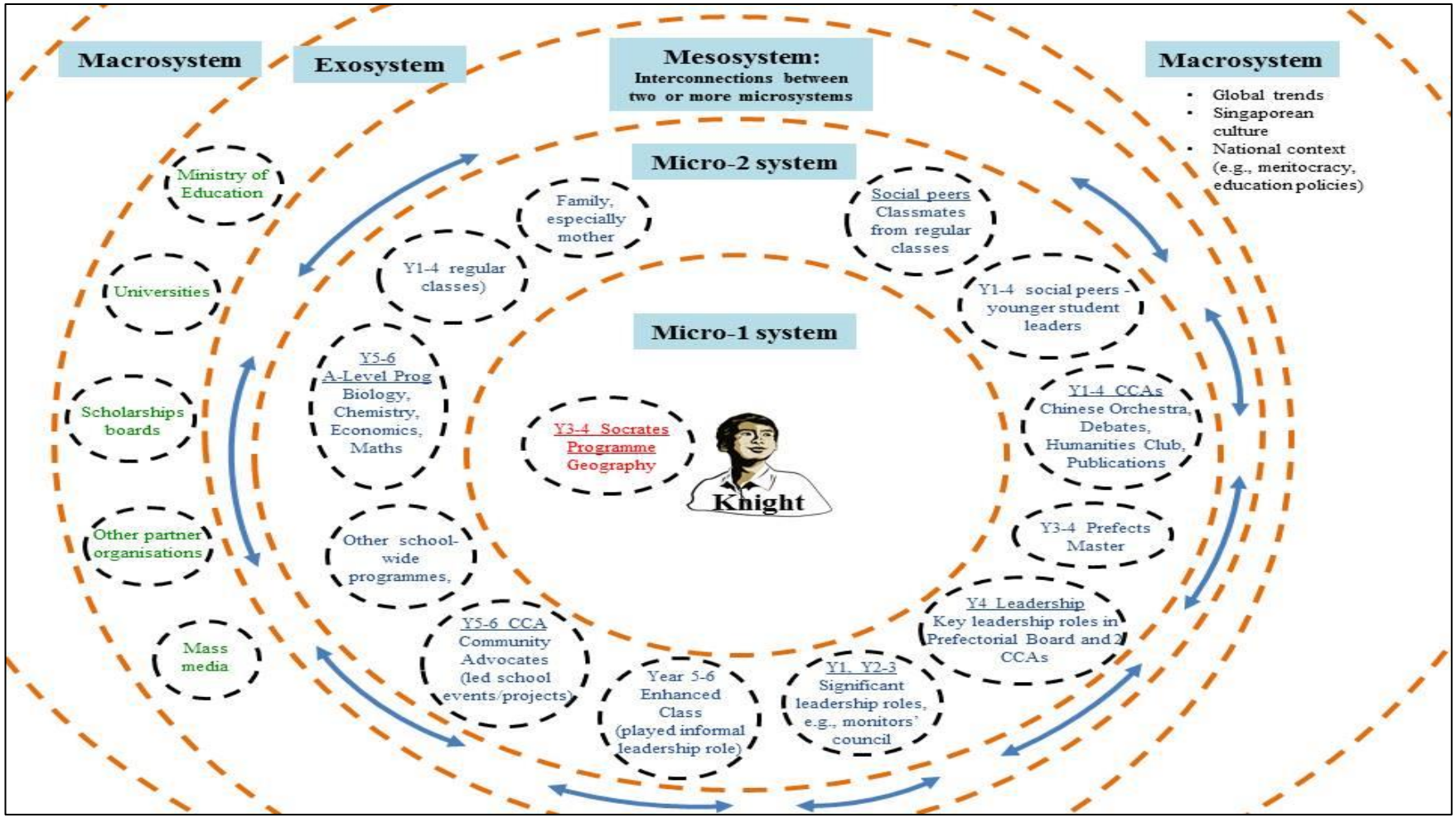

Figure 6. Empirical ecological model: Knight.

Michael

Michael was a serious and diligent nineteen-year-old. As a little boy, he was inquisitive and read ahead of his years. His mother played a key role in this, nurturing his interests and supporting him with resources. He believed in hard work and discipline, values which he said was instilled by his mother from young.

Michael excelled in the PSLE and chose to join Sunnyrise School. He described Year 1-2 as "fun" and "engaging". He performed exceptionally well and joined the Socrates History Programme in Year 3 because of his keen interest in the subject. Influenced by his twin brother, he also joined the Socrates Chemistry Programme. But by the end of Year 3, Michael realised that he did better in the Humanities with less effort. He also enjoyed his Humanities classes more than his Maths and Science classes. Michael attributed his love for the Humanities to his love of reading. He went on to join the Year 5-6 Humanities Programme where he studied History and Literature.

Being in a school where everyone was smart made Michael feel "just average"; he figured he did well only because he worked hard. Although Michael felt his teachers facilitated his learning, they neither sparked his interest nor inspired him. It was his thirst for more knowledge that led him to read further. Peer influence did not seem to contribute much to Michael's experience of TD too. He was close to his Socrates classmates but reckoned that they bonded mostly because of shared challenges such as the pressure of examinations. However, Michael felt that the school's culture of excellence resonated with him and directed him to challenge himself. He said, "I think it definitely did scour me as a person . . . . It was a guiding value."

Michael viewed himself as interest- and goal-driven but pragmatic. He described his Sunnyrise years as "smooth-flowing … no angst in it." There were the occasional anxious moments but he managed well because he was clear about what he could and could not achieve, seeing the exceptionally able peers in his Socrates class.

At the time of the interview, Michael had been given a place in the law faculty of a local university. Michael would have liked to be a historian but he

thought a professional law degree was more pragmatic in Singapore compared to a history degree which he perceived would lead to few job opportunities.

Figure 7 represents the empirical model of Michael's ecological system. His micro-1 environment depicts limited elements and relations for TD although there was continuity over Year 3 to Year 6. There are more academic-related elements in his micro-2 environment compared to Knight but there was not always continuity.

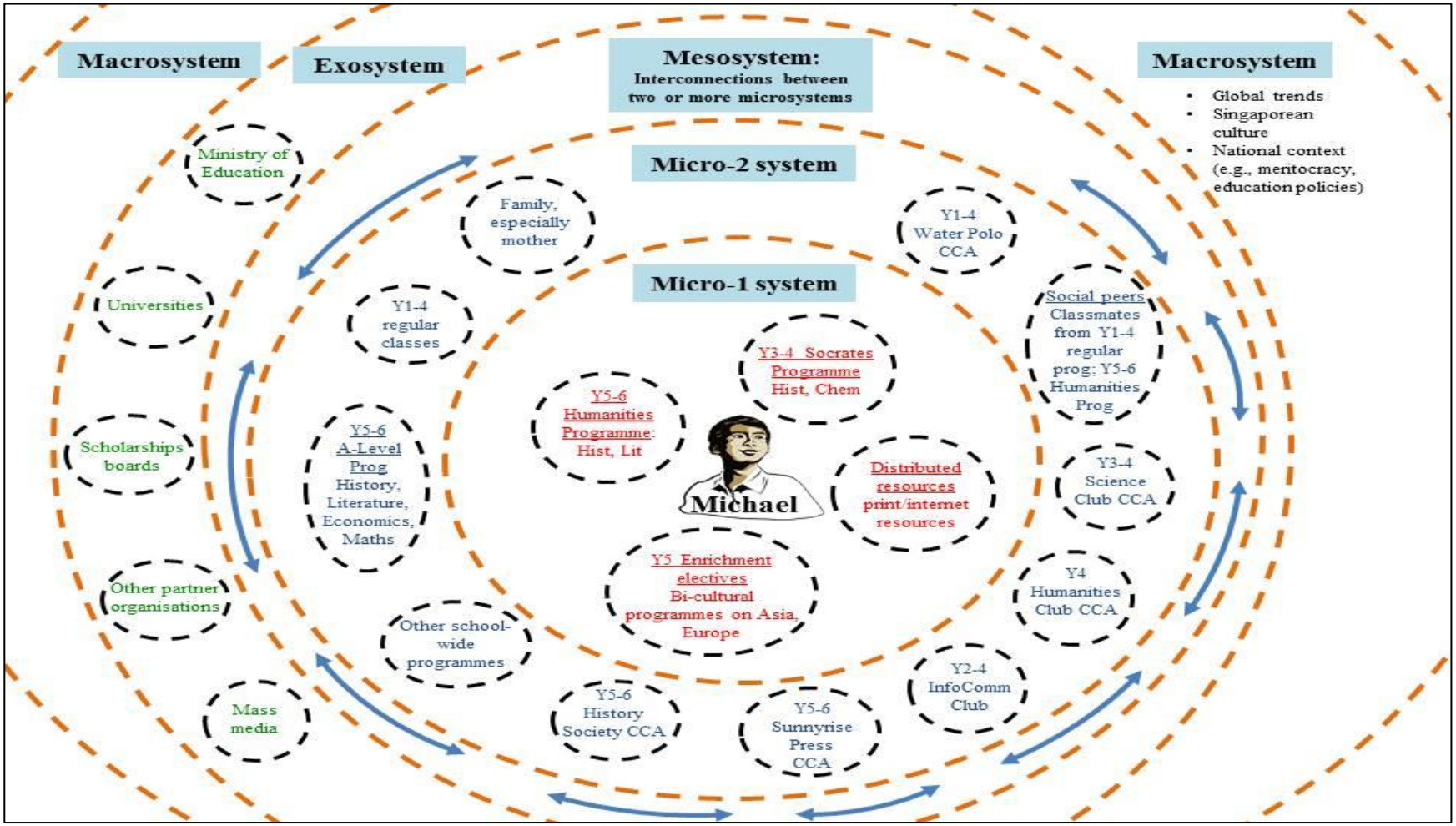

Figure 7. Empirical ecological model: Michael.

Jay

Jay was an exceptionally able and inquisitive twenty-year-old. In his early years, his mother taught him using CD-ROM educational materials and read to him. She also inculcated in him positive learning habits that contributed to his self-drive in learning. His parents let him do whatever he wanted as long as he did well in school. On his part, Jay knew how to influence them. He shared, "In a sense, you have to bring them to your side so whatever their worry, you have to address that."

Jay excelled in primary school. In Sunnyrise School, he became well known among his teachers for his academic prowess. Jay's interest in Literature was a natural extension from his love of reading. He went on to take Socrates Literature and A-level Literature. His interest in Science grew because of teachers who were willing to answer his "inconvenient" questions. In Year 3, Jay chose Socrates Chemistry because he wanted to go deeper into the subject. He frequently read beyond the syllabus because he believed it was crucial to understanding the heart of a subject. His passion grew and he set his mind on the International Chemistry Olympiad.

Jay thought his teachers played an important role in shaping his interests. They sparked his interest, and provided the encouragement and resources for him to explore deeper. But he added, "You need to know how to teach yourself also, and you need to know how to find help if you cannot teach yourself." Jay also identified like-minded peers to be a significant factor in developing his interest. Interactions with like-minded peers led him to good books, and his self-directed learning flourished. Jay's seniors were his sounding board for questions and ideas, and they shared with him useful learning strategies. He said, "They are a sort of conduit for you to go further."

Jay felt that the culture in Sunnyrise School encouraged students to stretch their capabilities. By Year 3-4, he was not only in the Socrates Programme and a range of national-level Science competitions but was also very active in co-curricular activities and leadership roles. In Year 5-6, Jay was in the national training team for the International Chemistry Olympiad.

Unlike many of his peers, Jay felt that he didn't choose the Olympiads to enhance his university applications or scholarships chances. For him, it was just all about pursuing his interest. He thought of university studies overseas because he wanted the exposure but eventually decided to study medicine locally.

Figure 8 represents the empirical model of Jay's ecological system. The micro-1 environment depicts rich elements and relations for TD; the micro-2 environment is rich in both academic and non-academic elements.

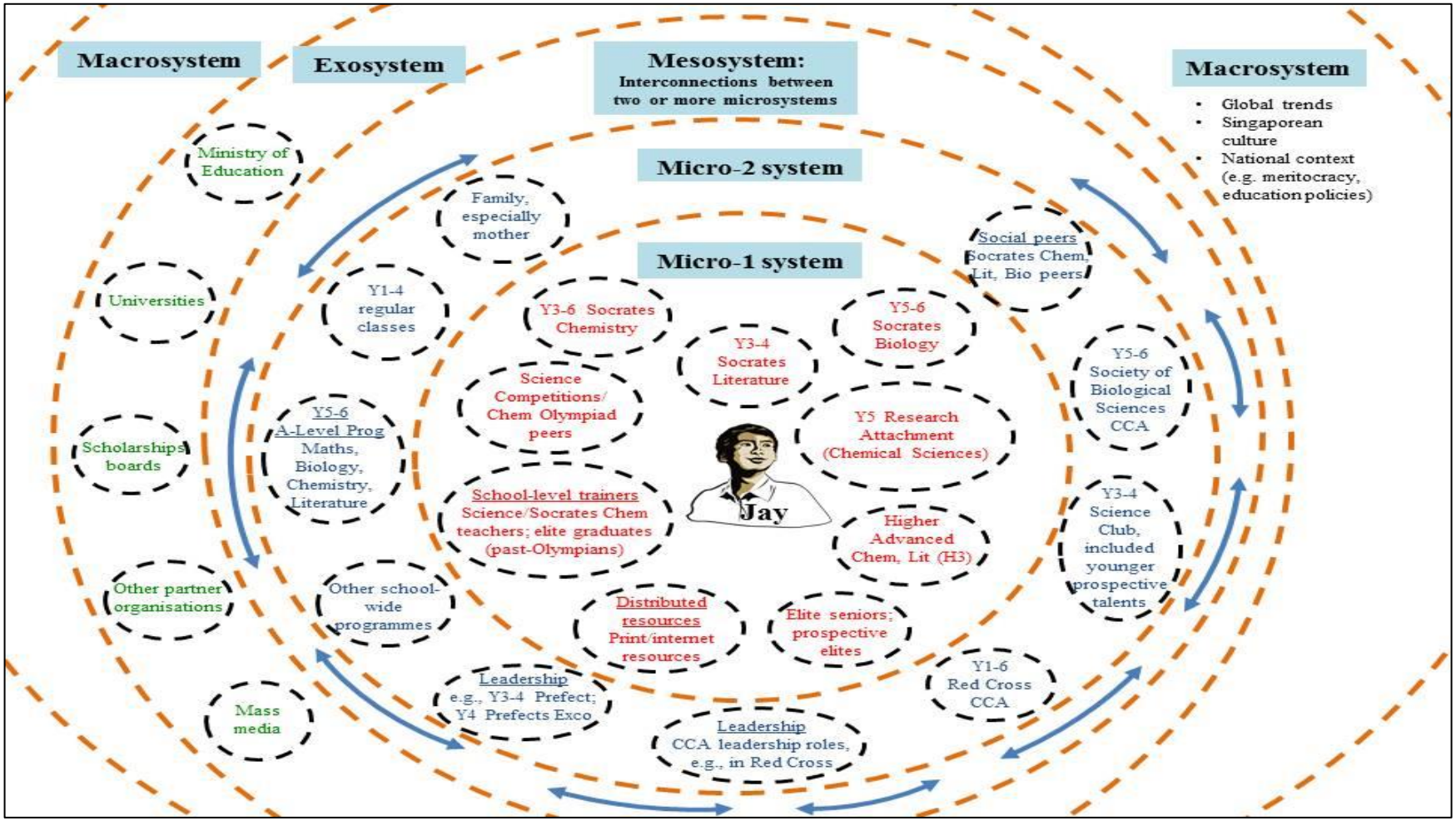

Figure 8. Empirical ecological model: Jay.

Mark

Mark was a bright and earnest nineteen-year-old who was an avid reader. As a young boy, he was extremely inquisitive and would ask his mother many questions. In primary school, Mark found schoolwork too easy so he took to finding things out for himself through reading. He met good teachers and enjoyed the curriculum when he arrived in Sunnyrise School. His excellent performance led him to the Year 3-4 Socrates Programme where he chose to study History and Chemistry. The challenging Socrates curriculum pushed him to work harder. He recalled having a greater facility for History than Chemistry. He shared:

> The more I did it (Chemistry), the more I realised that my ultimate interest wouldn't lie there . . . . I realised that I was not that good at it . . . . It helped me realise that Humanities is probably what I wanted to do more of.

Mark excelled in his Socrates History class and was selected for an international Humanities symposium by the end of Year 3. That proved to be a crystallising experience for him. He explained:

> The experience itself I thought was very transformative . . . . I was working with a very smart and talented classmate. It was just this amazing synergy and . . . . I met all those other students overseas who were themselves very bright. They had very different opinions . . . . I found it exhilarating, the meeting of different minds . . . . I was really in the flow.

Mark went on to do Literature and History in the Year 5-6 Humanities Programme where he continued to excel.

Mark credited his parents for allowing him to follow his interests. His mother had a big influence on him in that she introduced him to Philosophy and other Humanities subjects when he was quite young. Mark was also influenced by his teachers in significant ways. He found them passionate and knowledgeable about their subjects, making him "excited about learning and curious about different things in the field." Where peers were concerned, Mark connected exceptionally well with individuals he could debate ideas with. The environment in the Socrates and Humanities Programmes was just where he could find his intellectual peers. Mark also felt that his experiences in the Debating Club and History Society mattered

because the issues which he debated or dealt with were often issues of interest in his Humanities class.

At the time of the interview, Mark was looking forward to undergraduate studies in one of his dream schools, Yale University. Figure 9 represents the empirical model of Mark's ecological system. It shows micro-1 and micro-2 environments that are rich in elements and relations salient to academic TD.

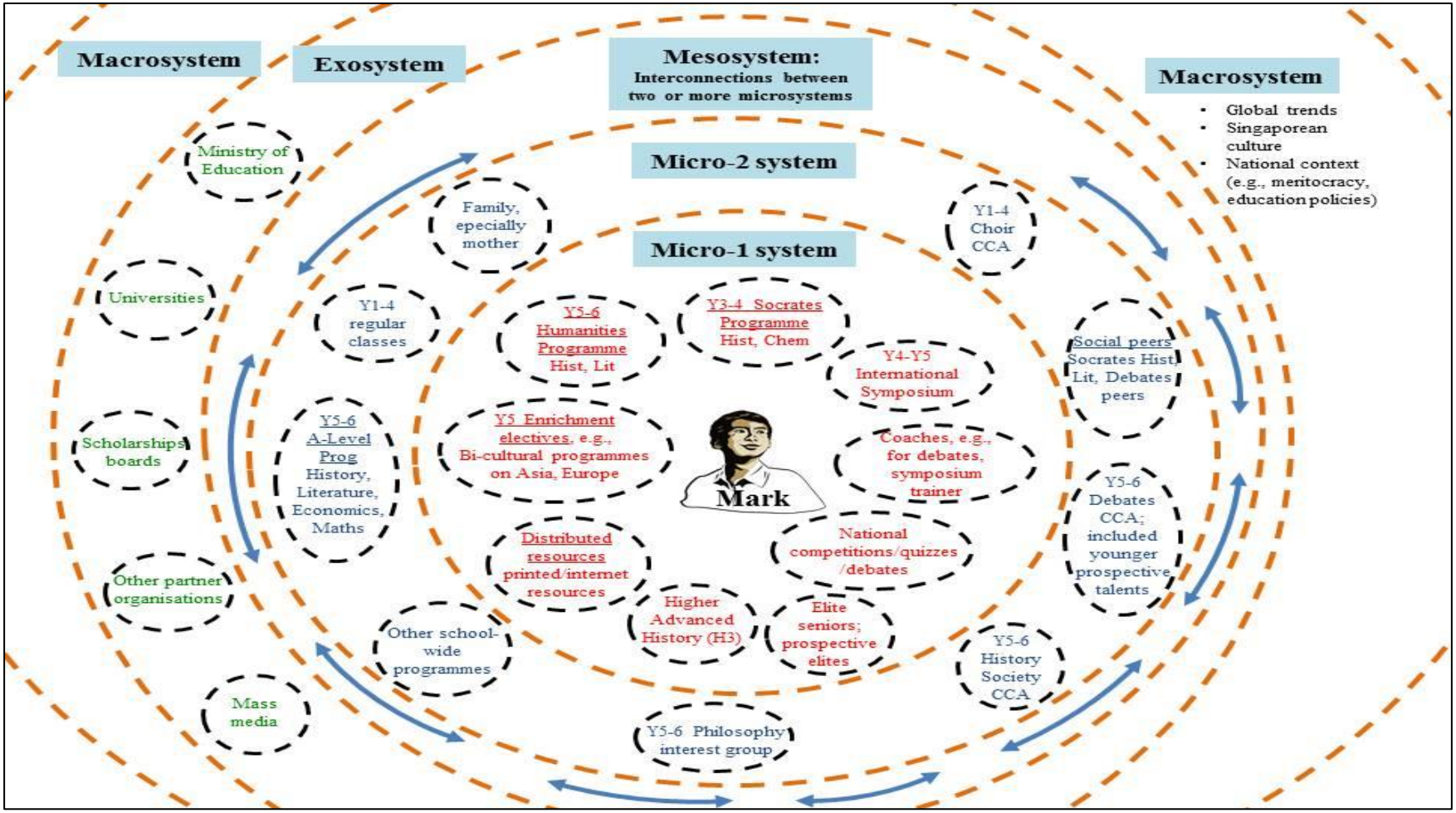

Figure 9. Empirical ecological model: Mark.

Matthew

Matthew was an intelligent and perceptive student whose academic prowess was well-known in school. As a young boy, he was an early reader, devouring the books at home and the local libraries. His mother felt that Matthew's intellectual curiosity was what motivated him to read. Matthew's parents were largely hands-off where his education was concerned. They trusted him because he had good grades and conducted himself well. On his part, Matthew felt school was far removed from his parents' own experiences and consequently managed things on his own.

In his first two years of Sunnyrise School, Matthew described feeling very smart because he continued to excel among peers whom he regarded as highly able. In Year 2, he reckoned that he did better in Chemistry and Geography so he applied to join the Socrates Programme. The challenging work in the Socrates class kept him engaged and his interest grew. By Year 5 and 6, Matthew was deeply immersed in the Olympiads as well as additional higher advanced classes in Chemistry and Geography. Matthew was inspired by the dedication and passion of his teachers whom he found ready to engage with students.

Matthew felt energised in the Socrates classes and at competition training because he could stretch as far as he wanted. He enjoyed interacting with like-minded peers. His Socrates Geography teacher shared her observations of Matthew and his competition peers:

> They just blossomed; they ignited the fire in one another . . . . The sparring with each other actually pushed them to another level.

Matthew described the environment in Sunnyrise as "quite challenging, engaging and vigorous". The "freedom to explore, play around and search for answers" sustained him in the research laboratories while he found the Olympiads to be particularly meaningful because "there was a lot of subject learning". He didn't view the demands to be stressful because to him, "it was just do what you want" – there was choice. He found Sunnyrise School to be a place where it was "OK to be smart, to study, and to focus on academics".

In the A-level examination, Matthew scored distinctions in all the subjects he took including higher advanced subjects. At 20, Matthew was headed to Yale University although he had yet to decide on his courses of study.

Figure 10 represents the empirical model of Matthew's ecological system. The micro-1 and micro-2 environments are rich in elements and relations salient to academic TD.

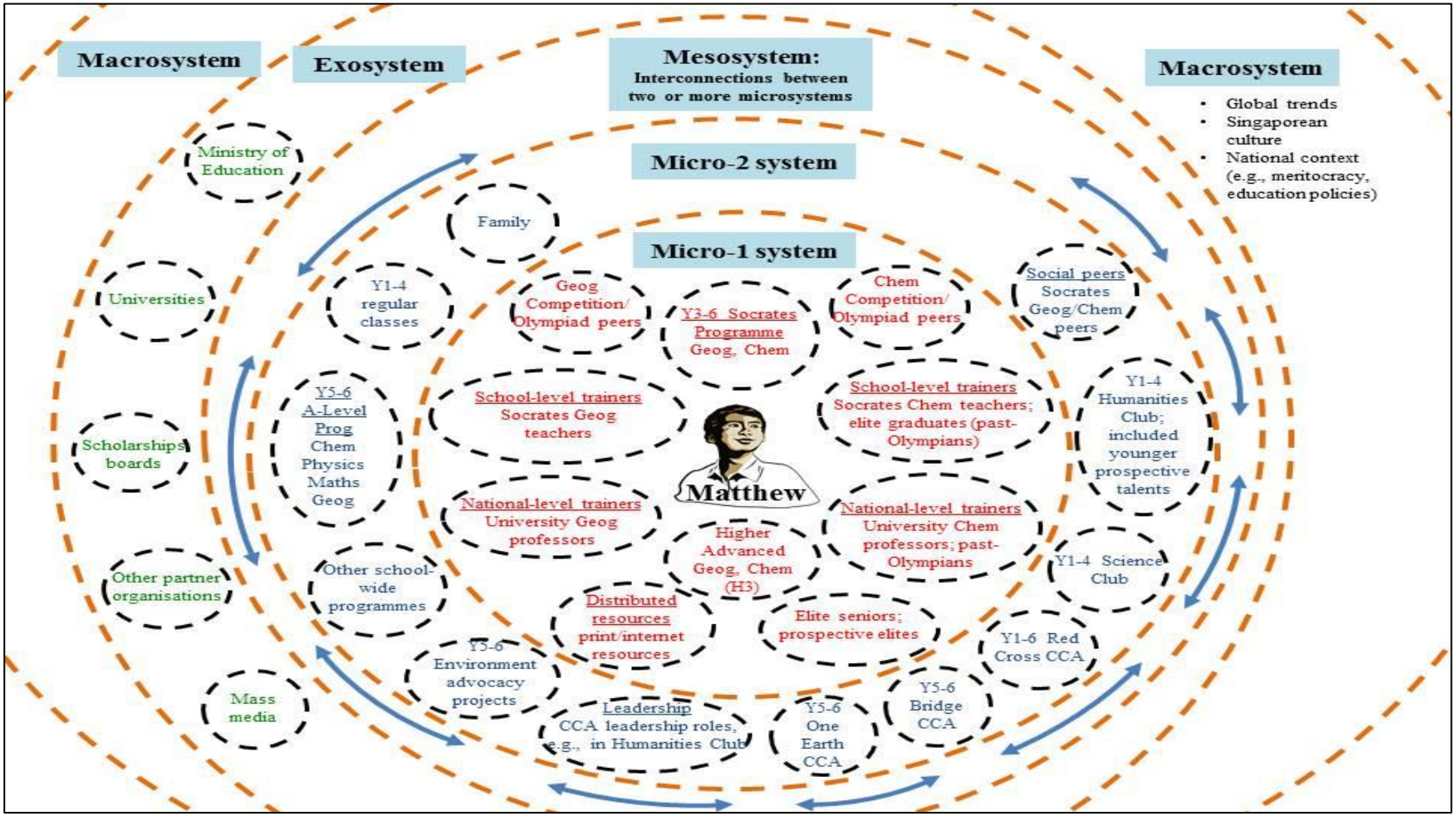

Figure 10. Empirical ecological model: Matthew.

Zach

Zach was a highly motivated and diligent student with a love for Maths and Science. He remembered being playful and inquisitive as a child. His mother shared:

> Whatever interested him, he would just pick it up and then he would ask . . . . So, we had no choice but to get him the [resources] and let him learn by himself.

In Sunnyrise School, Zach viewed himself as only slightly above average in Maths and Science. But he was keen to learn and joined the Maths and Science Clubs in Year 1. Before long, he was representing the school in national competitions in Science and Maths. By Year 3, he was admitted into the Socrates class for Maths and Physics. He received a prestigious national award for excellence in Science and Maths at the end of Year 4, and went on to distinguish himself in international Olympiads in Year 5-6.

To Zach's Maths teacher and Olympiad trainer, Zach was focused and persevering when doing Maths. However, Zach was not like that in the earlier years. His failure to get into the Maths Olympiad training team in Year 1 was a turning point that changed him to become more focused and proactive in managing his time. Zach's engagement in the Maths Olympiad deepened and intensified after the incident.

Zach pointed out that his teachers encouraged him and directed his efforts by providing opportunities such as competitions and extra-curricular training that stretched his learning. He was also drawn to his highly able peers in the Socrates class and competition teams. He felt the need to maintain a high level of engagement because of his peers and teachers. Being in an environment where everyone was immersed in one thing or other shaped his behaviour. He was happy being busy in school; being hypo-stressed made him unhappy. Zach also felt the high expectations from being in a top school. He said, "We were expected to do well in academic competition, you want to live up to that."

Although Zach's pursuits seemed to be more about the goals he set for himself, he viewed awards as affirmations of "what is done right". This was said in reference to messages from the school or the larger system such as the Ministry of

Education. At the point of the interview, Zach was preparing for university life in Stanford University.

Like Matthew, Zach's ecological system represented in Figure 11 shows micro-1 and micro-2 environments that are rich in elements and relations pertaining to development in his talent subjects.

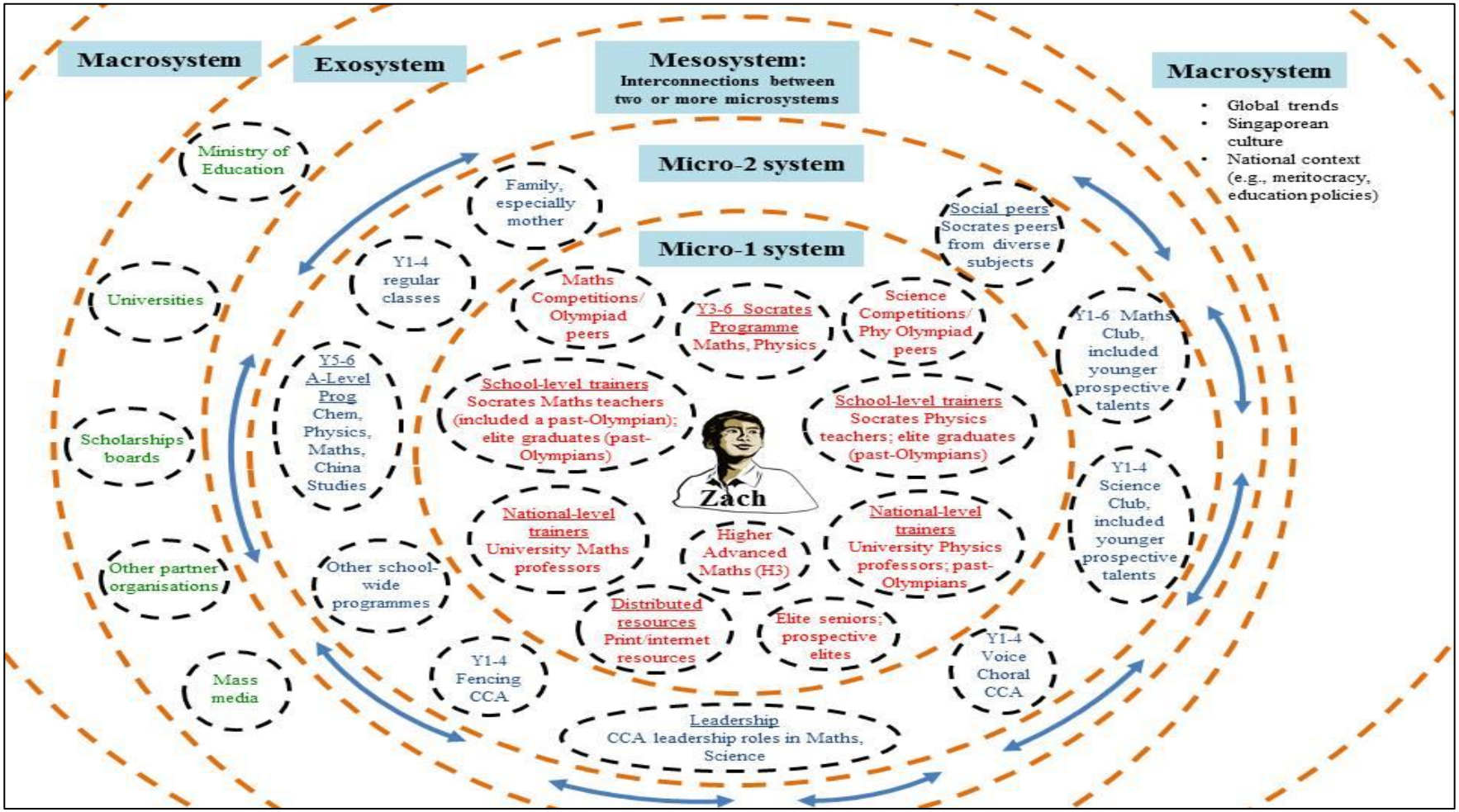

Figure 11. Empirical ecological model: Zach.

Person Characteristics

This section discusses process-relevant person characteristics of the eight case study participants, that is, characteristics that can influence the proximal processes of TD. It takes into account *force*, *resource* and *demand* characteristics (Bronfenbrenner & Morris, 2006). Force characteristics refer to the dispositions that can trigger and sustain proximal processes of development (e.g., curiosity) or disrupt them (e.g., distractibility). On the other hand, resource characteristics are the developmental assets (e.g., ability) or liabilities (e.g., persistent illness) that influence the capacity of an individual to engage in the development process. Demand characteristics refer to the capacity to invite or discourage reactions from the social environment that can foster or disrupt the developmental process (e.g., proactivity versus passivity). I provide an extract from the analysis of person characteristics of the case study participants in Appendix J.

Force Characteristics

Early attraction to reading, inquisitiveness, early interest, self-efficacy. The G90 students were early readers. They developed a love for reading early in their lives. Being inquisitive, reading became their way of learning and finding things out for themselves. Mark's mother recalled:

> He enjoyed reading and learning. I think reading books was play, and play was reading books. He didn't like toys.

Jay's reading extended to self-help books when he was just in primary school. Matthew was intellectually curious and eager to find out about the world around him as a young boy. He started reading the books lying around at home, then went to the neighbourhood library on his own, and discovered internet resources when he was still in primary school. Zach regularly learnt beyond what the school taught by reading on his own. Their love of reading often led to interest in the subjects they studied in school. For example, Mark attributed his interest in Literature and History to his love of reading. This interest and their sense of self-efficacy in particular subjects led to their decisions to study the subjects at a higher level and faster pace in the Socrates Programme.

In the G20 group, Michael and Alex were similarly attracted to books and started reading from an early age. Michael showed an early interest in History, triggered by the "Horrible History" book series he chanced upon while Alex took to IQ puzzles and "Mensa" books. On the other hand, Gibbs and Knight were both attracted to leadership roles in their primary school rather than anything academic. Knight believed that his primary school leadership experiences as a prefect and deputy Head Boy sparked off his interest in leadership and led to his desire to seek out larger leadership roles. Gibbs had a strong sense of justice and stood up for his peers in primary school when they were bullied. But Knight hardly ever read, and spent his leisure time on TV and computer games as a young boy. Gibbs professed to reading science books in order to gain admission into Sunnyrise School but it was not something that he did regularly.

Like the G90 participants, Michael and Alex were intellectually curious and displayed the propensity to learn and find things out for themselves. For instance, Alex would take things apart to look at them because he wanted to understand the components to a whole. His love of Maths puzzles led him beyond books to the internet to search for them. Michael's love of reading and curiosity predisposed him to learning beyond regular school work through self-directed reading. In Sunnyrise School, both exerted agency in their desire to engage deeper when they decided to take Socrates subjects at the end of Year 2. Gibbs' and Knight's routes to their Socrates subjects were quite different. Gibbs first became more interested in the Humanities subjects largely through peer leadership group influence. In contrast, Knight barely knew what his interest was in the academics. He joined Socrates Geography because he just wanted to try it out like his peers.

Summary. The students clearly displayed differential responses to their environment in the pre-secondary school years. All except Gibbs and Knight were particularly attracted to reading and learning on their own. Similarly, all except Gibbs and Knight showed the propensity to seek out challenges in the academic subjects that they were interested in. Gibbs and Knight's focus and responsiveness were much more directed towards leadership than any academic area. Although they joined the Socrates Programme in Year 3, they did so more because of peer group attraction than the drive to engage in deeper learning. Their interest and self-efficacy were in the leadership area. For the others, the love of reading, intellectual curiosity,

early interest and self-efficacy in particular subjects were force characteristics that predisposed them to seeking out challenges in these subjects.

Resource Characteristics

Academic preparedness, psychosocial skills. Besides being early readers with an immense drive to engage in the academics, the G90 students were fast learners and possessed excellent academic habits and psychosocial skills such as the ability to focus, confidence, intrinsic motivation and diligence. Although Matthew appeared to be not the most hardworking to his teachers and peers, he was actually learning at a much faster pace than the others. He had the ability to relax and activate at appropriate times. The G90 participants may be said to have the academic preparedness and psychosocial skills that predisposed them to a TD trajectory in the academics.

In the G20 group, Michael stood out. He had the intrinsic motivation to do well academically and his automaticity about diligent work meant that he was prepared to work hard whether he enjoyed the work or not. He also read ahead of his years, equipping himself with linguistic fluency. Alex, who had a reading speed beyond his years, was a fast learner who demonstrated an exceptional pace of learning in Maths early on. However, being hyperactive, he frequently wanted things done in the quickest way. As such, he did not always do well in examinations. This tendency to lose attention and to be motivated only by what interested him in Maths made it difficult for Alex to engage in proximal processes that required a sustained pattern of interaction. For example, his Year 1-2 Maths teacher commented:

> He was very quick in his Arithmetic but those of geometric proof, he may not be so interested because you got to write out the [mathematical logic].

It was to be a developmentally disruptive disposition that interfered with Alex's progression in Maths TD.

When Gibbs and Knight arrived in Sunnyrise School, they were attracted to leadership training and undertook several leadership roles at class and cohort levels, displaying a strong tendency to engage and persist in progressively more complex leadership roles. Although they qualified for the Socrates Programme, they started out lacking the developmental assets, that is, resource characteristics of knowledge,

skills and experience *at the level* of their Socrates classmates. Gibbs may be said to have been in a somewhat better position than Knight: at the very least, he did some reading and was capable of self-directed learning. To him, the academics were about effort and the A-level examination; he was confident about his ability to do well. In contrast, Knight perceived himself as an "average" student and his academic abilities as "not very good". He was tentative about his strength and interest in the academics when he joined the Socrates Programme.

Summary. Based on their resource characteristics, the G90 students and Michael (G20) seemed more ready for the TD journey: they had the academic preparedness (prior learning experiences and knowledge, core concepts, ways of thinking) for a faster pace of learning, and the psychosocial skills that predisposed them to work of increasing challenge and complexity. Alex and Gibbs in the G20 group displayed some positive developmental assets but there were also developmental liabilities that would hinder the process of TD. There seemed to be more developmental liabilities evident in Knight's case that would limit his ability to engage in TD requiring directed responses.

Demand Characteristics

Capacity to learn, increasing competence, propensity for academic challenges. The inquisitiveness, and the interest and capacity to learn that was evident in the G90 students invited reactions from their mothers and teachers that fostered the proximal processes of TD. For instance, Zach's mother was impressed by his increasing competence and interest in learning, and became less directive and more responsive to his interests. She provided him with the resources he wanted, and allowed him to learn by himself. In Sunnyrise School, his consistently exceptional performance in Science and Maths subjects led his teachers to direct him to a range of opportunities that provided him with intense challenge, for instance, national and international Physics competitions. Matthew, Jay and Mark moved their teachers to find similar opportunities that led to interactions with some of the most able individuals in national and international events and competitions.

In the G20 group, Knight was less able to invite the kind of reactions from his home or school environment that would foster the proximal processes of TD. At home, his mother nagged him about the amount of time he spent in CCAs; in class,

he was mostly quiet and was better known for his leadership roles than his academic abilities or academic preparedness for challenging work. On the other hand, the early reading ability and precocity of Michael and Alex captured their mothers' attention, leading them to provide the children with resources and support that fostered academic preparedness for a faster pace of learning. The teachers' focus of attention on their faster pace of learning led to extended learning opportunities that were closely related to the proximal processes of TD.

Gibbs' diligence with his school work earned him his parents and teachers' trust. As a result, his parents did not pressure him in his studies; his teachers also left him to pursue his interest in leadership. Gibbs recalled:

> My parents just trust me. I do my part, don't break their trust. I know I won't do anything stupid . . . . You have to earn the trust and respect for teachers to be able to stand up for you.

However, these reactions from his parents and teachers did not directly foster the proximal processes of TD. They were responding primarily to his ability to manage his commitment between academics and CCAs, and less to his growing competence in the academics.

Summary. In relation to TD, the demand characteristics of the G90 students positively influenced significant individuals in their lives, that is, parents and teachers, to direct them to TD opportunities of increasing challenge. In the G20 group, Alex and Michael influenced their mothers in this manner significantly but less so their teachers compared to the G90 students. Knight's extensive involvement in his CCAs and leadership roles discouraged reactions from his mother or teachers that can foster the proximal processes of TD; these significant individuals were concerned over his ability to balance his academics and CCAs.

Talent Development Outcomes

The eight students were deemed to be highly able and to possess high ability or potential in a subject-specific domain. There were two reasons for this: (a) the students were in the top 3 per cent of the national cohort in the standardised PSLE, and (b) they were identified for the TD programme, based on stringent selection

criteria. This section examines transitional outcomes for the process of TD of these students.

Success in TD

Success in TD especially in the literature of eminent persons and gifted individuals may be perceived from the point of view of society and of the individual (VanTassel-Baska, 1989b). Society's highest standard may be said to be eminence, that is, high-level achievement usually marked by a contribution that has historical significance in a given field/s, often with societal recognition to boot. The individual's highest standard may be life satisfaction, usually linked with one's achievements in a career area and in relationships. Although I view both as worthwhile considerations, the highest standard for secondary and post-secondary students is, realistically speaking, more about high-level achievement and recognition, usually evidenced by awards at the national or international level (also Gagne, 2007; VanTassel-Baska, 1989b). Perhaps none could have made this clearer than the Prime Minister of Singapore himself in his message at the Teachers' Day Rally on 31 August 2006. He said:

> The performance of Singapore pupils in international studies such as TIMSS indicates that Singapore's education system compares favourably with other systems. However, there is also the intent of Singapore and the schools to go beyond producing high averages to producing peak performers and to produce students performing above the 90th percentile on international platforms and earning gold awards in academic Olympiads.

As such, it is not uncommon for top schools in Singapore to communicate goals about student achievements beyond standardised examinations (e.g., A-level) to their internal and external audiences and stakeholders. For instance, in Sunnyrise's School Prospectus, it was stated that students "journey beyond traditional boundaries in their pursuit of knowledge." This was illustrated with statistics on the achievements of its students in national and international academic competitions. The school's proven track record of these achievements was often held up as a benchmark to inspire current students, and to attract prospective students and parents.

On the other hand, the individual's highest standard for highly able students may be how positive one feels about one's achievements in relation to his/her progression to tertiary education and the opportunities that open up to them such as a prized scholarship to a top university (Gagne, 2007; VanTassel-Baska, 1989b). In Sunnyrise School, the percentage of students going on to top universities such as Harvard or Cambridge, on prestigious scholarships was communicated to its stakeholders, and current and prospective students.

In this study, I developed a checklist to examine the transitional TD outcomes of the students (Appendix K), drawing from the two perspectives of success in TD discussed above. The checklist was aligned to the school's objectives and goals of TD for its highly able students. The basis for each criterion in the checklist is explained. However, it is acknowledged that the stated criteria may be significant within one context but less so elsewhere, depending on the TD culture of a school.

Thriving in TD?

The data that I collected revealed that the G90 students reached the national talent pool although they may not always have represented the country at an international event. For example, Jay was in the Singapore International Chemistry Olympiad training team but did not get to represent Singapore at the competition. Looking at the levels of TD provisions in the school, the students accessed levels 2, 3 and 4 provisions, with substantial time spent on level 4 provisions between Year 4 and 6. This provided evidence for sustained systematic and active engagement in special provisions in the Socrates Programme. Their achievements were noteworthy, with Matthew and Zach achieving gold and silver awards at the International Olympiads.

Moreover, the students conveyed a sense of personal fulfilment from the recognition they received or simply from the depth of engagement in a subject that they loved. They also usually joined a related academic CCA and sometimes undertook leadership roles in the CCA. There was evidence of transference of knowledge and skills from the subject area into other areas of engagement. For instance, Mark applied what he had learnt from his History and Humanities interactions in debating, a CCA that saw him grow from strength to strength in Year

5-6; Matthew led his peers in the Humanities Club to develop environmental programmes for primary school children while Zach developed programmes in Maths for his Year 5 Maths Club peers who never got the opportunity to participate in competitions.

Teacher comments on person characteristics alluded to positive force, resource or demand characteristics that were consistent with those associated with eminent behaviour (VanTassel-Baska, 1989b). Even when the school curriculum structure did not permit them to continue with a Socrates subject in Year 5-6, they found ways to navigate the constraint. For example, although Matthew was not allowed to take Socrates Geography in the Humanities Programme, he pursued his interest in Geography by taking A-level Geography with an additional higher advanced course (H3 Geography). The students achieved perfect grade points in the Socrates subjects consistently, and excelled in the A-level examination, ranking in the 95th percentile of the school. All went on to top-class universities although they were not sure what they would major in.

However, the attainment level of the G20 students conveyed little sense of anyone having reached their potential according to the TD culture in the school. They reached level 2 and 3 provisions by Year 4 but they were not actively engaged, nor was their participation sustained in any systematic manner. Alex, Gibbs and Michael excelled in the A-level examination but they neither engaged with vigour nor flourished in the Socrates Programme. Gibbs and Michael did well in school-based assessments consistently while Alex and Knight struggled to maintain their performance. Eventually, Alex and Knight fell off the TD track at the end of Year 4 with Knight switching to a science-based combination that ended with dismal outcomes at the A-level examination.

Time and energy were often channelled into something else, not academic pursuits, for example, multiple leadership roles in the case of Gibbs and Knight. Their CCAs were often in non-academic areas except for Michael who seemed to thrive by his own standards, different from the culture of TD in the school. He wanted to excel in examinations, especially the A-level examination. Although he didn't think about national or international platforms, he found personal pleasure and satisfaction in reading on his own. Also of note was Alex who, despite being

channelled into an Enhanced Class, navigated his way into taking a higher advanced Maths course in Year 6. He also found pleasure in being an informal Maths tutor to his less able classmates in Year 5-6.

Teacher comments pointed to person characteristics and behaviours that pertained to doing well in the A-level examination, or to efforts in leading others or serving the community except for Michael whose teacher wrote about his interest in History and in exploring unfamiliar ideas. Gibbs went on to do a liberal arts course, Alex a business course, and Michael a law course, all in local universities in Singapore.

Appendix L provides the cross-case analysis (extract) of the transitional TD outcomes discussed in the preceding paragraphs.

***Summary*.** Based on the strong and vigorous growth in the subject areas chosen by the G90 students, it may be said that these students thrived in the TD process, each working at high levels of proficiency and commitment in pursuing their interest. At the other extreme would be Knight who even failed to build knowledge and skill competencies in core subjects that would facilitate his progression into tertiary education. Gibbs lacked the propensity to excel beyond A-level grades. For both Knight and Gibbs, there was neither the energy nor time invested into the academics as was invested in their leadership roles. Alex and Michael ended up prioritising their A-level examinations. Although they remained interested in their talent subjects, they did not seem to have any clear goals in their TD journey, spending time on it only when they were able to.

CHAPTER 5

Microsystem: Immediate Experiences

Introduction

In the ecological systems model, talent development (TD) is directly shaped through the individual's interactions within his/her immediate settings, or microsystems. A rich microsystem has the potential to develop students' readiness to engage in sustained and progressively more complex interaction, thereby allowing the students to thrive in the TD process.

The literature on TD has centred on the people and settings situated around students such as family, teachers and peers. These settings serve as microsystems that can provide opportunities for TD in subject-specific domains. Because development occurs through proximal processes in these microsystems, this chapter examines the pattern of activities, roles and interpersonal relations experienced by students in their micro-1 and micro-2 systems as defined in this study (see Chapter 1).

Appendices M and N provide cross-case analyses of the micro-1 and micro-2 systems of the eight case study participants respectively. The discussion that follows focuses on the interactions with objects and symbols, peers, seniors, teachers and family because they were most relevant to the students' experiences in relation to academic TD.

Objects and Symbols

Proximal processes in *solo* do not involve interpersonal interaction but focus on progressively more complex reciprocal interaction with objects and symbols (Bronfenbrenner & Morris, 2006). This section discusses what these objects and symbols are, and how the students' own dispositions and capacities played a role in affecting the direction and power of the proximal processes of TD.

Solo Proximal Processes and Person Characteristics

My data demonstrate that students who had a love of reading and propensity to find things out for themselves were more likely to hold self-directed orientations

to learning. Their early heuristic experiences led to confidence in self-management and greater learner autonomy. The G90 students were clearly individuals who believed that they had the personal capacity to take responsibility for their own learning. For instance, Jay's comments reflected his ability and propensity to engage in learning that was progressively more complex:

> Whatever holes there are in your knowledge, you must fix it yourself. You have to learn to fix it. You cannot rely on teachers all the time . . . . Most of what you learn is still, in my view, something you do yourself because there is only a finite number of classroom hours. If you really want to go extremely far in a topic, a lot of it is through self-motivated reading . . . . Despite the fact that they (referring to Science Club peers) had training, that kind of thing is like two hours a week. It is definitely not at a tempo that is enough to do much for you. I mean if you go there to clarify something . . . . that'll be good but a lot of it is about self-driven learning.

Matthew's teacher shared about his confidence and self-direction in learning:

> I just showed him certain things, made suggestions and he was on his own. He will find out on his own. You don't have to teach him but in the end, he taught me.

On the other hand, Knight and Gibbs in the G20 group displayed an orientation that was marked by dependence on a teacher to spark interest and to provide guidance until they feel adequately confident to learn on their own. For example, Knight shared an experience of how he could not get a piece of work done:

> At end of Year 3, we were asked to do a project on our personal interest and go on to investigate it . . . . That didn't really take off . . . . What I felt could be better was if there were actually constant guidance throughout the project. It was supposed to be a free-choice project but I think that we were not there yet to take it on our own.

Similarly, Gibbs recalled his TD experience as a long hard road where it was easy for one to fall off track. He highlighted what he viewed as the teacher's critical role: firstly, to spark his interest and secondly, in what he called the "spoon-feeding"

stage, to help him discover what he liked or did not like by providing opportunities and making it safe for him to venture.

The stark difference in the students' responses discussed above may be traced to their dispositions and capacities, person characteristics which Bronfenbrenner referred to as *force characteristics* and *resource characteristics* of a person respectively. Jay and Matthew took to reading early in their lives; they were inquisitive and enjoyed intellectual challenges. They read up on their own and developed agency in learning; they had the drive and commitment to engage in tasks that were progressively more complex on their own. On the other hand, Knight hardly read while Gibbs read only when he needed to. In addition, their focus of attention and drive were centred on leadership roles. These examples suggest that the student's own dispositions and capacities were relevant features of the environment, playing a strong role in affecting the direction and power of the proximal processes of TD. Furthermore, for Jay and Matthew, they constituted the environment to make self-direction in learning possible. They turned to distributed print and non-print resources that were readily available through home support, school resources, libraries and the internet.

Other Person Characteristics

In the G20 group, Alex and Michael similarly displayed a propensity to learn on their own. This could be traced to early reading and the intellectual curiosity to learn about the world around them. However, the degree to which the solo interactions produced synergistic developmental effects in TD also depended on the interplay with other person characteristics. In Alex's case – his tendency to work only on tasks that were enjoyable hindered his development and progression in Maths. In Michael's case, he had no clear goals related to TD. Instead, he focused on his examination goals which he thought to be more realistic, presumably because he saw himself in a very competitive field of exceptionally able peers. This seemed to have hindered the possibilities that he could have imagined for himself in terms of TD.

Building upon Person Characteristics

It is noteworthy that engagement in solo activities involving complex tasks, in turn, seemed to build upon person characteristics to do with self-direction. Thus, the use of initiative, thought, and independent judgment in locating resources and working out the complexities encountered (i.e., self-direction) fosters valuing of self-direction, which in turn, leads to intellectual flexibility. There was clear evidence for this in the G90 cases. For example, Matthew exercised self-direction in substantively complex work, that is, he used his initiative, problem-finding and problem-solving skills, and independent judgment in locating resources and working out the complexities he encountered as leader of Singapore's maiden team to the International Geography Olympiad. In the process, he built upon his capacity and active propensity to conceptualise his own experience, and to become an active agent in relation to self and the environment.

Summary

The students with the dispositions or force characteristics of intellectual curiosity, interest, and drive in academic learning; and the resource characteristics of love of reading were more likely than those without such traits to value self-direction in learning and to benefit from progressively more complex reciprocal interaction with objects and symbols in the form of print and non-print materials. In addition, the solitary activities involving reading and working at challenging tasks continue to foster a belief in the self as active agent of learning. This finding is consistent with the perspectives of various models that have been proposed to understand self-directed learning (e.g., Garrison, 1997; Song & Hill, 2007).

Peers

Some students formed meaningful relationships with peers that promoted high-level engagement in academic talent development (TD). However, others joined peer groups that led to disengagement from the TD process. Members of these two types of peer group may have had different experiences in school, contributing to different TD outcomes. In this section, I discuss peer interaction and the influence on students' experiences in academic TD.

The micro-1 and micro-2 systems of the case study participants in Appendices M and N show the multiple peer groups each participant may belong to in school. They are categorised into different types of peer group (Tierney & Colyar, 2005) in Table 3. Only in-school peer groups were considered because I did not detect any out-of-school peer group from the interviews.

Table 3

Types of Peer Groups

Formal	In-class	• TD classes, e.g., Year 3-4 Socrates classes, Year 5-6 Socrates classes, Year 5-6 Humanities Programme classes • Year 6 Higher Advanced (H3) classes • Year 5 Elective groups • Year 1-4 regular academic classes, Y5-6 regular A-level classes • Year 5-6 Enhanced A-level Class
	Out-of-class	• co-curricular activities (CCAs), both academic and non-academic • student leadership groups, e.g., Prefectorial Board • competition groups, both academic and non-academic • community involvement programme (CIP) or service groups • House activity groups
Informal	Friendship groups	• academic group, e.g., study group • academic-cum-social group • social group

Appendix O provides a cross-case analysis (extract) of significant peer groups of the students, with an in-depth look into the time spent together, focus of peer group, basis of connection (i.e., identity definition), and strength of peer group (Tierney & Colyar, 2005).

G90 Peer Groups

In the G90 group, the in-class and out-of-class peer groups in their micro-1 systems included formal TD classes, higher advanced classes, electives, and competition training or symposium groups in their talent subjects. In addition, they belonged to related academic-based co-curricular (CCA) groups such as Maths Club in their micro-2 systems as well as other non-academic CCAs. Furthermore, they may have significant leadership roles in the academic CCAs or have been involved in school community service that was related to their talent subjects.

Time spent together. Clearly, the G90 students spent extended and repeated contact with like-minded, highly able peers due to their participation in out-of-class activities that were related to their talent subjects. The overlapping group membership cutting across in-class and out-of-class groups contributed to the extended time spent together. Interactions with like-minded peers in these settings catalysed the process of academic TD in various ways, for example, reinforcing interest and providing them with support and encouragement. Jay described how peer interactions led him to good books, multiplying the benefits he enjoyed from reading and self-teaching:

> The interesting things that you read and mention to your friends casually sometimes make you want to read more. It's interesting how it is . . . . In the initial stages in terms of interest, it reinforces things because your friends are interested and they feed you things; you feed them things sometimes too. If there is no like-minded support, then there is very little incentive and there is no one to share it with.

Mark commented that the peer groups allowed classroom discussions to continue beyond classroom time.

Focus of the group. The primary focus of these peer groups was intellectual engagement in a shared area of interest. This was driven to a high level by the students' intense intellectual curiosity, quest for knowledge, and interest in learning. Those who were in competition training learnt to tap into each other's strengths to support competition preparation. Matthew's teacher shared her observations of the group synergy:

> The four students (Matthew's team-mates) came together; they just blossomed and they ignited the fire in one another. They would teach each other. The sparring with each other actually pushed them to another level. You got people in the group who looked at maps since very young. So, it spurred Matthew to go and find out. That is the part where you can really see his talent and gift.

Basis of connection. The G90 students distinguished themselves from others by their shared interest in particular subjects, intense intellectual curiosity, quest for knowledge, and characteristics such as a love of reading. For instance, Mark said:

> I connect more with people who are able to connect on a cerebral level, like people whom I can debate ideas with.

The overlapping groups shared a strong academic identity that was centred on learning and pushing the boundaries of what they know, which in turn promoted excellence and achievement goals. Thus, the peer groups of the G90 students served as a driving influence that promoted and reinforced the ideology of academic excellence and vigorous growth that was consistent with high-level academic talent development. Pushing the boundaries and engaging in high-level intellectual conversations were the norm for them.

Strength of peer group. The significant amount of time spent together, shared interests and strong academic identity fostered friendship bonds that further strengthened the network of overlapping peer groups. This led to synergy of resources, intellectual engagement, and a feeling of support and encouragement in the TD process.

G20 Peer Groups

In contrast to the G90 students, the micro-1 systems of the G20 students comprised only the formal talent development class. Out-of-class groups were starkly missing. In their micro-2 systems, there were few out-of-class academic groups. Leadership roles of the students were in non-academic groups. Evidently, the G20 students spent much less time interacting with their highly able peers than the G90 students. Gibbs and Knight stood out significantly: their micro-2 systems were rich in non-academic activities and leadership roles, suggesting significant

investment of time and energy in these areas and much less time in their talent subjects.

Informal Maths group. It is interesting that Alex had an informal group of Year 3-4 Socrates Maths peers that he credited for helping him stay interested in Maths. He recalled what they did together:

> We were bored . . . . We just found other countries' Olympiad questions [from the internet] and did them . . . . Yeah, just do together.

Although the group was drawn together because of their shared interest in intellectually challenging Maths, Alex declared that they undertook tasks for enjoyment. There was no clear goal of where their Maths activities were headed. He shared:

> We are quite regular guys as in we do the three big things. For most people, these are sports, computer games, and girls. For us, we enjoy Maths puzzles instead of computer games.

This may be a forced identity of the group, perhaps because they had no access to Maths Olympiad training. The group seemed to be more social in nature; they never considered tapping into the academic network of their peers who were in the Olympiad training programme. Thus, their interactions involving Maths were intermittent. The lack of systematic and sustained interaction on increasingly complex tasks in Maths meant that there were limited gains in Alex's progression in Maths TD from this peer group interaction.

Yet the peer group helped Alex in other ways, providing him with a sense of belonging and social-emotional support. Like all other Sunnyrise students, they shared a similar academic achievement identity of a university education in the near future. As such, Alex and his peer group were tightly connected by a sense of obligation to succeed and to help other members of the group succeed. They helped each other to stay focused on achieving academic excellence in examinations. Alex said:

> We pushed each other a lot. My group of friends, the good part is that we are all super strong in different subjects so we can help each other out.

Alex professed that this informal peer group helped him stay connected with challenging Maths when he was grouped in a class of low achievers (Enhanced Class) in Year 5-6. He said, "They would just give me [Maths] puzzles to do." Alex's Enhanced Class became a stable peer group that seemed to have helped him excel in the A-level examination. It was here that he felt a sense of self-efficacy from peer recognition of his high academic abilities, and their acceptance of his role as peer tutor. By Year 6, he seemed to have redeemed himself: he did well enough in Maths to earn the opportunity to take the Higher Advanced Maths course.

Loose Socrates group. Knight seemed only loosely connected to his Year 3-4 Socrates Geography peers in reality because of his heavy investment of time and energy in student leadership roles in non-academic areas. Although Knight perceived himself to share a common academic identity with his Socrates peers and felt supported, in reality, he was not immersed in interaction with them. In addition, his social peers were students from his regular subject classes because he was uncomfortable with his Socrates peers. He said:

> To hang out as a clique [with Socrates peers], no, I don't think so. On the work basis, I do interact and work with those high flyers but on a friend basis, I usually relate better with people who are more average, really average . . . . Easily relatable I think, just being able to have and sustain a conversation well and be comfortable with one another's presence.

Further, Knight's leadership responsibilities seemed to have given him an identity that was non-academic in nature, not one that promoted progression in TD or academic TD goals.

Overlapping peer groups. Gibbs spent extended and repeated contact over the years in formal in-class and out-of-class settings because of overlapping peer groups from the Socrates History class and Prefectorial Board. The formal settings meant that there was a structure and environment that promoted frequent interaction and support. Gibbs soon became close friends with members of the group. However, he was connected to the group on the basis of leadership identity more than academic TD: they were bonded by their strong commitment to lead in serving the school, and by a shared confidence in their ability to do so. Gibbs noted:

> We are close without needing to be close – in our everyday life, we don't have to be always together. We know that because of our ability and who we are, no matter what happens, when the time comes, when we need to get stuff done, we always come together.

There seemed to be some synergy from his overlapping peer groups that benefited Gibbs in the Socrates class: although he regarded himself to be less high-performing than his peers academically, he felt "on par" with them when they worked on Prefectorial Board projects. So, in the Socrates History class, while he listened to what his highly able peers brought to the table, he also wanted his views to be heard. In return, his peers appreciated having him around. However, these peers were not his study peers: Gibbs preferred to study with peers whom he perceived to be closer to his level of academic ability because he felt that his closest peers were too intellectual and he couldn't always connect with them. Gibbs' lack of academic self-efficacy in this peer group limited the potential gains that he could have enjoyed in relation to academic TD.

A different academic identity. Michael's closest peers comprised in-class friendship cliques from his Year 1-4 and Year 5-6 classes. The group developed due to repeated contact with the same set of peers in formal lesson groups over the years. Members bonded mostly because of shared academic challenges such as the pressure of examinations rather than their interest in History or the Humanities. Michael said:

> You don't really make very close friendship through like, 'Oh, I like History, you like History, okay, we are going to be very good friends . . . . I have friends who are of the same academic interest but we are not like completely bonded . . . . We will talk about History and stuff but that doesn't translate to going out and hanging out together . . . . I can't really go out and talk about History and stuff.

These peers provided Michael with a sense of belonging, and social and emotional support. Implicitly, the group promoted academic achievement among members because they were all focused on doing well academically and dealing with the academic challenges confronting them. His ability to help his friends gave him a sense of self-efficacy in the group.

Summary

The peer relationships and interactions of the G90 students promoted an ideology of intense academic advancement and vigorous growth in TD while that in the G20 group either fostered disengagement from the TD process or lacked the elements necessary for high-level TD, although there were also broader peer group experiences that extended beyond the highly academic TD experiences of the G90 students.

Seniors

The term *seniors* in this study refers both to students in the school who were in a higher grade level than the participants and those who had graduated from school. I provide an extract from the cross-case analysis of the interaction with seniors in Appendix P. The nature of the relationship and the effects of the relationship were considered.

My analysis revealed that the G20 students experienced little or no influence from their seniors in their TD journey. This was due largely to a lack of opportunity for direct contact with seniors who were elites or who shared their interests in particular subjects. Their micro-1 environment showed a lack of microsystems within which there were seniors. On the other hand, the G90 students shared positive experiences and individual gains from interactions with seniors who were elite students in shared areas of interests. Their micro-1 and micro-2 systems included settings (e.g., Olympiad trainings, Science Club) where they experienced regular and sustained interactions with elite seniors.

These seniors were present in their lives as trainers, informal mentors or role models. The relationships that developed ranged from close, interactive relationships to admiration from a distance. For instance, Jay and Zach interacted substantially with elite seniors in the Science Club and school-based training sessions for the Olympiads and other academic competitions. Jay described the relationship and benefits he experienced:

> You kind of have a mentor-mentee relationship. I mean it's not a stated thing. It's just that you know this senior is good at this kind of thing. Then, you will end up asking him. They are a conduit for you to go further. They start

> recommending, "Okay, if you are interested, you do this or read this, or you can ask this teacher, or go for this kind of thing" (referring to the kind of activities useful to TD).

For Jay, Mark and Zach, elite seniors showed them where to focus their energies in developing their talent. The seniors were "conduits" for knowledge that was part of the tradition of the area from which the students gained content area knowledge and enrichment experiences. They were experts who were more accessible to the students than university faculty who sometimes served in roles such as national Olympiad trainers. The seniors also linked them to resources that resided in their own networks.

Strong bonds developed not only because of the extended time spent together in planned activities but also the sense of camaraderie stemming from the school tradition of seniors-juniors ties – one where seniors feel a sense of responsibility to help juniors succeed; juniors feel a sense of obligation and commitment to excel and succeed. Such was the commitment that each of these participants felt when they became seniors in the later years of Sunnyrise School. Friendship ties often developed over time and the students continued to keep in touch with their seniors even after they graduated from school.

Matthew had fewer opportunities to interact with elite seniors in the secondary school years because of a lack of planned interactions, that is, there was no talent development framework for Geography in the school at that time. Nevertheless, he was motivated by the reputation of his most outstanding seniors. He said:

> It's more of their reputation that preceded them. You know what their achievements and records are. So, it is more of the example they set for us, the expectation to do as well as they have.

Knight in the G20 group who had no contact with seniors described feeling inspired by them in similar ways, for instance, he saw through them "the possibilities of what could be" and how they managed in school as well as what they did after graduation from school.

Summary

The G90 students who experienced substantial gains from elite seniors were those who enjoyed close interactive relationships with their seniors during planned activities in the school that were sustained over a significant period of time. Those with little or no contact with elite seniors experienced little gains other than being inspired by their achievements.

Teachers

Reciprocity

The G90 students enjoyed a close relationship of reciprocity with their Socrates Programme teachers. Some of these teachers were also their trainers in academic competitions. The teachers were valued for their passion and knowledge in the subject. They provided the students with breadth and depth of learning in the field, fostering their curiosity and excitement about learning and about the field. For example, Mark said:

> I was very influenced by some very good teachers. These teachers . . . sought to go beyond what was planned in the syllabus, . . . giving us a glimpse of what else, like the vastness of the field in which the academic discipline is a part of . . . . And also being very open-minded in matters of debate like encouraging us to look at what there is in the field and then forming a critical opinion through our research and our study . . . . They invested a lot of their time and effort in helping each student individually.

The teachers directed them to challenging opportunities such as academic competitions and extra-curricular training. They were often a source of motivation and inspiration to the students because of their passionate commitment and drive for excellence. Matthew recalled feeling comfortable about challenging and asking his teachers questions. He explained:

> They showed a readiness to engage us and a willingness to share their experiences [in the field].

The teachers were more willing to push further in the subject domain, making them think harder. The students felt energised because they were able to push back the

boundaries. The warm relationship that the students enjoyed with their teachers frequently led to informal interaction in the academics outside the classroom. Thus, the responsive care and attention from the teachers led to feelings of positive student-teacher relationship that furthered the G90 students' commitment to engage in progressively more complex tasks and to invest increasing amounts of their time into their talent subjects.

Lack of Responsive Attention

The data that I collected from the G20 students were mixed. Gibbs met teachers who love their subjects and who inspired him. He described his best teachers:

> They were unparalleled in their own area. They love their subject and teaching is how they share their love. They talked about life in general. It was so inspirational because every subject has a lot of meaning. I am learning the subjects because there is meaning and value in it in my life and I am not learning just for an exam.

Gibbs felt his teachers created an environment where there were many opportunities and he felt supported and safe to go out and try. In reality though, he kept very much to classroom work in the Socrates Programme, perhaps because of distractions from the leadership roles that took up much of his time.

In Michael's case, there didn't seem to be much synergy between him and his Socrates History teachers. He felt that they provided him with reading materials at a time when he didn't know how to push himself in the subject. However, by Year 5-6, he did his own research besides reading what his teachers gave him. As such, he felt that it was his own interest that led him to read further after mastering what was required for his examinations. He elaborated, "I wouldn't say it was like a self-driven, purposeful goal towards getting deeper into the subject; it was more of swimming with the currents." Michael's teacher felt that he was just moving along in class. She recalled:

> He may have that interest. He may do other things without the teacher pushing but when it comes to the crux of giving up that interest for something else that is more practical, he will do what is practical . . . . Before exams, he

would come and talk to me. He sent me multiple essays, and asked, "How can I improve on it?" It was really very exam-focused.

The relationships that Alex and Knight had with their Socrates teachers suggested a lack of responsive care or attention that undermined the TD process for both of them. In Year 1-2, Alex's exceptional ability in Maths captured the attention of his Maths teacher; she gave him out-of-syllabus questions to keep him engaged. He enjoyed her Maths lessons because he had something productive to do and the extra tasks helped him deal with his hyperactive nature. When she found it difficult to keep up with him, she introduced him to Maths Olympiad and the Maths Club. The teacher's focus of attention on Alex's exceptionally fast pace of learning in her Maths class and her responsiveness in finding him appropriate learning opportunities in Maths were closely related to the proximal processes of TD: Alex was introduced to more challenging learning opportunities in Maths. This contributed to developmental outcomes in Alex's TD at that point of time**.** As Alex grew older, he became more able to find challenging questions on his own. Alex felt he had the "right teacher at the right time", someone who was there to nurture his interest in Maths when he didn't know how while also looking after his well-being.

However, Alex's propensity to lose attention or to engage only in what interested him, became a problem in Year 3-4. His teachers viewed him as a student with the aptitude but not attitude; teachers' comments frequently centred on the need for more effort in his work. His Socrates Maths teacher was exasperated with him and wondered why he was in the Socrates Programme. Alex's description of his Year 1-2 Maths teacher as "understanding and accommodating" suggested what seemed missing in his interaction with his Socrates Maths teacher. While his Year 1-2 Maths teacher tried different ways to engage him, his Socrates Maths teacher left him to decide how he wished to work. He saw Alex as an inattentive student who did minimal work in his class. He felt that it was his parents who wanted him to be in the Socrates Programme. The lack of responsive attention to Alex's person characteristics (e.g., tendency to lose attention) seemed to have hindered the development of proximal processes in support of his TD.

Yet by the time Alex got to Year 5, he realised that teachers would rather teach an enthusiastic student. He realised that being responsible and inquisitive could

influence his teachers' response towards him in a positive way. His earlier experiences with his teachers seemed to have positively affected his later functioning in interactions with his Year 5-6 teachers. Alex improved on his work habits and classroom behaviour, and began to enjoy his Maths lessons more. This led to better performance and the opportunity to take a Higher Advanced Maths class in Year 6.

In Knight's case, he perceived that his teacher's mismatched expectations of his class undermined learning and development of interest. He said:

> We were all excited about Socrates Geography in Year 3 but the fire sort of fizzled out by Year 4 . . . . I think there was a difference between what the teacher perceived a Socrates class to be like and what we were really like … in terms of quality work and discussion.

Knight said that he and his classmates developed self-doubts about their ability in the subject and they eventually lost interest. Their behaviours changed; their quality of work worsened. Knight felt that the teacher's unrealistic expectations of his class undermined the rapport and trust that could develop between teacher and students. That, in turn, undermined their motivation to take up challenging work.

Knight pointed out the need for greater teacher responsiveness and care in the early phases of TD. He spoke about the need for teacher guidance until a student was adequately confident to learn on his own. He cited examples of being left prematurely with tasks they couldn't cope, as well as the need for more teacher guidance in the selection of enrichment activities. In contrast, Knight felt he had a closer bond with his teachers in the regular academic classes because they cared for him as an individual. The rapport with these teachers made learning more enjoyable, and helped him persevere in the learning process. Knight reflected on his Socrates teacher's influence on his development in Geography:

> Even though you may be interested in the subject but the person facilitating the learning is as important as the subject itself . . . . I mean for you to influence the student, the first step would be to build rapport with the student. So, if the rapport is not there, not knowing the student as a student, as an individual student, then it is hard to influence the student. So, the trust factor wasn't there first.

Appendix Q provides a cross-case analysis (extract) of salient student-teacher interactions.

Summary

In sum, a close relationship of reciprocity and responsive care that was evident between the G90 students and their teachers furthered the TD process; one that lacked the teacher's responsive care or attention to process-relevant person characteristics undermined the development of proximal processes of TD, shaping motivation and TD outcomes negatively.

Family

This section explores the family environmental characteristics of the case study participants within the dimensions of family demographics, and family climate and values. Appendix R provides an extract from the cross-case analysis.

Family Demographics

The case study participants came from stable intact families except for Knight whose parents were entangled in a divorce when he was in Year 3-4. In terms of birth order, six out of the eight students were either first-borns or only children. As a group of highly able students, there is consistency with Roe's (1953) finding that the scientists in his study were typically the eldest children.

Alex, Michael, Jay, Mark and Zach were from higher-income homes while Gibbs, Knight and Matthew were from middle-income homes. This assessment was based on the type of homes they lived in, whether private or public housing.

The parents of Michael, Jay, Mark and Zach had university qualifications. Alex's parents had O-level qualifications but ran successful businesses. The parents of Gibbs, Knight and Matthew had either Polytechnic or A-level qualifications.

Of the eight students, Knight seemed to have the least advantaged family environment while Alex, Michael, Jay, Mark and Zach were most advantaged in terms of home stability and resources.

Family Climate

Quality of family relationships. Seven of the eight students grew up in close-knit families where members gathered regularly for dinners. Knight who was from a one-parent family was the exception but he was close to his mother from young. The parents were supportive of their children and provided a home environment of mutual trust and acceptance. The mothers played a dominant role in their lives. Although the fathers were generally seen as supportive, they were mostly absent because of work. In the interviews, the students made specific references to their mothers or to both their parents collectively. This suggested that the parents presented a united front in raising them, like more than 90 per cent of parents in Singapore who believe in the sharing of responsibilities for raising their children (Quah, 1999).

The parents were not particularly controlling. None of the students was forced to do anything they did not want. Even Knight who described his mother's parenting approach as strict was able to persuade his mother to support what he wanted to do.

Parenting style and attitudes. In the G90 group, all but Matthew may be said to have had very watchful and diligent mothers where there was a high level of maternal responsiveness to the child's learning from an early age. Their mothers were directly involved in learning activities with them, fostering the early development of learning skills such as reading and developing a love for reading. Jay's mother read to him regularly, taught him using CD-ROM materials, and took him to the library. Mark's and Zach's mothers provided initial introductions to their talent area in the Humanities and Maths respectively. The mothers were also responding to the students' *demand* characteristics – their inquisitiveness, interest in learning, and capacity to learn.

There was high behavioural supervision in the primary school years such as monitoring of homework and work routines. Jay's mother made him work when he wanted to play. She established rules at home such as the no-TV rule. Mark's mother incorporated talk about school happenings and what was learnt in school in everyday family conversations. In the process, she showed Mark the connection between classroom learning and the real world. Zach's mother was very attentive to his

interests and inquisitiveness, and galvanised resources and the family network to support him. Leisure time often involved learning activities with their mothers. In the later years of school, the nature of support from their mothers changed to providing socio-emotional, logistical and resource support.

In Matthew's case, although there was a seemingly low level of direct parental responsiveness and behavioural supervision, parental expectation was clear - doing well in school was important and this meant getting high marks. Moreover, Matthew seemed to be socialised into self-driven learning within a traditional family setting that was influenced by Confucian values: everyone had a role and responsibility; diligence was expected. He played his role as the eldest sibling, taking responsibility for his own learning, doing well in school, and staying out of trouble. When his mother introduced him to libraries, he learnt to find things out on his own; libraries quickly became his treasure-trove of knowledge.

In the G20 group, the level and nature of maternal responsiveness and behavioural supervision in Alex's and Michael's case were similar to that of the G90 students. However, the situation was different for Gibbs and Knight. Gibbs was left to study on his own even in his primary school days. He felt no parental pressure to study; there was no academic expectation. In Knight's case, his mother was strict and required from him conformity to her expectations in the primary school years. She pushed and hand-held him in his school work. But, unlike the G90 mothers who were actively involved in learning activities with their children during the leisure hours, Knight was left to his own devices. Knight recalled watching lots of TV and playing computer games. He said, "There was nothing intellectual like reading." In secondary school, the strict supervision over academic work disappeared because his mother could not keep up with the complexity of secondary school work. Knight was left on his own although his mother continued to nag him about academic results because of her own anxieties.

Of the eight students, Jay, Mark and Zach from the G90 group, and Alex and Michael of G20, experienced a high level of direct parental responsiveness and behavioural supervision in the pre-secondary school years that included planned learning activities during leisure time. The family support and encouragement of academic achievement behaviours and educational aspirations was high within a

literacy-rich family environment throughout the years. Although there seemed to be a lack of direct parental responsiveness and behavioural supervision in Matthew's case, the more traditional family home environment conveyed clear messages about academic achievement and desired behaviours. While there was parental focus on academic achievement, there was less focus on the enjoyment of learning in Gibbs' and Knights' early and later years in school.

Values Espoused and Enacted

Parents of the G90 students placed a high priority on education. Doing well in school was a basic expectation. Reading was actively promoted in the families. Mothers inculcated good academic habits in the early years through direct involvement in learning activities. For example, Jay's mother modelled how to learn and taught him learning skills such as making notes. Mark's mother wove values and approaches to learning into everyday family conversations. She organised family life to give intellectual conversations centre stage. Mark grew up enjoying family discussions on what he learnt in school. Zach learnt from his parents that education was about preparing for the real world. He learnt values related to achievement such as hard work and persistence. For Matthew, messages on diligence and doing well in school came across from his mother less directly. He saw how his younger brother needed his mother's regular supervision while he and his sister were entrusted to work on their own. He realised that his mother allowed him to learn on his own because he had proved himself to be independent, self-directed, and able to do well on his own.

When the students were older, intellectual pursuits continued to be prioritised over other activities in family interactions. Parents provided support for interest-driven learning, believing that interest promotes enjoyment of learning. All the G90 students developed a love of reading, good academic habits, and self-direction in learning that continued to grow in Sunnyrise School. There had been coherent and consistent messages and behaviours about the value of education and good academic habits communicated through family interactions.

In the G20 group, all the parents similarly placed a high priority on education. Alex's and Michael's parents were very similar to the G90 parents: they prioritised intellectual pursuits and being active and involved in learning. They were

themselves directly involved in learning activities when Alex and Michael were younger, fostering a love of reading, building interest, and developing academic habits and self-direction in learning by role-modelling these values. Michael recalled that he learnt from his mother that working hard was a part of life. Hard work and discipline became second nature to him. He made sure he finished his work no matter how difficult, and grew up with the belief that hard work provided the ticket to success. Alex's father modelled the importance of trying one's best and learning from mistakes in his business ventures. There was never too much emphasis on academic results in Alex's family; trying hard was more important. So, Alex felt empowered to learn because he only needed to try his best.

Although hard work was a value that was also espoused in Gibb's and Knight's families, there were other messages. For instance, Gibbs' mother conveyed the message that socio-cultural capital was needed to get ahead or excel in school. At the interview, she said, "We are a family with no background . . . . I don't have strings [to pull]." What came across was a certain disadvantage that she felt due to her educational background of being "just a poly(technic) grad(uate)". Gibbs seemed influenced by his mother: he had the perception that his peers all read "atas" books (referring to more scholarly books) while he read all the "kiddie stuff". His mother's emphasis was not about academic learning, academic achievement, or being the best. It was about being a good person – who he is as a person is more important.

Knight's mother focused on academic results and put pressure on Knight to perform well academically in order to "have a better future". He described his mother's strict parenting approach:

> She was very hard on us . . . . She would go through the homework, what the teacher taught . . . . Yeah, there were things to be done, must get it done; that was it.

As a result, Knight felt immense pressure to perform academically for that better future.

In stark contrast to the other parents, there was little parental interaction to do with developing good academic habits, or fostering a love of reading and interest in learning in Gibbs' and Knight's families.

Summary

What stood out in the G90 case studies were the coherent messages and consistent behaviours in the family settings. There was fostering of early development of reading and interest-driven learning. Mothers may provide the initial introduction to a talent area. Of significance was the intellectual atmosphere in the families – suggesting overall high intellectual interaction within a literacy-rich and stable family environment. This, together with high parental monitoring and responsiveness including the deliberate use of leisure time for learning activities in the early years added up to advantaged family settings for academic TD. The mothers played a dominant role, no doubt catalysed by the gratifying signs of their children's growing competence. Alex and Michael in the G20 group enjoyed the same advantaged family settings while Gibbs and Knight had less advantaged family settings for academic TD.

To sum up this chapter, each student traversed distinct experiences among the microsystems discussed. The microsystems are crucial sites in the TD process, setting norms, roles and opportunities that can advance the students' knowledge and skills in their talent subjects. Yet, microsystems may not all operate in harmony in support of TD. A student may gravitate towards microsystems that hinder TD. On the other hand, a rich microsystem may help offset the drawback of another. Furthermore, the microsystems exist within other levels of the ecological system that affect the students. This is discussed in the next chapter.

CHAPTER 6

Mesosystem, Exosystem and Macrosystem

This chapter consists of three main sections. It explores and discusses how the mesosystem, exosystem and macrosystem influenced the talent development (TD) of the case study participants.

Mesosystem: Overlapping Relationships

TD occurs in the face-to-face settings or microsystems of a student's life. However, each individual microsystem is only a part of that student's total experience. This was discussed in Chapter 5. Each student experiences many settings, activities and roles, and TD is affected by the intersecting orbits in which the student is simultaneously involved. This section examines the combined set of microsystem interactions and discusses salient features of the mesosystem, that is, the totality of the students' direct experiences, roles and relationships.

School Culture

Different focus for excellence. For the G90 students, school culture was about excellence and this was experienced as doing their best and winning in national or international events such as academic Olympiads. It was also about passion and the drive to push the boundaries of what they were learning in their talent subjects. To illustrate, I provide extracts from two interviews:

> Matthew: For us, school culture was more like excellence. The whole idea of excellence was doing the best, always being the first. This pushed us to win every competition.
>
> Mark: I think a lot of people had this sense of *carpe diem* in the sense that I must fill, for example, my two years in Year 5-6 with everything I can manage to do. I feel it is very competitive but everybody seems to be bearing it with the utmost equanimity. It is scary but I think it is a passion that helps you to excel as well because everybody around you is trying their best in what they do . . . . I feel compelled to do the same.

Although school culture for the G20 students was similarly about excellence and doing their best, they had a different focus: examinations, non-academic co-curricular activities (CCAs) or leadership roles. Academically, excellence was about achieving perfect GPAs or straight-As in examinations, quite unlike the G90 students. In the focus group interviews, most of the G20 students had shared that the Socrates Programme gave them a sense of perspective on their academic and intellectual abilities, suggesting that they compared themselves with their Socrates peers. Yet when it came to academic excellence, their reference group tended to be their age peers rather than peers in the Socrates class. In their CCAs though, excellence was about winning or pushing their leadership capabilities.

Conflicting narratives. In the academics, the G20 students wrestled with conflicting messages about excellence in their regular academic classes and Socrates class. For instance, among Gibbs' regular subject peers, the narrative was about studying hard and striving to achieve the perfect GPA of 4.0; it was the tacit expectation for anyone joining a very selective school. Any kind of talk about pushing to be the best or studying beyond the curriculum was perceived as arrogance as there were peers who had to struggle to achieve the "4.0" benchmark. On the other hand, the narrative among his Socrates peers was about challenging the limits of what they were learning. The conflicting narratives about excellence acted against each other as Gibbs moved between his micro-1 and micro-2 systems. Gibbs' preference to study with regular subject peers drew further attention to the discrepancy between the two narratives that confronted him. The lack of academic TD settings in his micro-1 or micro-2 systems did not help too.

Thus, although both the G20 and G90 students were inspired by the school culture to excel, their focus of attention and responsiveness differed: the G20 students focused on examinations, and their CCAs or leadership roles, while the G90 students centred on pushing the boundaries of what they were learning in their talent subjects and being the best beyond the school.

Family and School

Coherent messages. For the G90 students, the school culture of excellence that motivated students towards exceptional achievement goals was congruent with family messages about learning and pursuing their passion. Parenting practices and

messages in the home that supported interest-driven learning predisposed them to select particular settings (e.g., academic clubs and enrichment in academic subjects) in the school from the outset, reinforcing the proximal processes of TD. The students felt empowered to forge ahead beyond the confines of syllabuses and classroom work.

Contradictory messages. In the G20 group, there tended to be contradictory messages at home vis-à-vis the academic TD process. In Gibbs' case, his parents' beliefs about student leadership roles as something crucial for his progression to elite universities and prestigious scholarships added to Gibbs' struggles with the conflicting messages that already confronted him in his network of peer groups (see earlier discussion). The height of this occurred at the Year 4 to Year 5 transition when Gibbs' parents encouraged him to leave the school following his failed bid for a leadership role. Following this critical event, Gibbs retreated even more to doing what he knew best – excelling in school examinations. At the interview, he recalled ruefully that the event hindered him from a future he had imagined for himself beyond the A-levels – that of studying in a top-class university overseas under a prestigious scholarship that would, in turn, pave the way to top jobs.

The messages at home also added up to a fragmented incongruent mesosystem that was not favourable to Knight's TD. A prime example of this was a critical event Knight recounted at the interview. Influenced by his mother, he decided to switch to Science and Maths subjects in his A-level years although he was stronger and more interested in the Humanities. Knight ended up struggling in these subjects in his last two years of school. He said of his painful experience:

> My strong subjects that kept my GPA from falling were my Humanities subjects in Year 1 to 4 but I didn't take my Humanities subjects in Year 5 and 6 . . . . Yeah, I actually brought over the weaker subjects.

Parental views on the seemingly easier Science and Maths subjects to excel at the A-level examination that were linked to less subjective marking and therefore playing it safe – in short, the focus on gaming the system rather than on Knight's strengths and interests – conflicted with the purpose and process of academic TD.

During the interview, Alex candidly pointed out how parenting practices predisposed him to choosing a peer group that enjoyed challenging Maths without

the heightened intensity of the G90 students. Interestingly, he distinguished two types of peers who were highly able in Maths: those who were self-motivated and "did interesting things" like himself, and those who were groomed by their parents in a systematic and sustained process. He elaborated on the latter group:

> They start all the way from the Primary 1 Maths Olympiad preparatory course. By the time they reach Primary 6, they are definitely good already. They had six years of Maths Olympiad training.

Alex identified with the first group, pointing out that his friends' parents were not pushy, just like his parents. But the easy-going parenting style and attitudes also contradicted messages about academic TD in school such as commitment to vigorous work, high achievement behaviours, and perseverance.

The discussion above reinforced the point that messages at home and in school in relation to learning and academic TD can add up to a congruent or fragmented mesosystem that is more or less supportive of the process of academic TD.

Favourable and Less Favourable TD Settings

TD niches. The G90 students entered settings that were especially favourable to TD, that is, TD niches within the micro-1 and micro-2 systems. For instance, Zach chose to join the Maths Club and Science Club early on in Sunnyrise School, and then the Socrates Programme and Olympiad groups. The micro-1 settings had a high concentration of prospective Maths and Science elite students, elite seniors who were proximal models of talent, and teacher-trainers. These synergised with the micro-2 settings of academic clubs where challenging activities and events organised regularly not only promoted interest but provided benchmarks of the students' progress. These activities frequently provided openings to national TD opportunities in the respective subject domains.

Entry to the TD niches was mostly by selection but it is also notable that the G90 students navigated whatever constraints that came their way. For instance, although Jay was constrained by the school in the maximum number of Socrates subjects a student could take, he found other appropriate options such as academic competitions; when he did not make the cut at the International Chemistry Olympiad

selection, he took up an internship at a research institute. These students believed firmly in personal agency in seeking out opportunities to match their ability and interest levels. Jay summed it up well for the G90 group:

> There are many different student aptitudes. Maybe the high-end students, they can go on to the Olympiad, that's fine. But there are some that might not have that kind of ability. Instead of just asking why it's like that, they must match the opportunities to their ability . . . . You find something to do that is challenging enough.

Thus, besides the Socrates class, the G90 students gained membership in TD niches through hard work and deliberate practice (Ericsson, Krampe, & Tesch-Romer, 1993) in their talent subjects. Their dispositions and resource characteristics such as capacity were congruent with the heightened intensity of learning that they desired; these were also in consonance with the type of individuals they met in the ecological TD niches. As pointed out by Lerner (1982), the person-environment fit led to adaptive learning for the students. In the network of TD niches, the students felt affirmed when they were successful but a lack of success would spur them to renewed efforts to overcome difficulties, much like the subjects in Bloom's (1985) study.

Less favourable settings. On the other hand, the G20 students seemed to have very limited opportunities for entry to the micro-1 TD settings. This led to a micro-1 system that comprised largely the Socrates class. Moreover, the students tended to choose non-academic CCAs or leadership roles, diverting their time and energy to activities or events that had little to do with academic TD. As a result, the students ended up with a narrow set of TD experiences and interactions. To give an example, the Olympiad Maths groups provided specific settings in the micro-1 environment that were especially favourable to Maths TD. However, access to this ecological niche for Maths TD was controlled by selection tests. Failure to enter this niche setting was unfavourable to Alex's TD because it restricted him from a peer culture mesosystem that could potentially motivate and energise him to invest time in Maths TD in a more systematic and sustained way. Furthermore, failure to enter this mesosystem restricted interactions with other significant individuals such as elite seniors and teacher-trainers.

The G20 students navigated the lack of formal TD opportunities in different ways and to varying degrees. Alex had a social group from his Socrates Maths class who kept up his interest in challenging Maths especially in Year 5-6 when he was not allowed to continue in the Socrates Programme because of his low GPA score. He borrowed notes from these peers, and they obtained their own sets of Olympiad questions and other challenging Maths problems from virtual communities on the internet. This informal peer support fuelled his study-on-your-own approach to dealing with the lack of formal TD opportunities in the later years of Sunnyrise School.

Gibbs had gained entry to an academic competition group in Year 2 due to his high GPA score. That was a turning point event that triggered a mindset change in him – from someone who was focused only on studying what was in the examination syllabus to knowing that "there is a big world outside the syllabus, more interesting and worth pursuing." His relationship with these peers expanded beyond academic TD to overlapping interactions in the Prefectorial group and the History class of which they were all members. However, his interactions with these peers in academic TD were not adequately sustained in Year 3-4. His attitude and behaviour towards challenging learning opportunities that would stretch his capabilities in his talent subject seemed more influenced by the conflicting messages from his network of peer groups and home. He increasingly identified with his regular class peers that he preferred to study with, leading to a concomitant lack of readiness and motivation to commit to challenging opportunities in the Socrates Programme. Instead, he channelled his energy and time to leadership roles. As he regarded himself academically less high-performing in the overlapping peer groups of Socrates classmates and Prefectorial Board members, he never thought about stretching himself and was content to push hard in the leadership area where he felt more on-par with them. In the interview, Gibbs barely spoke about TD in the academics. Academic excellence for him seemed to stop at straight-As in the A-level examination.

Michael seemed to be much more preoccupied with his regular classes and learning for examinations. TD was given a subordinate role especially in the last two years of school; it was something he did when he had time. His decisions on learning

activities seemed to rest on his preference to feel safe with what he was doing. This was palpable during the interview. He rationalised:

> Naturally, at the start [of the Humanities Programme], you would feel intimidated. Like OK, this guy is probably going to be a scholar, the other guy is going to be a President's Scholar but in the end, because the expectations I set for myself were to get into NUS Law (a local law school), to get a good Law degree, I wouldn't be envious or aim higher than what I know I can achieve . . . . You are safe in your own zone, I guess.

Knight had a keen interest in leadership at the outset. In fact, at the time that he joined the Socrates Programme, he also chose to spend much more time in CCAs and leadership roles. His heavy investment of time in leadership responsibilities and non-academic CCAs meant that there was less time available for pursuits in the academic domain. He found it hard even to complete his work in his regular academic classes let alone take up additional learning opportunities in the Socrates Programme. As such, his micro-1 system was restricted to TD experiences in his Socrates class. His micro-2 system comprised mostly non-academic CCAs and leadership settings that competed for his time and mental energies. Additionally, he was more comfortable in his leadership peer groups, and with social peers from the regular subject classes. As such, the micro-2 systems he chose to spend most time in were settings that were incongruent to the processes and messages that one would find in an academic TD setting.

Knight struggled with balancing the demands of his academic and CCA involvement in Year 3-4. Most of the TD opportunities in the Socrates Programme were out of Knight's reach because he performed worse than others in the Socrates class. Sometimes, he vetted himself out because he had no time. This restricted interactions with highly able peers and significant others in his talent subject.

The micro-1 and micro-2 ecological TD niches supported academic TD for the G90 students because there was an environment-person fit. The settings in the micro-1 system and academic micro-2 system attracted them and supported their intense drive to learn and the desire to spar with the best. Although the students may be interested in other areas such as leadership, they voluntarily invested much more of their time, and emotional and intellectual energy in the ecological niches that

supported their TD. This was in sharp contrast to the G20 students who mostly divested their time in non-academic CCAs or leadership groups, or chose to focus on school learning for examinations. Their focus of attention and responsiveness were not on academic TD. It may be said that the mesosystem of the G90 students grew to reinforce academic TD within and across the micro-1 and micro-2 settings over the school years. The G90 students' experiences, roles and relationships expanded within these settings, supporting development in their talent subjects. The messages about expectations, knowledge and experience consistently focused on advancing in the talent area and being the best. Moreover, the students were able to move from one niche microsystem to another within the mesosystem with ease because of overlapping members, activities and messages. The collaborations and synergistic effects across the intersecting microsystems in which they were simultaneously involved, promoted their aspirations and their imagined future of prized scholarships and world-class universities where they would meet the brightest minds.

Summary

All the eight students in this study participated in the school's TD programme but they had remarkably different experiences, in particular between the G90 and G20 students. The G90 students were embedded in influential mesosystems that invited increasing complexity in their micro-1 systems. There was congruence and a high degree of overlap across the micro-1 and micro-2 systems that they entered, reinforcing the goals and objectives of TD. For Gibbs, Knight and Alex in the G20 group, there was inconsistent and contradictory membership and messages in their microsystems that undermined the proximal processes of TD. In the later years, the A-level examination, CCAs and leadership roles formed much of their whole experience. Their dispositions and behaviours were oriented to performance outcomes in these areas rather than TD outcomes. Michael spent most of his time and energy in microsystems that focused on regular academic achievements instead of expanding his mesosystem to include more micro-1 experiences and relationships.

Exosystem: Systemic and Structural Arrangements

The arena of TD programme provision and the structural arrangements associated with schooling are part of the students' exosystem because students are affected by the decisions educators and administrators make about how programmes

and schooling structures are conceptualised and delivered but are excluded from decision-making. This section focuses on these influences on students' experience of TD and schooling and the decisions made in their microsystems. It incorporates students' perceptions from the focus group interviews since the students spoke at length about their learning experiences in the Socrates Programme in the group setting.

Policies and Provisioning for TD

Socrates classes. In the focus group interviews, both the G20 and G90 students were positive about their Socrates classes. The G20 students spoke about gaining deeper disciplinary knowledge and thinking, and acquiring a deeper appreciation for the subject in the process. Moreover, they spoke about learning that was connected to the real world and that broadened their perspectives. On the other hand, the G90 students enjoyed the intense intellectual challenge and pace because they wanted to learn the knowledge-tools and engage with the language and rules of the subject field quickly. Without exception, the students found their Socrates classes different from their regular subject classes which they described as "boring", "standard", and "in-the-box kind of exam-learning" where students memorised key points to score marks.

However, when the students were asked what was hard for them in the Socrates Programme, the G20 group spoke about their struggles to keep up with the challenging and fast-paced Socrates lessons. Although they appreciated the faster pace of learning compared to their regular subject classes, they found themselves struggling to keep up with the Socrates classroom work. It appeared that they did not feel that their pre-Socrates experience had adequately prepared them for the complexity of study in the Socrates class. Knight described his experience:

> I struggled in terms of the work from the teacher or in general class discussion, and when doing projects, the need to be ever critical and the need to be on your toes. It challenged me as well but at the same time I found it hard to keep up with my peers in terms of the level of critical thinking needed. I felt at that point that I couldn't because I was not at that level yet.

Despite their struggles, dropping out of the Socrates Programme was not an option any of the G20 students considered. The regular subject class, perceived to be about exam-learning, was simply not an attractive alternative for them. As such, the students endured demoralising moments and stress; they persevered to find their own coping mechanisms and grew in the process. For instance, they shared "take-aways" from the Socrates class that included learning to manage expectations and failure, and a growing belief in ability as a malleable rather than fixed attribute in a person.

For the G90 students, they confronted goal-management issues when faced with the most challenging of learning materials in the Socrates class: they wondered whether they had enough passion and energy to sustain pursuing the subject. Some spoke about their "tipping point" experience where they had to decide whether to step up to the challenge or step back. For all of them, the experience of intense challenge pushed them way beyond what they thought they could achieve like the individuals in the Olympiad studies (e.g., Tirri, 2000).

It appeared that the core Socrates curriculum catered to the G90 students much better than to the G20 students. The experiences of the G20 group suggest that their Socrates classroom lessons did not help their interest grow. In some cases, they felt that they were left to learn on their own prematurely in the TD process. From the interviews, the Socrates curriculum standards seemed unrelenting, a one-size-fits-all. Yet scholars (e.g., Benbow, 1992) have indicated that a wide ability range exists among the most able students.

Breadth of learning. The desire for breadth of learning was a theme in the G90 group that was starkly missing in the G20 group. After months of intense Chemistry Olympiad training, Jay said:

> I kind of lived, breathed and ate Chemistry because we were training for it (referring to the Olympiad selection) to get Sunnyrise people into the national team. When I exited it, I realised that I wanted to learn quite a lot of other things as well. I think my curiosity for breadth was increased. After having tunnel vision for so long, for just one subject, doing one subject so intensely, you begin to look beyond. I realised I wanted more . . . . There are so many things that you want to do and learn.

Thinking retrospectively about the TD opportunities opened to him and what he had chosen to do at the various points of his school life, Jay figured that he would do a lot of other different things. He thought that breadth would have been very important in TD as well.

> I think, as in the breadth – it is not the kind of thing that is answered by cramming more breadth into the syllabus but it is just like I would read up more on my own. Certain things – I should just have pursued those as interests. I was just consumed in my Chemistry and Literature for a while.

Both Zach and Matthew similarly desired breadth of learning and interactions beyond their Socrates class and intense Olympiad involvement. Mark expressed it eloquently for the group:

> I believe very strongly in a liberal education. By this, I mean not having learning to be confined to a talent area at the expense of other things. I think it is valuable for someone who is talented in the Humanities to know things about Science or to do other things in addition to Humanities and vice-versa. Because I think a lot of insights can be made when you mix disciplines together . . . . I mean all these areas are complementary to the extent that we should not compartmentalise who we are and to the extent that other interests help.

External learning opportunities. Learning opportunities beyond school seemed to have provided the G90 students with more diverse learning experiences. I illustrate this with some experiences shared during the focus group interviews:

> It (an international festival) was a very meaningful experience in terms of broadening your scope of understanding of the subject, teaching you that there is a world out there and giving you a sense of value in the subject.

> We got to experience Science in a different country, like how it was taught and at the same time we got to interact with people of different nationalities. In a sense, they approached Science in quite different ways from how we approach it in Singapore. So I think it sort of opened a new way for me to look at the subject.

> It (referring to attachment to an international science agency) is useful because you see how in such a new field, the scientists try to figure out what is happening even though they are like groping in the dark.

This theme was, however, noticeably missing in the focus group or individual interviews with the G20 group where students seemed to accept that such opportunities were beyond reach for them. They seemed resigned, articulating that what was offered in the Socrates classroom was more than adequate to challenge them. They did not consider forging new and challenging learning contexts for themselves like the G90 students.

Restrictive requirements. The minimum GPA baseline criterion to continue in the Socrates Programme seemed restrictive because it required a student to be good in all the academic subjects taken in school. Alex and Knight in the G20 group felt this most at the Year 4 to Year 5 transition point. Alex recalled:

> For GPA, the school wants you to reach a minimum Grade Point (GP) for everything. All your subjects must be GP about 3.6 at the very least before they let you pursue your Socrates Programme. But for us, we just pursued that one particular subject. We ignored the other subjects because we got no interest. We study, yes, but it is boring.

The GPA criterion became a hindrance in Alex's talent development in Maths. He was placed in the Enhanced Class which was a class for the twentieth percentile of the school. Alex felt that he could have pushed a lot further and learnt far more if he had been allowed to continue in the Year 5-6 Socrates Maths Programme.

Knight experienced the same predicament: his weak Year 4 GPA moved him from the Socrates Programme to the Year 5-6 Enhanced Class. In the Enhanced Class, Knight was subjected to restrictions on A-level subjects, academic enrichment, co-curricular activities and leadership opportunities. He felt that the Enhanced Class placement hindered his learning without addressing the root of his difficulties. For one, being grouped with academically weak students left him feeling segregated, without a reference group or support network like he used to have in the Socrates class. He elaborated:

> Our environment is so important. When you are put in a class whereby everyone around you is weak academically, this forces a hindrance because there is no benchmark as to how you can compare yourself to the general Sunnyrise population, on how they are doing . . . . You would not be able to seek help within your class because if everybody is weak, then who are you going to seek help from unless you got friends outside the class.

The findings from the G20 and G90 groups regarding TD provisioning suggest that the Socrates curriculum may not have provided an optimal match for the students: the G20 students had difficulty coping with the level of complexity they encountered; even the G90 students were pushed to their tipping points. It seemed like a one-size-fits-all curriculum, leaving the G20 students with few opportunities to engage in other aspects of TD beyond the classroom. A GPA-based requirement to continue in the TD programme failed to recognise that students may not have advanced ability in all subject domains; in effect, a single measure determined the "fate" of students such as Alex and Knight.

Schooling Requirements

All the case study participants had to juggle the demands of high-stakes examinations, schooling requirements, and academic TD. Schooling involves requirements not only in the academic domain but also in the areas of character and leadership development, community and citizenship development, sports and health development, and arts and aesthetics development. At the interview, Gibbs represented the competing demands that he and his peers experienced, highlighting the many narratives in their school lives, thus warranting quoting him at length:

> Actually, one of the interesting things that I picked up from our discussion is very much about the narrative of our school . . . . The moment we come in [to the school], we are told that academic excellence is not enough. You all must do your CCA (co-curricular activities); you must do your leadership stuff; you must explore yourself in many ways to become better. So, in Year 1, Year 2, we have a lot of free time so you get to read all the other stuff, right? Then, you get better at Chemistry or Physics or whatever. And then you go to Year 3, Year 4; because there are so many other things for you to do, then you don't get to read as much. Now, in this scenario, where we focus on the

> Socrates Programme and put academic excellence as our first priority but then in Year 3 and Year 4, we have a lot of other narratives running through our lives also: as students in a general school community, where you have to go and excel in Sports, we still have to go and win [in] our CCA, you still have to do a lot of things. So then, time becomes a very big issue . . . . We reached a stage where we have a lot of other narratives that are running through. And I think generally, in Singapore, you know how the Minister [of Education] talks about how exams are no longer important; soft skills are the thing. So, as you do this (academic talent development), we still have to keep in mind all the other things that we have to do and to learn. So, then we go for all these other things that have a lot of value that may or may not push us or give us the time to be academic high achievers. I think, in our focus group, there are some of us who are naturally inclined to be very gifted in what we do naturally, whereas there are some of us who have to work very hard to learn the things to keep up.

The culture of academic preparation for elite universities and scholarships suggests a need to demonstrate not only exceptional academic results but also well-roundedness. This leads to increased pressure on students to excel in the different areas of schooling. The G20 group tended to navigate the complexities of schooling and academic TD by giving less attention to the latter – it seemed to be their way of "unloading the overload". Their priority was on meeting the schooling requirements and excelling in examinations, in particular, the high-stakes A-level examination. The G90 students managed the high demands on their time and energy by choosing co-curricular activities that were aligned to their talent subjects. However, during the interviews, they lamented the loss of breadth of learning in other interest areas as a result of the decisions they made.

Summary

Programmes designed for TD can fall short of being ideal for highly able students as the findings in this study show. The TD provisioning seemed to be a one-size-fits-all and did not seem to provide an optimal match for the students. This is an issue because even though the students qualified for the Socrates Programme, the range of ability among highly able students can be very broad (Benbow, 1992). A

very challenging programme that probes depth of understanding tends to reveal greater disparity in student learning (VanTassel-Baska, 2001). Continuity in the TD programme was also based on a single GPA measure that failed to recognise that students may not show advanced ability in all subject domains (VanTassel-Baska, 2005), particularly at higher levels of study. Furthermore, other highly time-consuming aspects of schooling that are important to students contributed to their overall load. Thus, the systemic and structural arrangements of TD and schooling can impact students' decisions in their microsystems and therefore their experience of TD.

Macrosystem: National-level Factors

This section discusses salient themes that emerged on macrosystem factors that seemed to have influenced the students' interactions at the lower ecological levels.

Meritocracy and a Highly Competitive Education System

In the focus group interviews, both G20 and G90 participants saw themselves as distinct from other students in the school because of person characteristics such as interest, passion and hard work. Like their elite seniors, many of whom had earned a place at the pinnacle of society, the general belief was that they would be able to achieve the same through their ability and hard work. Thus, the governing principle of meritocracy in the Singapore society seemed well-assimilated among the case study participants – they highly valued hard work and believed that the talented would be given opportunities to rise. For example, Matthew valued the government's focus on education and meritocracy:

> I guess that is the right focus on meritocracy and education, like based on your results, you get opportunities. Of course, it is very beneficial for me.

Related to meritocracy, the role of mothers in the education of their children is notable in this study. The students related how their mothers played a primary role in their education from their early years. The mothers were no doubt concerned with academic performance, fitting in to the image of "kiasu parenting", a colloquial term used to describe parents' high expectations of their children in terms of academic performance and striving to support their children so that they would be better

equipped to handle the challenges of competitive schooling. Most of the mothers invested substantial resources and energy in their children's upbringing. Significantly, they were their children's "key educational agent" (Yeoh & Huang, 2010), being directly involved in learning activities with their children even during their leisure time. These mothers practised "discretionary mothering" (Yeoh & Huang, 2010), that is, they had the means (e.g., academic, financial) to select and prioritise their parenting activities to focus on coaching their children while delegating basic caregiving tasks to others such as domestic helpers. The amplified concern with their children's upbringing and education reaped obvious benefits – six out of the eight participants , that is, Jay, Mark, Matthew, Zach of the G90 group, and Alex and Michael of the G20 group – grew up with a voracious reading habit, strong work ethic, and were confident self-directed learners.

However, the comments from Gibbs and Knight's mothers stood out during the interviews – comments that suggested that they felt disadvantaged when it came to helping their children because they did not have sufficient academic or financial capital. Gibbs' mother, for instance, recounted her situation:

> We are a family with no background. I am only a poly(technic) grad(uate), not a degree holder …. I don't have strings [to pull]. So, I cannot help him a lot. He had to work it out himself …. I can only help him to photocopy things.

Meritocracy is very much part of the lived experience of parents and children (Barr & Skrbis, 2008) due in large part to structural shifts in education policies to drive the meritocratic social system in Singapore. This resulted in a highly competitive education system (e.g., Choy & Tan, 2011). These macro-level factors of meritocracy and a highly competitive education system manifested within the family microsystem, influencing the role and behaviours of mothers in today's modern world. This, in turn, had an impact on the experience of students, in particular, the discretionary and uneven mothering practices seemed to have contributed to the differing readiness of the students to benefit from TD opportunities in school.

What the State Values

A second key theme that emerged from the students' interviews that seemed to have influenced what they did in their microsystems had to do with their perception of what the state valued, for example, in relation to the Singapore economy. Specific to this were the possibilities and futures they imagined for themselves in their transition to higher education and future careers. To illustrate, the national drive for research and development in science, touted as the fourth pillar of the Singapore economy, encouraged Jay to consider research as a possible career. This influenced what he chose to do in school. He took up Chemistry research while in Year 3 and 4, and undertook an internship in pharmaceutical research in Year 5. Zach's awareness of the push in biomedical research at the national level gave him a sense that there would not be much support and investment in the areas of Maths and Physics, his talent subjects. At the Public Service Commission scholarship interview, Zach was totally disheartened. He recalled:

> This interview was [for] a [government] scholarship. They wanted to know what exactly excited me about Physics . . . . So, I was sharing with them like the exciting possibilities, you know, the frontiers of Physics as it appealed to me then . . . . And the response that I got was quite discouraging to me. It was very, sort of, cold response, very cynical, like "Uhm, yes, people your age should be thinking about Physics helping society. And you shouldn't be really thinking about these things that have no value to society." I still don't agree with that comment but . . . in the end, I didn't get the scholarship. That definitely discouraged me immediately. Look, why are you getting yourself into all this sort of thing … I mean, even people in the [government] ministry couldn't care less about it.

Thereafter, Zach started thinking much more about applied Maths or Physics, hinting of the probable consequence of his self-described "ill-fated" scholarship interview. This critical event further shaped his decision to travel to the US for his higher education.

The students who took Socrates subjects in the Humanities perceived a lack of state support for the Humanities and limited career options. Michael related the advice he received from his parents:

> My parents were very supportive [about me taking the Humanities] but they counselled me to think through it properly. They knew that I was more inclined towards Humanities, they knew I love History . . . . They said, "You can study Humanities, just don't be a historian because we hope you will be able to feed yourself in future."

Michael's mother related a conversation they had with Michael's History teacher during his A-level years:

> I think he had this frustration that History is not really a valued subject in our education system unlike in the UK. His teacher also said so. Yes, in the UK, History, Literature, all these are valued subjects. He did tell the teacher his frustration and all that. The teacher asked him what career he would be looking at . . . . When he decided to do Law, his teacher said that is a correct choice.

Mark similarly saw a future that offered him limited opportunities if he were to pursue the Humanities to a high level in Singapore. He said:

> The perception is that the only thing that Humanities is good for is for you to study Law later on and become a lawyer . . . . I think the government has always been heavily biased towards the Sciences.

For many of the students, the decisions they made in their microsystems were often linked to their perceptions of what the state or government values, and the opportunities and incentives that it would provide.

Government Scholarships and Global Elite Universities

All the eight students held aspirations to study in a global elite university with a prestigious government scholarship at some point during their Sunnyrise years. However, most relinquished this dream at a later stage for various reasons. This was corroborated by the parents during the interviews. In the G90 group, every student – Jay, Mark, Matthew, Zach – applied for the Public Service Commission (PSC) Scholarship in Year 6, considered the most prestigious of scholarships in Singapore. Only Jay was successful although he eventually turned it down on the

advice of his parents because there was a contractual bond period and the scholarship was not for the medical course he professed to be interested in.

The G20 group all gave up on prospects of any prestigious scholarship and elite university by the time they reached Year 4 or Year 5. Gibbs was convinced that his failed bid for a leadership role in Year 5 cut him out of the running for the prized PSC Scholarship and his hope of an Oxbridge or Ivy League university education, thereby hindering him in the TD process. Michael acknowledged the anxieties he experienced when he thought about the intense competition among his highly able peers for scholarships and elite universities, and made a decision to manage his expectations and goals by staying in his own "safe zone". Alex also dropped himself out from the competition, seeing that his "better-packaged" peers had been unsuccessful. For Knight, the Enhanced Class restrictions on his A-level academic subjects made him feel disadvantaged at the outset in these coveted opportunities. He felt that he was not given any chance to recover from his "academic lapses" in Year 3-4. At the interview, he suggested that the school can provide academic counselling but should allow students to make the final decision on their A-level subjects. He explained:

> Because I think there are students who are late bloomers . . . . So, I just feel that by putting a student in a minimal number of subjects – that is disadvantaging him from the start.

Moreover, Knight was not allowed to participate in enrichment electives or assume leadership roles. He summed up his immense frustration at being disadvantaged: "It was like putting everybody at the [same] start line but then breaking one of your legs."

The students' aspirations and struggles were captured in full intensity by Gibbs' exposition of his struggles and frustrations as he thought of his closest Socrates peers who went on to Oxford and Cambridge University on PSC scholarships. He said:

> I thought about it (scholarships) but then I decided not to let it "make me" . . . . It is something that in hindsight I always feel very stupid. I was making a choice not to be like that because that is not who I am . . . . So, no matter

> what a scholarship board wants, or no matter what I am supposed to do, as long as I know the call of who I am, then I am supposed to stick to it. That was what I felt when I was in Year 5-6 because generally everybody is fighting for a scholarship . . . . I am not far enough to tell whether it was the right decision but I think it is justified although when I found out about the scholarship, I felt stupid. 'Cause I realised that this actually is true – what people say – if I manage to fake my way through six years in Sunnyrise, then my life is set. Those people who get an Overseas Merit Scholarship (a top-tier PSC scholarship), their entire future is planned out for them. And as long as in this future, you don't make too big a mistake or you don't be corrupted, then you will get to where you want to get.

The students' aspirations for prestigious scholarships and elite universities influenced the decisions they made at the microsystem level during their six-year journey in Sunnyrise School. In a sense one may at first wonder why students such as Gibbs reacted the way he did on losing a leadership role in school or why Knight invested so much time into co-curricular activities and leadership roles until one gets to know that the PSC values co-curricular activities and student leadership roles besides excellent academic results when they select scholarship recipients.

Summary

This section has highlighted the national factors and messages that seemed to have influenced students' aspirations, relationships and decisions in their microsystems, specifically meritocracy and a highly competitive education system, student perceptions of what the state values, and state-sponsorship for higher education in elite universities that potentially leads to rewarding careers in the elite Singapore Administrative Service and beyond. In effect, these national factors have a strong influence throughout the vertical interactions of all the other ecological levels, not just the microsystems.

CHAPTER 7

Discussion, Implications and Conclusion

This study seeks to understand highly able students' experiences of their academic talent development (TD) using an ecological model to make sense of the interactive and mutually constitutive environments of the students. This chapter synthesises the findings of the previous chapters in order to answer the research questions, and come to an overall conclusion. Implications and future research are included.

Discussion

The students in this study participated in the Socrates Programme, an advanced talent development (TD) programme in Sunnyrise School, a very selective school that offers a school-based gifted education programme to all its students. The analysis of their transitional TD outcomes in Chapter 4 suggested that the G90 students thrived in their TD. This was based on the checklist of criteria drawn up to analyse the TD outcomes according to the TD approach adopted in the school. The G90 group demonstrated strong and vigorous growth in their talent subjects: all reached the national talent pool and demonstrated high levels of proficiency and commitment in pursuing their chosen subjects. In contrast, the G20 group did not seem to flourish in their TD. They turned largely to focusing their attention on their regular schooling requirements and high-stakes examinations. Two of them, Alex and Knight, even dropped out of the TD programme after the first two years due to poor performance, with Knight eventually failing to meet university enrolment requirements. I revisit the research questions in the section that follows, and summarise how these have been addressed in my study.

Research Question 1: What are the experiences of highly able students in an academic talent development programme in a Singapore school for academically able students?

The empirical ecological models of the G20 and G90 students (see Chapter 4) derived from the working model introduced in Chapter 1, showed distinctly different patterns in terms of the elements and relations present in the micro-1 and micro-2 systems. Specifically, the micro-1 and micro-2 systems were rich in academic TD

elements and relations for the G90 group but sparse for the G20 group. The micro-2 systems of the G20 students tended to be rich in non-academic roles and interactions, a situation that was distinctly absent in the G90 group.

What emerged from further analysis in Chapter 5 and Chapter 6 was that the learning ecology of each student differed in relation to the level of TD opportunities and progression they had had, thereby influencing the quality of their TD experience. The learning ecology is constituted by "the actions, practices and perspectives" of the students and individuals who interact at the microsystem level, under wider influences at the meso-, exo- and macrosystem levels (Hodgson & Spours, 2013, p. 217). The G20 students experienced low TD opportunities and low progression in the TD process and may be said to have been in varying states of stasis or equilibrium. On the other hand, the G90 students experienced high opportunities and high progression in their TD. If one were to juxtapose these two TD scenarios with Bloom's (1985) phases of talent development, the experiences of the G90 students by the time they were in Year 5 can reasonably be placed in the third phase of development, where individuals typically work towards mastery and begin to develop their own interpretations and larger meanings within the subject field. On the other hand, the G20 students would, at best, be in the phase where they work at learning the structure and rules of the domain with varying degrees of proficiency.

Research Question 2: Why do the students choose to do what they do in their TD?

Force and resource characteristics of the students, such as love of reading, interest, a propensity to seek out challenges, and personal agency, are germane to the discussion. These person characteristics work together with the dynamics of the five ecological levels to influence the decisions that students make in their TD. To illustrate, in the Socrates Programme, the G90 students who were clearly the high attainers seemed to have had many more choices about what they wanted to pursue in their TD. This did not appear to be the case for the G20 students. Except for the Socrates class (where they struggled), they appeared to have had a narrow range of options and did not have real access to most of the TD opportunities known to them, due either to real or perceived restrictions. TD opportunities whether from Sunnyrise School or sponsored by other agencies had selection criteria. Meritocratic principles of allocation led to a situation where the high attainers (the G90 students) continued

to monopolise the opportunities. This was especially so for the Level 3 and Level 4 academic provisions in Sunnyrise School (see Figure 3). Moreover, provisions that came with incentives in the form of positional medals or awards at the national or international level seemed more valued by the students for purposes of university and scholarship application. It may also be due to the cultural dispositions related to excellence that were intentionally or unintentionally cultivated in the school and beyond – for example, gold medal wins at international events were cheered and celebrated at school assemblies, and often widely reported in the mass media. Thus, it seemed that meritocratic selection processes more than student voluntary choice determine participation in many TD activities or events. This seemed to have propagated a situation in which the G20 students – the low attainers in the Socrates group – were overlooked in relation to their participation and progression in the TD process.

Being placed among a reference group with whom it is more difficult to compare favourably may lead to self-efficacy issues that influence the decisions of the G20 students regarding TD opportunities. By the A-level years, the G20 students had recalibrated their initial aspirations for prestigious scholarships and elite universities. They reverted mostly to what they knew very well – focusing on high-stakes exam-learning and other schooling requirements that are important for getting at least a place in a university. In other words, they chose a path where TD largely went into stasis: they had not thrived in academic TD as conceptualised in Sunnyrise School despite being highly able students. The G90 students remained the group that was repeatedly resourced and well-supported over the years in school. The high opportunities and recognition continued to fuel their aspirations and progression towards higher goals in the TD process.

The discussion on the learning ecologies of the students in the following paragraphs will provide further insights into this research question.

Research Question 3: Why do some students thrive in their TD while others do not?

In this study, the G90 students thrived in the TD process while the G20 students did not. This may be explained in terms of the learning ecology of the students. Borrowing from Hodgson and Spours (2013), the learning ecology of the

students may be conceptualised on a continuum from "low opportunity progression equilibrium" (LOPE) at one extreme to "high opportunity progression ecosystem" (HOPE) at the other extreme. From the analyses in Chapters 4 to 6, there appeared to be a relationship between national macro factors such as a highly competitive education system and meritocratic principles of distribution; the established structures and requirements of schooling and TD provisions in the exosystem; and the interaction patterns of individuals, groups and networks that manifest at the micro- and mesosystem levels. Process-relevant person characteristics and the dynamics of the five levels – micro-1, micro-2, meso, exo, macro – worked together to result in varying conditions of LOPE and HOPE for the students. Table 4 presents a summary of the characteristics of LOPE and HOPE from the foregoing analyses. I have concentrated on the mesosystem and exosystem levels since the learning ecologies are constituted mainly at these two levels. The characteristics of LOPE represent the conditions of the learning ecologies of the G20 students to varying degrees while that of HOPE describe the learning ecologies of the G90 students.

Table 4

Student Learning Ecologies

Student learning ecology as LOPE	**Student learning ecology as HOPE**
Mesosystem	
• performance-oriented approach to learning and the curriculum, with school culture of excellence experienced as perfect scores in examinations	• mastery-oriented approach to learning and the subject field, with school culture of excellence experienced as pushing boundaries, and being the best at national or international events
• lack of TD niches in micro-1 and micro-2 settings, with lack of supportive network of like-minded peers, elite seniors/models of talent, and experts in the field	• overlapping network of TD niches in micro-1 and micro-2 systems, with like-minded peers, elite seniors/models of talent, experts in the field

Table 4

Student Learning Ecologies

Student learning ecology as LOPE	**Student learning ecology as HOPE**
• lack of source of motivation and reward in talent subject	• high opportunity for public events as a major source of motivation and reward
• under-development of learner skills for participation and progression in TD, with person characteristics incongruent with intensity of learning, especially in micro-1 settings	• strong learner skills for participation and progression in TD, congruent with intensity of learning, especially in micro-1 settings
• low ecological and progression awareness in relation to TD opportunities, with lack of ability and support to navigate the environment	• high ecological and progression awareness in relation to TD opportunities, with capacity and support to navigate the environment
• teachers may be passionate about their subjects and craft but lack attention and responsiveness to student's person characteristics and TD progression (e.g., overly dependent on GPA as measure of success in TD)	• teachers passionate about their subjects and craft; attentive and responsive to person characteristics of student; consider student's progress towards what is possible in the talent subject/s
• poor internal collaboration between teachers, and between teachers and wider stakeholders	• high internal collaboration between teachers, and between teachers and wider stakeholders

Table 4

Student Learning Ecologies

Student learning ecology as LOPE	**Student learning ecology as HOPE**
Exosystem	
Schooling policies and requirements	
• rigid A-level curriculum structure – restricts TD progression routes and continuity in some subject areas (e.g., no opportunity for Science stream students to continue with Socrates Literature in Y5-6)	• alignment between A-level curriculum structure and TD provisions in Science, Maths subjects promotes TD progression routes and continuity
• heavy load of academic and non-academic schooling requirements	• alignment of academic and non-academic schooling requirements to talent subjects
TD policies and provisions	
• restrictive TD policies (e.g., GPA criterion for TD progression and continuity year-on-year)	• strong academic Olympiad framework in Science and Maths
• under-developed TD provisions at Y1-2 in some quarters (e.g., Humanities subjects), leading to weak exposure/exploratory opportunities for students	• high levels of institutional collaboration between school and Ministry of Education (MOE) and other agencies in Science and Maths Olympiads
• narrow focus on academic Olympiads in most subjects, leading to restrictive opportunities	• strong network comprising a range of partners including universities and research institutes seeing themselves as providers of TD opportunities in Science

Table 4

Student Learning Ecologies

Student learning ecology as LOPE	**Student learning ecology as HOPE**
• low levels of institutional collaboration between school and MOE on wider range of TD opportunities	• high quality information, guidance and advice on academic Olympiads
• lack of institutional collaboration between school and other organisations on TD opportunities, especially in the Humanities and non-Olympiad programmes	• high quality coordination of progression routes and continuity for academic Olympiads
• lack of coordination of TD opportunities from MOE and other organisations in some quarters	• strong school leadership in some quarters (e.g., Science and Maths Olympiads, science research) that seeks to bind the mesosystem and exosystem levels to reach out to a wider range of students
• lack of information, guidance and advice on TD provisions and opportunities from MOE and other organisations in some quarters (e.g., programmes that are non-competitive in nature)	• high quality information dissemination, guidance and advice on TD provisions and opportunities in some quarters (e.g., Science and Maths Olympiads)
• lack of shared narrative around the Humanities TD agenda and non-competition types of provisions	• strong shared TD narrative around the Science and Maths Olympiad agenda

To explain further, the macrosystem factors of intense competition in the education system, meritocratic principles of allocation, and the state's priorities and therefore sponsorship operated to keep the exosystem level in a highly competitive condition. For instance, outside of the Socrates classes, a strong focus on academic Olympiads in the school led to restrictive opportunities, catering only to the top few

students in the Socrates Programme. This, in turn, allowed the mesosystem and microsystem relationships in TD to move into stasis for other students, including the low attaining G20 students. At the centre of the stasis were weak collaborative relationships among key actors (e.g., teachers, administrators, external partners) at the mesosystem and exosystem levels that could have provided and promoted broader opportunities and greater progression in TD within the learning ecologies of these other students. In this type of environment, the G20 students focused on examination performance and other schooling requirements rather than participation and progression in their TD because academic results mattered in high-stakes examinations and this was where learner confidence tended to be high in addition to meeting other schooling requirements necessary for the holistic development of students.

Additionally, teachers and administrators were less likely to give priority to learning beyond examination syllabi and non-competition types of provisions due to the forces of accountability measures and performance targets. This made the learning ecology more vulnerable to the effects of the macrosystem, especially in relation to examination results, and key indicators on university admission and scholarship offers that were tracked by the school and other key stakeholders. The lack of institutional collaboration and coordination among key players such as the Ministry of Education and other external agencies also contributed to gaps in TD provision in some areas such as uncoordinated TD opportunities, lack of clear progression pathways and little provision of information, advice and guidance. For the G20 students, factors at all levels interact in such a way as to diminish opportunities for participation and progression in TD. The exosystem level seemed relatively unknown to the G20 students too, leading to a situation where they ended up trapped within restrictive microsystem and mesosystem environments in relation to TD.

On the other hand, a learning ecology in the condition of HOPE offers more possibilities for participation and progression in TD. In Sunnyrise School, this seemed to be the situation for the high attainers (the G90 students) in the Socrates Programme, facilitated in large part by the strong focus on academic competitions, especially the Olympiads and collaborations that support the Olympiads. Clearly, it is desirable to conceive moving the learning ecology from LOPE to HOPE as a

strategy of TD for all the students. It would offer more opportunities and possibilities for progression to other students including the low attainers in the Socrates Programme, leading to a more inclusive TD approach.

Thus, the dynamic relationships between the five ecological levels determined whether the students thrived or otherwise in TD. The students thrived when their learning ecology was in a condition of HOPE, as was the situation for the G90 students. The G20 students seemed more vulnerable and less ready to thrive in TD in the highly competitive environment of the Socrates group. This suggests that the G20 group would be more dependent on the school to mediate an educational space that is more supportive of their participation and progression in TD, one that allows them to participate more, make progress and transition into increasingly complex learning in their talent subject. The condition of the learning ecology (LOPE or HOPE) would also influence why students choose to do what they do in the TD process due to the bi-directional nature of person-environment interactions.

Reflections on HOPE

Movement towards a condition of HOPE is desirable for TD. In this regard, several considerations are worthy of attention. First, although Singapore's system of meritocracy has served the nation well, in recent years, it has contributed to rising inequality that has implications in schools. For one, income inequality has meant that there are non-meritocratic means to get ahead, for example, it has been reported that children from well-to-do homes get private tuition years ahead in advance of their grade in school (Varma, 2016). In this scenario, when these children enter school, they get selected for TD programmes and continue to be allocated opportunities and resources based on meritocratic principles. This leads to a situation where only a select few fully benefit from TD efforts, as in the case of the G90 students. As such, meritocracy needs to be re-imagined in order to reconcile meritocracy with inequality. As suggested by scholars such as Tan (2008) and Low (2013), there can be mediations at the exosystem and mesosystem levels to equalise the starting position for all since people start with differences in resources. This works to ensure more equal access to opportunities. For a student who enters TD, the school can mediate by opening up opportunities and resources to students, thereby mediating to move a learning ecology from the condition of LOPE towards HOPE. In the earlier

years, for example, Years 1 to 2, provisions that focus on exposure and exploratory activities and that allow open opportunities for participation enable students to experience and identify their own abilities and interests (Brandwein, 1995).

Another consideration is to broaden and incentivise a range of TD opportunities beyond competition-based provisions. This kind of mediation requires strong institutional collaboration and coordination of TD efforts with key players within and beyond the school. More students will benefit from TD efforts if there is less focus on sorting the best from students who are already identified as highly able students. In this way, TD can be seen in terms of balance and inclusivity, sustainability, and care of students. However, broadening TD opportunities goes beyond this. I explain in the paragraphs that follow.

It is striking how similar the G90 students in this study were. The benefits of the Socrates Programme seemed undeniable. They learned to think in certain ways, excelled, and became part of networks needed to launch them into a life of cherished achievements of elite students. The school and the whole ecological system relentlessly encouraged them to strive for elite universities and scholarships, world class achievements, and what these could do for them and for Singapore. However, their comments – about the tunnel vision experienced as a result of intense and long periods in preparing for the Olympiads, their desire for more diversity in learning, their disconnect with issues around them (such as those in their communities), their uncertainties or seeming lack of purpose in what they might wish to pursue in university – suggested a state where they had little experience despite their many achievements. They didn't seem to have a vision beyond the school years. The intensity of the TD programme and other schooling requirements left them with little time and space. There was little time for introspection, a quality said to be essential for living an intellectual life (Deresiewicz, 2014) or time to interact with others different from themselves. Thus, while some opportunities were created for them in the TD programme, it appears that others might also have been removed, leading to a situation where some abilities were developed while others were crippled.

Thus, an important aspect to consider in TD is not about loading more curriculum for deeper study but the development of forms of intelligence other than analytic intelligence. The G90 students may be said to be successful in a narrow

sense but what of social intelligence, emotional intelligence or creative ability? In their overlapping networks, they were always relating with people similar to themselves. This alienated them from others and from the larger community. In highlighting the disadvantages of an elite education, Deresiewicz (2014) writes that a narrow and deep focus in one area can lead to a lack of knowledge about issues and concerns outside of the academics, and a lack of ability to engage with other sections of society different from themselves. He posed a provoking question – should academic excellence be excellence in an absolute sense?

The experiences of the G20 group can be instructive in relation to Deresiewicz question. Although the G20 students fared worse in strict academic terms in the Socrates Programme, there were arguably significant "other educational outcomes". For one, the challenges they faced did not defeat them. Even Alex and Knight wanted to continue in the TD programme. This is certainly noteworthy in a culture that seems so much driven by a fear of failure. The G20 students did not have experts around them to render extra help or to advise them. They mostly received their TD from the Socrates class which seemed more tailored for the G90 students in the programme. Their tenacity should certainly be celebrated for they gained qualities that would undeniably be useful in life. They had experienced failure, or at least less-than-spectacular achievements, that perhaps they had not known before they joined the TD programme. Alex and Knight did not allow the numerical rankings to seal their fate nor deconstruct their identities. In this sense, they may be seen as more resilient. Thus, although from a narrow academic perspective, the G20 students were considered less successful in the TD programme, there seems to be a need to think beyond numerical rankings and the narrow focus on academic achievements, and to broaden TD efforts to develop students more holistically.

Implications and Conclusion

Implications

As Chapter 1 has described, the conflicting findings in the TD literature regarding the role of different environmental variables in the TD process are due in large part to the complexity of the interacting person and environmental factors. Calls have been made for more integrative models to address this complexity (e.g., Subotnik, Olszewski-Kubilius, & Arnold, 2003). In this study, an ecological working

model derived from Bronfenbrenner's ecological systems theory was proposed as a theoretical framework in order to focus on the interactions in the TD process rather than isolating selected variables of students and the environment. This section discusses the implications of the findings of this study.

Although developmentally instigative person characteristics (e.g., interest, agency) predispose a student to acquire the knowledge and skills that will enable him/her to aspire, progress and succeed in the TD process, it is important for educators to note that these individual characteristics that affect students' experiences and their responses to experiences are themselves formed through interactions with environmental conditions. This is so for developmentally disruptive characteristics as well. This ecological view of person-environment co-variation underscores why it is important for teachers especially to establish rapport and to care for students as individuals before effective learning or TD can occur. Inevitably, questions arise from this ecological view too; for example, what kinds of character traits optimise TD or what kind of environmental characteristics elicit developmentally generative traits like student agency? Such questions suggest possible future research directions.

Although contextual influences originate from sources at multiple levels of the environment, students can be influenced only by direct interaction with individuals, activities and objects in their microsystems. Curricula and programmes that are designed for TD enter into microsystems where students encounter them in the classroom or other configured settings. As such, attending to the ways in which policies and programme design reach students is a key concern for policymakers and educators. Microsystems connect to students through their capacity to elicit participation. In the TD context, the nature of the participation is important, that is, microsystems that demand sustained and progressively more complex cognitions and behaviours are developmentally beneficial for students. Bearing in mind that students differ in the amount of complexity with which they are willing or able to engage, attention to programme design and policies must take into account the environmental challenges confronting students; it must also consider provision of supportive services for student well-being such as buffers against debilitating pressure.

Students change as a result of their interactions within overlapping microsystem settings. Taking a mesosystem view of TD means giving attention to how the components of a student's life fit together. Microsystems that reinforce each other through congruent messages amplify the developmental effects of individual settings. However, when the mesosystem features incongruent environments such as differing expectations in school and at home, students are less likely to experience the sustained proximal processes of TD necessary for growth and progression. From a policy and practice perspective, understanding the student mesosystem can lead to strategies for optimising cultural coherence, reinforcing connections across environments, and effective collaboration of significant persons in multiple settings to support TD.

As the exosystem level is key to structural change because it sets the ground rules for the opportunities, experiences and environments encountered by students, this is the space where improvements or structural changes can be negotiated for policies and programmes that support the TD needs of students. This requires collaboration and commitment from policymakers and educators since systems-level change is often constrained by the confluence of policies and complexity of multiple players and issues. Furthermore, as exosystem initiatives also derive from national macro factors such as educational policies and reforms, an understanding of exosystem influences on students' experiences can provide insights on how mediations can be effected in support of students' TD.

Finally, although macrosystem factors cannot be changed or manipulated directly, it remains important for policymakers and educators to understand macrosystem influences on the experiences of students since a holistic understanding of the multiple environmental influences on students can inform policy and programme development work as well as the mediation measures necessary to improve outcomes for students.

Conclusion

The ecological model developed in this study provided a systematic and holistic approach to understanding the complexities involved in the TD of highly able students. The findings underscore the importance of identifying the elements and relations within multiple ecological levels in order to describe and establish the

condition of the learning ecology of each student. This was done by analysing the horizontal and vertical interactions between a range of factors and individuals within the learning ecology.

This approach led to a comprehensive understanding of the dynamics of the interactions between students and their multi-level interacting environments. Few studies in TD look across policy levels, address mesosystem interactions, and examine the effects of policies on individual students' microsystems. Thus, the study makes a useful contribution to the literature on TD in general and highly able students in particular.

In Singapore, no study has addressed the range of environmental interactions highlighted by the ecological model. This study therefore adds significantly to the TD literature base in Singapore. However, the study involved students in one school only. Future research may involve several comparable schools to allow deeper examination of multiple exosystem factors, along with individual, microsystem, and mesosystem elements.

Moreover, the holistic and comprehensive analysis afforded by the ecological model cast light on where and how mediation may be effected by key actors (e.g., administrators, teachers, key partners) to ensure effective participation and progression of all learners in the TD process. Understanding the characteristics of HOPE and LOPE conditions allows strategies to be developed that will maintain a learning ecology in the condition of HOPE, or shift the learning ecologies of students towards HOPE over time. For students, the ecological model provides a potentially useful means to understand the complexity and nature of proximal and more distal factors influencing their direct experiences, and thus how better to navigate the environments they encounter.

Importantly, the comprehensive analysis of the experiences of highly able students brought to the fore possible inadequacies in the way TD has been conceptualised and implemented in the school. While the main aim of academic TD is to help young prospective talents realise their potential, an exclusive focus on the goal of producing elite graduates or elite positional achievements can lead to a path of deep but narrow experiences for students. In addition, the approach can deprive many others of real opportunities.

TD as a part of education is also about cultivating the life of the mind (Deresiewicz, 2014): this means providing the time and space for students to reflect on their own conscious thoughts and feelings, and stretching their intellect, imagination, and connections to the world around them. Thus, worthwhile considerations for Sunnyrise School include reconceptualising its TD programme for more holistic TD as well as broadening access to TD opportunities at all levels in support of greater inclusivity of students.

To conclude, this enquiry has allowed a deeper and fuller exploration of the TD of highly able students. The insights gained will no doubt influence my professional work in overseeing academic provisioning and in enhancing the well-being of students. Equally, I am excited that I may be able to now bring these fresh perspectives to practitioners beyond the school.

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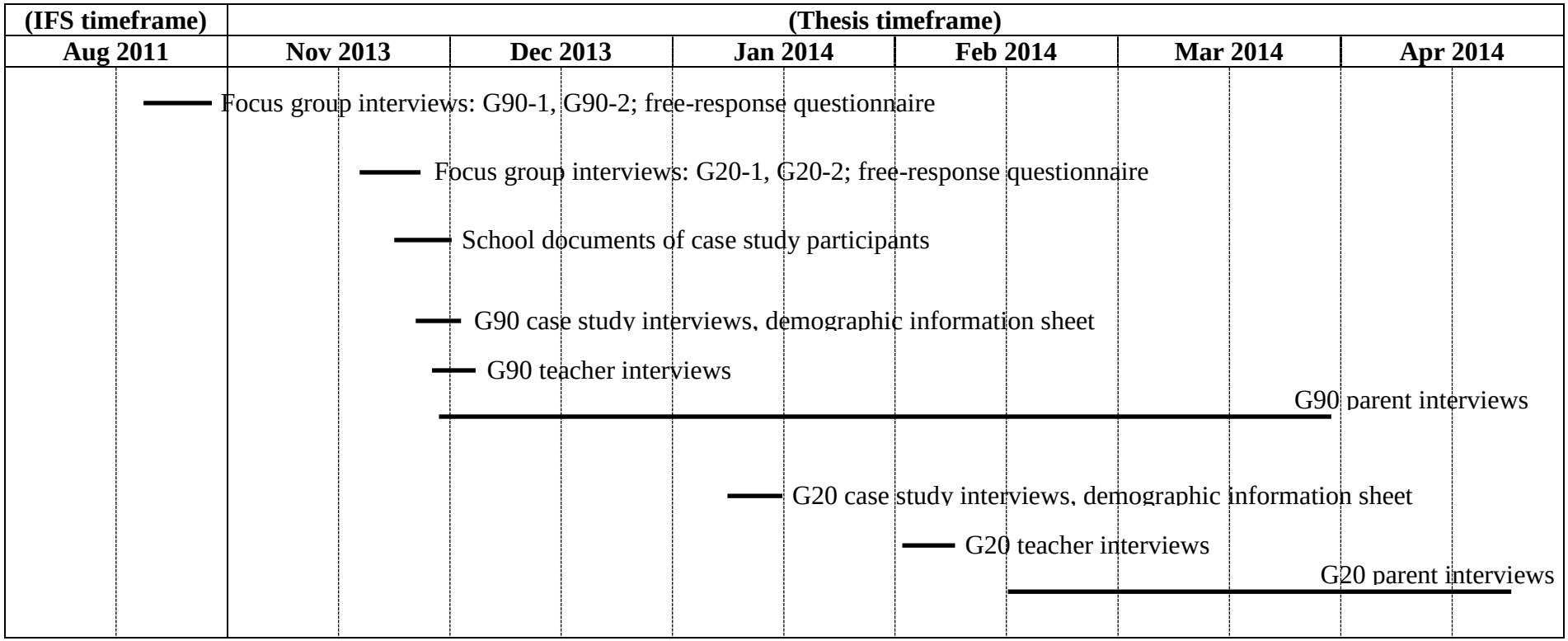
APPENDIX A

Overview of Data Collection and Timeframe



Legend:
G90-1 = first 90th percentile group. G90-2 = second 90th percentile group. G20 = 20th percentile group. Bold line (━) = data collection activity.

APPENDIX B

Focus Group Guide

About the study

1. Title of study

   "An ecological approach to understanding highly able students' experiences of their academic talent development in a Singapore school"

2. Purpose of the focus group (FG)

   To explore and understand how highly gifted/highly able students in the school perceive their giftedness/ability, and learning experiences in the Socrates Programme in relation to talent development; what mattered to them?

3. At the focus group

Introduction

1. Welcome and introductions.
2. Explain the purpose of the study.
3. Explain the purpose of the FG.

   The FG is an informal conversation to allow all of you to share your experiences. Feel free to elaborate your ideas, comment on the contributions of others, or to provoke conversations. The time is for you to talk.

4. Enlist support for confidentiality of information.
5. Convey to participants the option to

   a. read the transcripts;

   b. read the report when the study is completed.

6. Feel free to follow up on interesting points or leads offered by participants; balance responses from the group so that everyone gets heard.
7. Jot down non-verbal features of the interaction where possible.

8. Before end of the FG, distribute the free-response questionnaire for participants to write comments which they wish to keep private. Provide time for the participants to pen down their thoughts.

9. Remind participants to keep confidentiality of information.

10. Thank the participants for their time and participation in the study.

Interview questions

Key Question 1: How do highly gifted/highly able students in Sunnyrise School perceive their giftedness/ability?

1. Do you think of yourself as highly gifted or highly able? Why or why not? Does it distinguish you from the rest?

2. What meaning does the term "gifted student" hold for you?

3. Did you start out in Sunnyrise knowing what you are good at?

4. What or who helped you discover your gifts or what you are particularly good at? When did this happen? Give an example.

5. Do you think you are different from the other students in the way you learn? Give an example to illustrate what you mean.

Key Question 2: How do highly gifted/highly able students in Sunnyrise School view their learning experiences in the Socrates Programme? What matter to them in talent development?

1. Think about your learning experiences in the Socrates Programme. What was it like? Why?

2. What did you enjoy doing? Describe your experiences or critical episodes.

3. What did you not enjoy doing? Why?

4. What was important to you in relation to your learning? Why?

5. What really motivated you? Why?

6. What was hard for you? How did you feel about it?

7. What other kind of opportunities did you have to develop your gift/ability? What was it like for you?

8. Were there instances when you did not get to do what you were really interested in? Provide examples.

9. Any final thoughts.

APPENDIX C

Focus Group Free-Response Questionnaire

Please feel free to respond to the questions below or pen the thoughts which you prefer not to share within the group before you leave the focus group.

Thank you so much for participating in this study.

1. Based on your learning experiences in Year 1-6, what are the major influences in the development of your gifts and talents? These may be inside or outside school (e.g. external opportunities).

2. If you could tell the school one thing to do to improve the development of *highly* gifted/*highly* able students in the school, what would it be? Why?

3. Any other thoughts you would like to share.

APPENDIX D

Student Interview Guide

Introduction

1. Briefly explain the IFS and what the current study is about.
2. Run through the information sheet and consent form.
3. Explain the primary importance of the student's lens in this study.
4. Explain purpose of the demographic information sheet.

[Note: Focus on how the student think and feel about their experiences in relation to the contexts that they were in, and the changes over time (Lerner, 1991, p. 28).]

Focus area	**Interview guide questions**
(Breaking the ice and warming up) Student's fresh experiences in NS/university applications; gradually link to conversation on school experiences	1. You will complete your National Service (NS) soon. What are you looking forward to? Probes: ✓ Where are you likely to head to (university courses, place of study?) ✓ What would you like to achieve in the next few years? Or what are the possibilities in the next few years? 2. How would you describe your Sunnyrise years? Probes: ✓ Were they happy ones? Why or why not? ✓ Did the Sunnyrise experience excite/inspire you? Why or why not? How so?/Tell me more. ✓ What did you remember most about Sunnyrise? What did you learn from the experience(s)? (If student talks only about a positive experience, probe to ask about a negative/challenging experience and vice-versa.) 3. What did you remember most about your National Service? What did you learn from the experience(s)? [contrasting the experience with that of school] 4. How have you changed from the time you entered Sunnyrise School? 5. What do you see as your talent area(s)/what you are good at?
Microsystem	General, e.g., support of goals, understanding of demands involved

Focus area	**Interview guide questions**
(immediate environment, e.g., parents/family, peers, seniors, teachers, objects and symbols)	1. Who / what helped you in your efforts to go where you want to go? 2. Who / what hindered you? <u>Parents/family – parent's characteristics and student's characteristics in relation to each other, and in relation to the student's and parent's interaction with context over time</u> 1. How would you describe your family in a sentence or two? 2. What were your growing up years like? 3. What are your parents like? Other family members? What values are important to your parents/family? 4. What is your relationship with your parents/family like? How did this change over time (probes: e.g., the early years, Year 1-2, Year 3-4, Year 5-6) 5. How did your parents get involved in your talent area over the years (probes: e.g., the early years, Year 1-2, Year 3-4, Year 5-6?) 6. If you think about your parents' interactions with you and your siblings - what do you perceive to be different about this? ✓ How do you perceive your role in this? (e.g., do you think you contributed to this? how so?) ✓ How did this change over the years, e.g., parental control? 7. Who are you close to outside of your home? How has this individual influenced you? Tell me more. <u>Teachers</u> 1. How would you describe your teachers and your relationship with them? Over the years? 2. How did your teachers influence your talent development (TD)? 3. Was there any teacher who made a significant impact on you? Why ? 4. What was his/her role? 5. Any influence on your teachers?

Focus area	Interview guide questions
	✓ For example, the way they taught, what they taught, how they related with you? <u>Peers</u> 1. Who did you hang out with? Study with? 2. What are your views regarding your peers in school? Were there different groups? Tell me more. 3. Who did you have more contact with -- which group/s? why? ✓ What characterised this contact? / what did you do together? ✓ Probe interactions in the regular classes, TD classes, co-curricular activities. 4. What do you think about your peers in the Socrates Programme? In the regular programme? In your CCA? Give an example to illustrate what you say. ✓ who did you have (more) contact with? why? ✓ what characterises this contact? ✓ who did you stay away from? why? ✓ did this change over the years? <u>School seniors (including those who have graduated)</u> 1. What was your interaction with your school seniors like, e.g., in the subject area you are passionate about? In your CCA? ✓ probe role of the seniors in the school / alumni who return to the school. 2. How did your perception of them change over the years? 3. Did they influence you in some way? How? <u>Your interactions with what you study</u> 1. How do you study (typically)? ✓ Probes: Do you usually study things on your own? What did you do? Tell me more. 2. What did you think of the curriculum you had in Year 1-2? Year 3-4? Year 5-6? And Socrates curriculum? Tell me more. ✓ Probes: Did the Socrates curriculum excite/inspire you? What about the regular curriculum? What could have been done differently? Give an example.

Focus area	Interview guide questions
	3. Were there areas you wanted to study but did not get the chance to do so? If yes, give an example; what did you do about this? <u>General</u> 1. Was there one thing/incident that your parents / peers / teachers / significant others spoke to you about that excited/inspired you, or disturbed/disappointed you? Tell me more (or ask for a specific example/incident). 2. Did this affect/change you? How so? 3. What lessons did you learn?
Mesosystem (wider school contexts – school structure and culture, regular / advanced / co-curricular programmes, partner schools and institutions, including experts in the field)	<u>The wider school contexts – the structure and nature of school, the curriculum – regular and Socrates classes, CCA, the external programmes</u> 1. Did you think the Socrates experience developed and nurtured your talent area? Why or why not? Probes: ✓ What activities in school helped you develop in your talent area? How? ✓ What was discordant for you? Why? <u>School culture – exploring how the student experienced the culture in school</u> 1. Can you describe what the school culture or specific school traditions mean to you? ✓ Probe: How did you experience the school culture or specific school traditions in your daily routines? 2. What did you perceive to be different about the school you were in – for example, if someone asked you about your school? 3. If the school had been less than ideal to you, what did you do? <u>Effective contexts (may be a setting or social niche within a setting) - on selecting or modifying environments</u> 1. How would you describe the opportunities available to you in the school environment in terms of your development? What more could have been done? ✓ Probe opportunities for development, depending on the student's response to Q1.

Focus area	Interview guide questions
	2. What was meaningful for you (as you moved through the years)? ✓ what kind of context(s) in school facilitated your growth/was a good fit? ✓ transitions at Year 1, Year 3, Year 5 – what kind of changes confronted you? ✓ What was positive or negative about these experiences? – in terms of opportunities in general; in terms of TD ✓ What kind of context(s) provided you with the exposure that you like? Why? ✓ what kind of context(s) provided you with an arena for expression of your dispositions? How did these make you feel? 3. What kind of context(s) limited you? ✓ Tell me how you move among these contexts. ✓ What facilitated or impeded your movement? Were you able to do something about these contexts? 4. How did you feel about these contexts in relation to your TD? (note: explore what the student brought to these encounters – the intentions, awareness, hopes and fears, the forethoughts and afterthoughts?) ✓ How did you feel about these contexts in relation to your TD (or your hopes when you were in school)? ✓ What were your frustrations or fears then? ✓ How do you feel now, looking back? 5. Were these contexts your social contexts? 6. Do you think the environment that you were in supported your TD? ✓ Why or why not? How so? ✓ if not, what could you have done differently?
Exosystem	<u>Explore how the exosystem shape in part the resources and opportunities available to developing the students – e.g., support of academic TD goals through incentives and awards from universities and scholarship boards</u> 1. Were there contexts in which you felt you had no direct role but which have influenced what you chose to do in

Focus area	Interview guide questions
	school? Tell me more. 2. How did you think and feel then, and now?
Macrosystem	1. How did the national context / sociocultural context influence you in the pursuit of what you are good at? Tell me more. 2. How has this changed for you over the years?
Further probes: Process – general	<u>Opportunities for inclusion in TD activities, supportive relationships and friendships within the group; communication</u> 1. What activities were you involved in that were directly related to developing your talent? 2. How much time did you put into it? How was it organised? 3. How did you view the competitions? camps? social events outside the area? Provide examples. 4. individual development ✓ what did you learn in this environment? / what values did you take with you from this environment? ✓ what attitudes and values are appreciated in this environment? ✓ did you learn anything that is of use for you now that you are headed to university? 5. Support for development – how did you feel about this? 6. What could have been done differently?
Process – turning points	<u>Turning points – decision points where the student can select from among several alternative courses of action, each leading in a different direction</u> Looking back, 1. What do you see as turning points in terms of short- or long-term change in what you did, or will be doing? Why? ✓ How did you feel about the change/s, then and now? ✓ Tell me about how you perceive yourself then, and now. ✓ Tell me about how you perceive others, then and

Focus area	Interview guide questions
	now. [Note: some turning points are predictable, others not, e.g., chance encounters; explore the meanings and significance of these decision points, then and now] 3. Were there chance encounters? Tell me more. 4. Tell me about what led you to select one possible alternative over another at these decision points? (note: Was it about how he was changing or perhaps there were other social agents, e.g., your parents, peers, the broader social context?) 5. How did you feel about your choices and the influences in relation to development in your talent area, then and now? <u>Note</u>: This section explores what conditions precipitate a turning pt? ✓ transitions into new settings, new behavioural expectations? ✓ major changes in existing settings, e.g., changes in the family, cca, school; role transitions] ✓ what led to the selection of one possible direction/alternative over another at a particular turning point? o chance encounters may not be entirely random. Student's characteristics can lead to selection of particular setting, making encounter possible. o explore developmentally instigative individual characteristics, other social agents e.g. parents, peers; broader social context? o what are the implications/consequences of choosing one alternative over another?]
Process – continuity	<u>After the decision points, what processes helped maintain behavioural patterns over time?</u> 1. After the decision point, what helped you stay on track? What didn't help you? Why? 2. What determined your choices of peer groups? Did your peer groups change from year to year? 3. What was the range of social contexts in terms of peer groups in school? What kind of social context(s) made you happy?

Focus area	**Interview guide questions**
Person	<u>Bronfenbrenner's "developmentally instigative" characteristics</u> [note: exploring how the student's intentions developed over time -- how did the contexts interact with the student to sustain, generate, or change intentions over time? How the commitment to TD developed over time?] 1. Tell me more about your goals or intentions in your talent area, say Year 1-2, Year 3-4, Year 5-6? Did they change? How? Why? 2. What made you decide to commit to and maintain your intentions? note: ✓ e.g., pursuing a goal for self-oriented reasons (e.g., a challenge orientation); or ✓ pursuing a goal primarily to impact the world (a contribution orientation), or vision? [Note: on "personal stimulus qualities" - personal characteristics that evoke responses from others include intelligence, physical attractiveness, temperament] 3. To what extent did you feel you influenced how others responded to you? Can you share specific examples? 5. How did you see yourself different from your peers; similar to your peers? Tell me more. 6. Have there been chance encounters that led you to where you want to be? ✓ How did you perceive these chance encounters? [Probing personal agency - Do you see them as happening because by being who you are -- your competencies, interest, self-directedness -- led you to select, influence, or construct your own circumstances?] ✓ Have there been negative chance encounters? Tell me more. (If yes, probe - did you resist it and disengage before you got enmeshed?)
Timeframe	1. What contextual changes over time influenced development in your talent area? How did these influence you? How did you manage? 2. What else could have been done to help you?

APPENDIX E

Parent Interview Guide

Introduction

1. Briefly explain the IFS; explain what the current study is about – the talent development experiences of students who are highly able in the school.
2. Run through the information sheet and consent form.
3. Explain the purpose of the parent interview – to gather information for a case study on the student.

INTERVIEW QUESTIONS

Personal characteristics

1. What was (the student) like as a child?

   Probes (as subsequent questions and as necessary):

   a) intrapersonal characteristics
   b) his interest, abilities (e.g., what type and level of books or other materials was he reading?)
   c) what often sparked his interest?
   d) what sustained his interest?

Family interactions

1. What is the family's role in developing his interests/talent areas?
2. What resources were provided?
3. What is (the student's) relationship like with you?
4. How would you describe (the students) in decision-making? In dealing with setbacks? In relating with others (e.g., peers, teachers, significant others)? Give an example.
5. What did family activities centre on (in the early/primary school years, secondary school years)?

As a learner/interaction with curriculum

1. What was (the student) like as a learner?

Probes:

a) in primary school?
b) in Year 1 to 4?
c) in Year 5 to 6?

2. As the environment changed, what changes did you see in (the student)?
3. What do you see as (the student's) talent area(s)/strengths?
4. What motivated him in developing in his talent area(s)?
5. What impeded or frustrated him in developing in his talent area(s)?
6. What did he choose to spend time on; what did he value?
7. On the kind of agency observed in his learning, e.g.,
    a) Was (the student) someone who capitalised on opportunities for learning? How so?
    b) Did (the student) self-initiate learning or create opportunities for himself? How so?
8. How did he go about learning and advancing in (subject) (e.g., from school curriculum, competition training; books/online groups/peers/community resources)?
9. What was (the student) like while doing or learning (subject) (his affective experiences)?

<u>The pathways taken by the student</u>

1. What were the in-school learning and out-of-school learning he engaged in?
2. What were the formal and informal learning he engaged in?
3. Were there critical decisions or significant turning points? Give examples.
4. What changes were apparent in the student?
5. Was there any critical incident or difficult period for the student over these years? (e.g., at Year 1, Year 3, Year 5?) How did this affect the student? Tell me more.

<u>Interactions with peers and others</u>

1. Who did he often interact with?
2. How was he influenced?
3. Were others influenced by him? How so?

4. (If parent suggests that the student prefers to be by himself) Was this characteristic of him when he was younger or did it develop later on in school?

Interaction with teachers and significant others

1. Have any teachers been particularly helpful or responsive to the student? How so? What influence did this have on the student?
2. Have any teachers been particularly unhelpful or unresponsive to the student? How so? What influence did this have on the student?
3. Was there a mentor who had a significant influence on the development of this talent? (If yes), how did the mentor help? How do you think the student's relationship with the mentor differed from or resembled his relationship with his teachers?

General

1. In terms of his talent development experiences,
    a) when was he happiest?
    b) when were his low moments?
    c) were there processes/factors beyond his control that affected what he did or did not do in developing his talent areas?
    d) how did you support him?
2. What wishes do you have for your son's future education or what he does in the next few years?
3. If you have it all over again, is there anything you would do differently to support your son in developing his talent area/s? How so?

APPENDIX F

Teacher Interview Guide

Introduction

1. Briefly explain the IFS; explain what the current study is about.
2. Run through the information sheet and consent form.
3. Explain the purpose of the teacher interview – to gather information for a case study of the student.

INTERVIEW QUESTIONS

Background

1. How long have you known the student, and in what role?
2. How would you describe his relationship with you?

Personal characteristics

1. What was the student like?

   Probes:

   a) his intrapersonal characteristics
   b) his interests, abilities (e.g., what type and level of books or other materials he read?)

Interaction with the subject

1. What do you see as the students' talent area(s)/area(s) he is strong in?
2. What motivated him in developing his talent area?
3. What impeded or frustrated him in developing his talent area?
4. How did his interest and knowledge in the subject change over the years?

   (This question probes the different phases of interest development and level of engagement in the subject - was this personal or situational interest?)
5. What did he choose to spend time on, and what did he value?
6. On the kind of agency observed in his learning, e.g.,
   a) Is the student someone who capitalised on opportunities for learning? How so?
   b) Did the student self-initiate learning or create opportunities for himself? How so?

7. How did he go about learning and advancing in the subject? (e.g., from school curriculum, competition training; books/online groups/peers/community resources)
8. What was the student like while doing or learning the subject (his affective experiences)?
9. What often sparked his interest?
10. What sustained his interest and engagement especially when the going gets tough?

The pathways taken by the student

1. What were the in-school learning and out-of-school learning he engaged in?
2. What were the formal and informal learning he engaged in?
3. Were there critical decisions or significant turning points?
4. What changes were apparent in the student?
5. Was there any critical incident or difficult period for the student over these years? How did this affect him?
6. In relation to the student's talent development experiences,
    a) when was he happiest?
    b) when were his low moments?
    c) were there processes beyond his control that affected what he did or did not do in developing his talent area(s)?

Interactions with peers and others

1. Who did the student often interact with?
2. How was he influenced?
3. Were others influenced by him? How so?
4. How did his seniors influence him, and vice-versa?
5. How did the trainers/other significant adults influence him, and vice-versa?
6. What was he like at competitions/external activities?

APPENDIX G

Overview of Data Sets

Category: Focus groups				
Data set	**Data item 1**	**Data item 2**	**Data item 3**	**Data item 4**
G90-1	FG interview	document[1]	N.A.	N.A.
G90-2	FG interview	document	N.A.	N.A.
G20-1	FG interview	document	N.A.	N.A.
G20-2	FG interview	document	N.A.	N.A.
Category: Individual case studies				
Data set	**Data item 1**	**Data item 2**	**Data item 3**	**Data item 4**
Alex	Student interview	Parent interview	Teacher interview	documents[2]
Gibbs	Student interview	Parent interview	Teacher interview	documents
Knight	Student interview	Email interview[3]	Teacher interview	documents
Michael	Student interview	Parent interview	Teacher interview	documents
Jay	Student interview	Parent interview	Teacher interview	documents
Mark	Student interview	Parent interview	Teacher interview	documents
Matthew	Student interview	Email interview	Teacher interview	documents
Zach	Student interview	Parent interview	Teacher interview	documents

[1] *document* refers to the free-response questionnaire for each focus group participant.
[2] *documents* refer to academic records, co-curricular activities' records, school testimonial, and demographic information sheet of each case study participant.
[3] *email interview* was requested by the parent.

APPENDIX H

Examples of Coding and Thematic Maps

Example of coding

Source: Focus Group Interview G20-1

Key Question: How highly able students perceive their learning experiences in the Socrates Programme

Transcript	**Initial ideas**	**Codes**
WHAT DID YOU NOT ENJOY? WHY? **(Probe: were there fears about competition or being able to do well?)**		
R: There's definitely the pressure of performance because Socrates Programme is already seen as higher performing academically when you compare the results of regular versus the Socrates students. So naturally, Socrates students do feel pressure both to keep up their so-called more intellectual appearance from the regular side (peers) as well as within their circle of Socrates friends.	Pressure to perform well coming from peers within and beyond the Socrates group. Socrates students viewed as higher performing by others.	Social pressure and expectations
S: I think because the teachers for the Socrates subjects were quite understanding, right, some of the stuff they taught were quite advanced, so they actually took the time to ask if there's any doubts, and they were quite caring. So I don't think we need to worry so much about being left behind.	Understanding and caring teachers helped them manage the pressure to do well.	Coping mechanism

Transcript	Initial ideas	Codes
R: Like I previously said, the Socrates class is a collection of the more motivated and more interested individuals. So naturally, that drive to perform well will definitely be there and either the same or if not stronger than most students. When I didn't perform as well as I would like, usually I just go back to the grind.	Socrates class seen as more motivated and interested. The drive to perform well; willing to work hard to do better.	Self-pressure and expectation
J: Everyone in Socrates has more of a drive, more of a self-motivation to do well. But, I just like to address the fear of competition 'cause I myself I didn't really perform well in Socrates but I felt one thing that -- as in the results affect, like what R said, your results will drop and there's a need to maintain that being more highly intellectual – in a Socrates class because when you score a B in Socrates and others score an A in non-Socrates, you still feel the difference even though people say you are in Socrates. So for myself, I guess one thing that helped me get a better view 'cause if I'm not wrong, I'm quite sure I'm one of the bottom few in class but when I compare -- when the results come out, the aggregate scores, it compares you to the whole cohort so there's some sense of where you truly are among the whole batch of students. So I guess that's one thing that helped me realise that I'm not as low or as bad. **S:** They (referring to test scores) do go down a bit but there's not much pressure, I think, because it's Socrates and it's not considered a basic you need to pass.	Social pressure and expectation Rationalising – taking things in perspective. Comparing with the whole cohort helped. Rationalising – reminding himself what the Socrates Programme is and modifying/ regulating own expectations.	Social pressure and expectation Coping mechanism Coping mechanism

Transcript	Initial ideas	Codes
S: I think there were some periods when I was doing very badly for (subject). So yeah, I put in quite a bit of effort but I wasn't able to see results so I think it was a bad point. Because for (subject), I sort of knew the concepts and theories but when it comes to the maths, I'm quite bad.	Not doing well – worked hard but was not able to see results. "It was a bad point."	Feeling demoralised
R: I think I have similar experience as S because when I first came to Socrates (subject) in Year 3, I was actually -- my grasp of more advanced (subject) concepts was quite far below from some of my more enthusiastic classmates. So I actually failed through my first quarter of Socrates (subject) so I was quite demoralised because I didn't really understand half of what the teacher was saying in class. But eventually, I managed to catch up, yeah, but it was quite a difficult process and there was quite a lot of pressure on myself although there wasn't any, like, peer pressure, or people saying that "oh, you shouldn't be here."	Feeling demoralised - fell behind in the Socrates class – a difficult process, pressure from self	Feeling demoralised Self-pressure
J: I guess the usual results, not doing as well, mentioned by S and R, I faced some of it but to me, I always felt that the process of learning was more important so I was bothered but I guess I got over it.	Bothered about not doing as well initially. Rationalising - focusing on the process of learning helped him to deal with it successfully ("I got over it.")	Coping mechanism

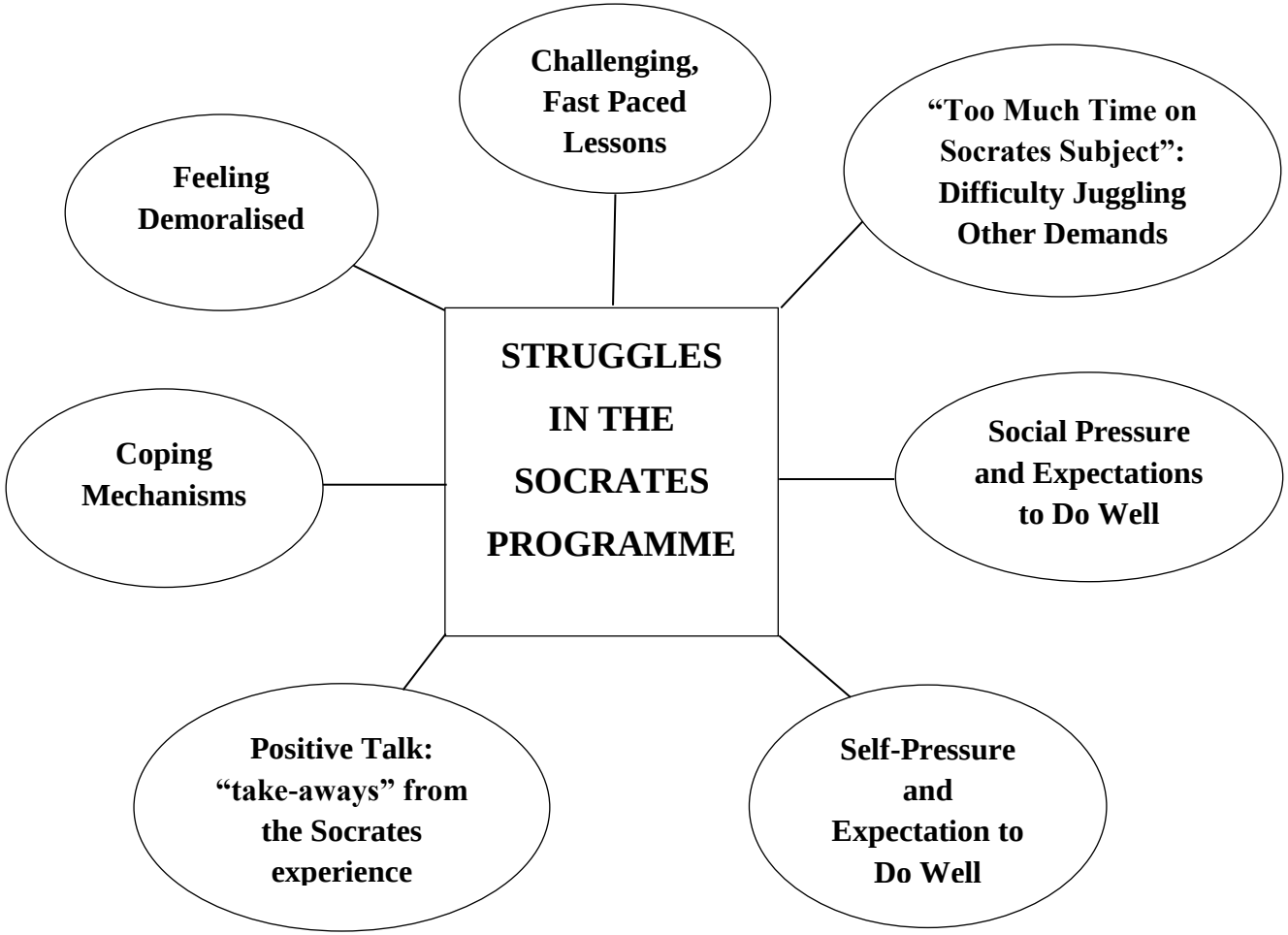
Transcript	Initial ideas	Codes
WHAT WAS HARD FOR YOU? HOW DID YOU FEEL ABOUT IT?		
R: Living up to expectations. Yes, of my own expectations. Actually for me, it was mostly my own expectations. But there were expectations from fellow students, both in Socrates and school but ultimately it's these expectations and the right amount of pressure that will keep people to continuously push themselves and do well.	Expectations from self and others within Socrates class and beyond. Rationalising - believing that high expectations and "the right amount of pressure" will push him to do well.	Self-expectation Social pressure and expectations Coping mechanism
J: For myself, what was hard was trying to keep up with the average in the Socrates class, because there's bound to be someone at the bottom so I guess it was just trying to keep up the average and what R said about keeping up with the expectations. I guess there's always the expectations for Socrates students to just simply do much better and with less effort as compared to non-Socrates students. At the start, for me, there was quite a bit of self-doubt, whether I should be in the Socrates class in the first place and it's very tempting to just want to just drop out at some point in time, and go back to the non-Socrates (regular) class where you would feel more comfortable.	Pressure and expectations from others "to do much and with less effort". Self-doubt about ability	Social pressure and expectations Feeling demoralised
L: I don't know, maybe related to how I felt I was always getting the same grades. As long as I study for it, I would get that grade; even if I put in a lot of effort, I'd still get that grade, 'cause the difference in improvement I made was insignificant, relative to the gap between me and those who were in the next grade.	Put in a lot of effort but improvement was insignificant	Feeling demoralised

Transcript	Initial ideas	Codes
S: I agree with him about expectations but for me it was not my own expectations. I think about the teachers' expectations 'cause for (subject), I did quite badly. 'Cause Mr ( ) came down specially to tutor so I think it's partly those two. You don't want to let these people down because the teachers have actually done a lot, the effort they put in.	Expectations from teachers	Social pressure and expectations
(Probe: What did you learn about yourself in the Socrates Programme?)		
R: I learned a little bit about managing expectations as well as managing failure because expectations – we are bombarded with expectations from everywhere, from outside also from ourselves. So, it's unhealthy if we let all the pressure just take over how we guide ourselves during our school life. So, managing expectations was something else I managed to take away from my Socrates experience. Then also, managing failure so I don't know, maybe Socrates students have a different concept of failure as compared to a non-Socrates student. Because for a Socrates student, maybe a B or a C might be devastating whereas non-Socrates students might see a B or C as "Oh, they were better than expected". And this is all, it's how -- because I think if any of us had given in to any of our setbacks, then we probably wouldn't have carried on with Socrates but in the end, we did, and here we are, so I think that's also something else we managed to take away.	Managing high expectations from self and others; managing failure. Learning that struggles and challenges push one to go further.	Positive talk "take-aways" from Socrates experience Coping mechanism

Transcript	Initial ideas	Codes
S: I think it's also about going for other opportunities offered to us like some of the competitions, some of the different conferences, that sort of things. I think it opens your eyes, then you realise that actually if you want to develop, you can't just stick around and wait for it to be handed to you. You should go out and find your way. **L:** I think I learned that I could push myself more because when you're given one whole stack of readings, I thought, Oh, this would last us the whole term so that's how I paced it. But the next lesson, people were done with it (laughter). I realised that if they could do it, I better start getting to it. I managed to pull through so that's something I learned about myself.	Being more aware of his personal role in talent development; Awareness of ability as malleable, not a fixed entity Awareness of ability as malleable.	Positive talk "take-aways" from Socrates experience Positive talk "take-aways" from Socrates experience
J: I guess I learned that there was much more that I could do than I expected of myself. That we had what it took. There was much more in us. We could do so much more and we didn't know that our abilities was that much.	Increasing awareness of his potential and awareness of ability as malleable.	Positive talk "take-aways" from Socrates experience

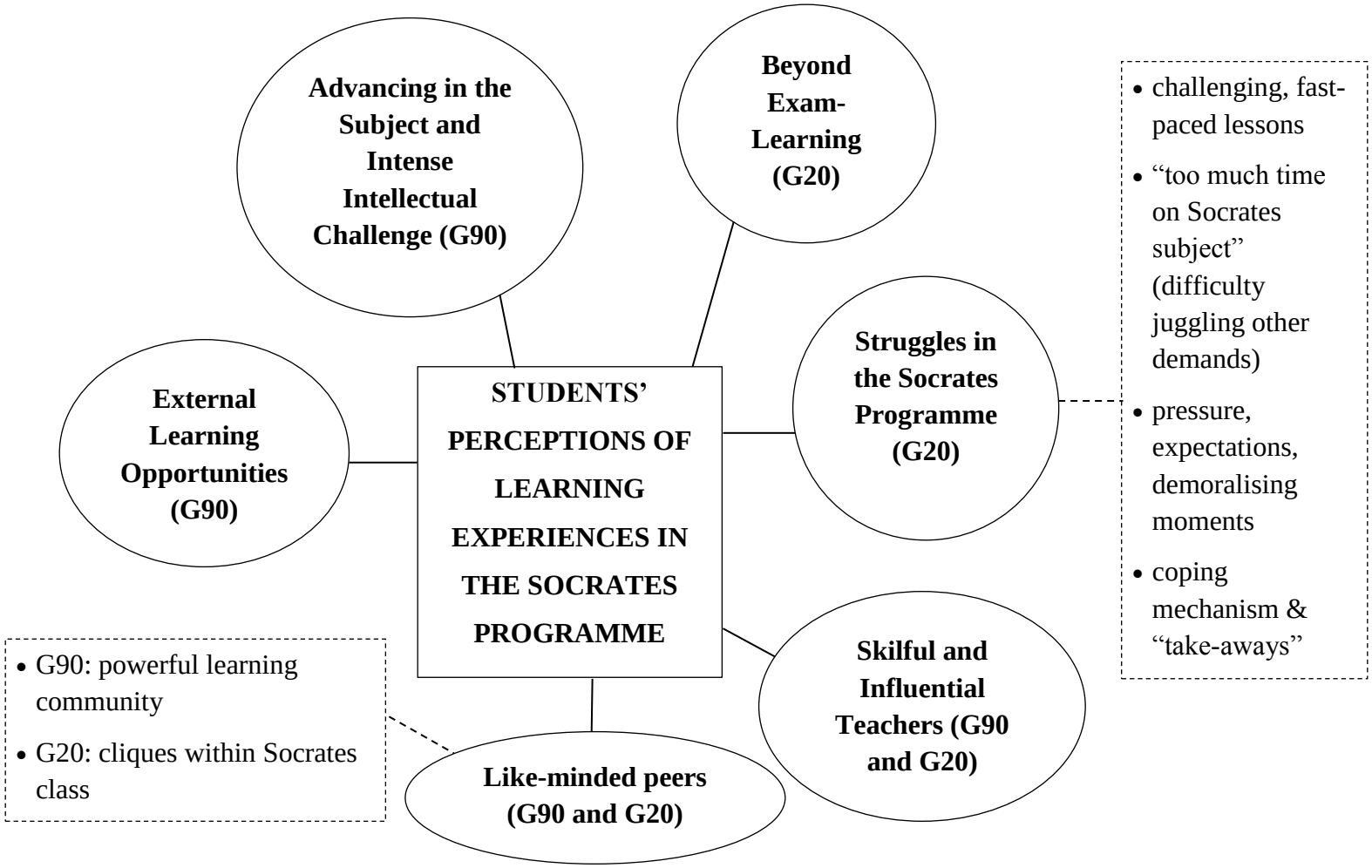
Example: Codes for the theme "Struggles in the Socrates Programme"

Source: G20-1 and G20-2 focus groups



Example: Thematic Map (Students' Perceptions of Learning Experiences in the Socrates Programme)

Source: G90 and G20 focus groups



APPENDIX I

Example of a full case study description

Alex

Person, Abilities, Interests

Alex was an early reader who took to books when he was just a few months old. His mother bought him books and these kept him occupied. Alex found books on dinosaurs, space and the like exciting. He read encyclopedias and started going to the library from the primary school years. By the time he was eight, he had a reading speed of more than 900 words per minute.

Besides reading, Alex was curious about everything around him. He would take things apart to look at them because he wanted to know how the components related to the whole. Being a fast learner, he got bored very quickly. His mother had to pull him out from his kindergarten after the first term because he simply refused to write the alphabets repeatedly. However, the next kindergarten he went to fitted him like a glove. The principal and teachers recognised Alex's strengths. For instance, they pulled him out from the regular reading programme and gave him IQ puzzles to do instead. His lower primary school years were also "a breeze". Alex had a lot of time to play and explore. He read voraciously. His mother recalled that they never stopped going to the library, borrowing thirty or forty books each time.

As a young boy, Alex was rather goal-oriented. When he was in pre-school, he set his mind on going to Sunnyrise School when he found out from his mother that it was the best secondary school in Singapore. Later, when he found out about the Gifted Education Programme (GEP), he became very serious about getting into the programme. Alex always wanted to do well but he also wanted things done in the quickest and shortest way. As such, he did not always do well in examinations. For instance, he had his first shock when his PSLE results fell below what would be expected of GEP students.

Alex was hyperactive and often ended up standing outside the classroom because he couldn't sit still during lessons. However, school life became a bit better

when he got into the GEP in Primary 4. His teachers gave him extra work to engage him intellectually. Alex described his experiences:

> The teachers would give you (extra) worksheets because they realised that for people like us, we enjoy doing work. Doing work is not really a chore especially if I really like the subject. I enjoy Maths and Science; it's like playing a game.

Alex displayed an early interest and ability in Maths. His mother recounted an incident when he was in nursery school:

> When he was about four, we brought him to a bookstore. He was reading, you know, those brown exercise books with multiplication tables at the back. He got so absorbed. I think he could recite that quite easily when he got home. He was so thrilled . . . . Yes, he loves (number) patterns. When he was free, he would just doodle number patterns and he would write down some funny equations, that kind of thing.

Noticing his interest in numbers and running out of resources to teach him herself, she decided to put him on the Kumon Programme when he was in K1 (first year of kindergarten) but that didn't work out as he became bored. She bought him IQ puzzle and MENSA books and realised that he took to doing them. For the rest of his pre-school years, Alex just read. His mother described how he learnt during that period:

> I think that he basically grabbed a lot of knowledge from reading. He would borrow all kinds of books.

While in primary school, Alex enjoyed challenging sums and excelled when examination papers were difficult. He made many mistakes when questions were too easy because he wasn't engaged to think. By the time he got to secondary school, Alex had learnt to search the internet for Maths puzzles to entertain himself.

Alex's Years 1-2 Maths teacher, Mrs Hugh described him as exceptionally intelligent and found it difficult to keep up with him. She said:

> I spent hours crafting questions but he got them done in a minute . . . . Yes, he just stood out [compared to his classmates]. The quizzes that I gave him, I added a lot of challenging questions. He also finished them just like that.

Although Mrs Hugh tried her best to engage Alex in class, she realised she couldn't at times. Eventually, she introduced him to Maths Olympiad questions and enrichment materials from the Maths Club, and went on to recommend him for the Year 3-4 Socrates Maths Programme.

Alex was motivated by challenges only in areas that interested him. Mrs Hugh shared:

> Yes, he is interested in Maths, basically, Arithmetic. He is very quick in his Arithmetic. But those of geometric proof-type, he may not be so interested because you got to write out the obvious like "because this is equal to this, hence I can deduce" . . . . Arithmetic-wise, very quick, trigo(metry) – all that, he can get it done.

Alex's teachers in the secondary school years described him as a student with the aptitude but not attitude. Their comments on Alex centred on the need for him to put more effort into his work. His Year 3-4 Socrates Maths teacher, Mr Kong wondered why he was in the Socrates Maths class. His mother recalled the Primary 6 year when she tried to get Alex to do his practice papers for the PSLE exam as "a big struggle, every mum's nightmare". In Year 6, he didn't study much for his SAT (Scholastic Achievement Test) and had to retake the test. This was despite the fact that he had the resourcefulness to look for materials and the ability to study on his own. The chance to get into a university that would allow him to flourish was obviously not adequate to get him to work hard. Alex tried to justify his lack of hard work by linking his work habits to Maths geniuses. He said:

> It's like that. I don't know. For me, I do things for enjoyment. I guess that is why you see a lot of those people that enjoy (their work), like those Maths geniuses, most of them are super poor, live in poverty but they have fun doing Maths, then it's OK.

Alex did not think much beyond pursuing his Maths interest for enjoyment. He was not sure about where he was headed with all the work that he was doing in

Maths. He thought somewhat about top universities when his peers were doing that in Year 5-6 but nothing much happened beyond that. It wasn't so much that he ignored all these things though. Rather it was because he accepted that he was not the best. He tried to explain:

> Not ignore. As in, for example, you see those international competitions that will boost your thing (referring to school testimonials or university recommendations)? You know in the Socrates Maths class, there were twenty people, right? For IMO (International Maths Olympiad), they only send three students. Yeah, I know I am not the top three so even though I am in Socrates Maths, I would probably be in that group of seventeen, and then get booted out because I am not the best. Yeah, so I'm okay, I guess. It's because I know the situation and the realities, I'm okay.

Alex navigated the context he perceived himself to be in by finding learning opportunities on his own. He looked for the kinds of learning that interested him and never thought much about whether they were useful. He said:

> I never really planned. I just enjoy it, yeah. Do for enjoyment and for learning (not for testimonials and scholarships).

As Alex's focus was primarily on having fun in what he did, he never quite saw anything he undertook as challenges.

Alex performed well in school Maths in Year 5-6, obtaining A-grades both in school assessments as well as the A-level examination like more than eighty per cent of his age peers in Sunnyrise School. Competition-wise, he achieved a certificate of distinction in the American Maths Competition. However, there were no comments from his teachers on his ability in Maths in documents such as the school testimonial or school progress reports after Year 1-2.

At 20, Alex was looking forward to university life after his National Service stint. He had hoped to go to one of the top universities in the US or UK such as Harvard University or Cambridge University for Maths and Applied Maths, or the Wharton Business School where he aspired to take his interest in Maths into the financial or business world. Such universities inspired Alex because he perceived

these places to be able to provide him with the kind of challenges, opportunities and like-minded peers he sought in his school years.

Alex was never very unhappy in his life. He was contented with everything and he had excellent support and little pressure from his parents. Career-wise, he was not quite sure what he would choose but reckoned that he would take over his father's company in his mid-thirties. As such, he saw himself as having some ten years of "buffer time" to learn and to experience before making any firm decision.

Parents and Family

Alex is the eldest in a family of four children. His mother, a housewife, spent her time looking after him and his siblings while his father travelled frequently on business. The family lives comfortably in a landed property in land-scarce Singapore.

Although both parents are non-graduates, they placed a high priority on education. However, they were very easy-going and did not force their children into studying anything they didn't want. Whenever Alex's father talked to him and his siblings, he made clear the importance of trying their best and working hard. Both parents were encouraging and never placed too much emphasis on results. Alex shared:

> My parents just wanted us to try our best. Even if you fail, never mind. At least you know you tried your best and it's fine. So for me, there was never really any stress. No matter how well or how badly I did, they were always like "okay, keep it up" or "try harder next time."

This parenting approach influenced Alex in that he was not stressed about school or results all through his school years. He knew he needed only to try his best. Alex shared how he felt:

> If I try my best, I am fine; doesn't really matter the (results); doesn't need to (have done) well by general standards. I just need to be contented with my results. If I think I'm doing my best, then that's all that matters.

Alex's mother was a key figure in his life as his father was often busy working. In the early years and in primary school, she was more directly involved in

Alex's learning and development. She was always attentive to what interested Alex and supported him with resources for in-depth exploration. She worked with his interests rather than be ruled by what she thought was useful. She shared:

> When he was into dinosaurs, I learnt all the dinosaurs' names with him . . . . So we borrowed guide books, bought guide books, got toys, videos so he explored in-depth . . . . I worked with his interests so when he was into trucks, we went in-depth to see all vehicles like construction vehicles, sports cars, everything . . . . I think pre-school was the curious age. When he was into animals, you know, he would go in-depth into all kinds of animals . . . . The family support was pretty crazy. I always provided him the concrete materials. I think it is important. So when he likes something, we try to source for it from all types of shops. At one stage, I think he was very into soldiers. So you know, we went all lengths to get him his army of soldiers. Then he worked out his war zone, that kind of thing. I provided him a lot of toys over the years.

Alex's curiosity led him to want to know more and more and his mother catered to that consistently. In the lower primary school years, when he was bored in school, she motivated him by buying him the books he enjoyed. The upper primary school years became happier years for Alex because he was no longer bored when he got into the GEP. He became self-driven and his mother didn't need to do much to motivate him.

Alex's mother was certainly a key driver in developing his early interest in Maths. She did not find assessment books very appropriate in engaging his interest. So she explored bookstores with Alex and allowed him to buy what interested him. She said:

> I gave him those American Mathematics books, puzzle books. He loved them. He read all kinds of puzzles. We were basically always in the library and bookstores, searching. He would buy all kinds of puzzle books.

She never sent him for tuition or out-of-school enrichment classes although she did try to cultivate creativity in Alex by getting him to attend Art lessons. That didn't turn out well because Alex was not interested. He preferred to read and when

he got into the GEP in Primary 4, there were advanced programmes in Maths to cater to students who excelled and needed greater challenge.

Alex's mother laid down ground rules and supervised him in his schoolwork when he was in primary school. Later in the secondary and junior college years, her role changed to one of sourcing materials for Alex. She said:

> Definitely not so involved and not aware of what he is doing in school anymore, from curriculum to everything (else). And I find that it was way too fast-paced for me. I don't know what he was doing . . . . Yeah, if he needs me, he'll come to me, "Oh, mum, I need this, and this" when he is doing certain things. Then I will to try to source that for him.

Alex explained how his mother supported him through his later years in school:

> My mum didn't really study much so she can't sit down and help me out with anything related with Maths. But if she sees that I have a problem, she'll try to help me by finding people for me to go to, like she will talk to her cousin or if I have problems with Maths, she'll try to find someone outside to help me.

Alex explained further how the nature of the support he received from his mother changed as he grew older:

> For Year 5-6, it was different. The resources she helped me to get were for university courses. I'm still not very sure what exactly to choose so she goes round talking to her friends and asking "what degree leads where" because she's also not a uni(versity) grad(uate) so she doesn't have that much knowledge. She tries to set me up with people to talk to.

Alex was close to his mother and would go to her with his problems. She gave him quite a lot of freedom, allowing him to "go out to learn and explore". She needed him only to let her know who he was going out with. Alex described his mother:

> She just lets me learn. She said, "At most, learn from your mistakes when you are young; it is OK. So I had quite a lot of freedom when growing up.

However, when it came to key decision-making points, his mother stepped in. For instance, she insisted that Alex took all three science subjects in Year 3-4 although he disliked Biology. She did not want Alex to be in the minority group offering just two Science subjects.

Alex figured that he might have influenced his mother to help him more compared to his siblings. This was because when he had questions or problems, he would ask her and she would look for resources for him. His siblings tended to hide them away so his mother didn't always know where to help them.

All in all, besides his closest friends, Alex singled out his mother as someone who helped him sustain his interest in Maths.

Teachers

Alex found most teachers in Sunnyrise School, especially the Socrates Programme teachers well able to cater to the advanced learning needs of students. He especially remembered the Maths and Science teachers in the Socrates Programme who allowed students to explore and go as far as they wanted to. He elaborated:

> For example, you can see all of those geniuses in class; the ultra-geniuses would bring up random things that you never heard before but the teacher can reply to them . . . . The "go-as-far-as-you-want" – I think that especially applied for the Maths and Science teachers, especially the Socrates Programme ones. They really let you explore anything and everything. You just (need to) approach them.

Alex found most of his teachers understanding and accommodating too. For example, he shared how some of his teachers helped him manage his hyperactivity:

> I tell them that sometimes I fidget more or want to walk around. They are OK; they will just let me do it . . . . Understanding and accommodating, that is my definition of nice teachers.

When Alex was in Year 1-2, his Maths teacher, Mrs Hugh, gave him out-of-syllabus questions to keep him engaged in the subject. For him, such Maths questions gave him something productive to do during Maths lessons. Alex felt that this teacher made a significant impact on him not only because he enjoyed her Maths

lessons but also because she was understanding and accommodating. As Alex grew older, he became more able to find challenging questions on his own. So in a sense, he felt that he had the "right teacher at the right time", someone who was there to nurture his interest in Maths when he didn't know how while also looking after his well-being.

Alex had affirmation and advice from some teachers that inspired him and helped him to persist in pursuing his interest in Maths. He said:

> Quite a lot of teachers told me that I have a lot of untapped potential, and that I need to channel my energy properly and do things. When they tell me this kind of things, I made sure I try to do what they advised. That also somewhat inspired, kept me doing that kind of Maths questions because I wanted to keep up my level there. I didn't want to lose that kind of proficiency and speed.

Alex felt pulled back in his learning when teachers taught at a non-differentiated pace in class. This happened in the non-Socrates Programme classes. For instance, Alex shared:

> I like Maths and Science. I can go faster than (the pace in a) regular class. But the teachers, for the sake of the entire class, had to follow the normal pace so in that sense, I felt pulled back . . . . I am just one guy in the class of thirty people. Yeah, so I sit down and just dream and doodle, that kind of thing or do my own work.

Alex had more leeway to influence his teachers when the entire class learnt at a faster pace, for example in the Socrates Maths class. He said:

> The teachers usually are quite nice in the sense that they will listen to the class if the whole class thinks this (referring to what was being taught) is useless and we can understand it by ourselves; then they will move on. But generally, I think I learn Maths and Science much faster than other people so generally, my "move on" is like maybe (in) 5 (or) 10 minutes, I can understand the topic. People need one lesson (referring to the one-hour duration of lessons in school) so I can't just interrupt.

Although Alex was frustrated in situations when he was held back in his learning by the slower pace of the rest of his classmates, he knew he couldn't be selfish about learning ultimately. This became less of an issue to him when he was older because he knew how to challenge himself together with his closest friends who were his intellectual peers.

However, Alex's sloppy work habits or poor classroom behaviour got him into trouble with his teachers sometimes. When he was younger, he would be sent out of class for being talkative. When he was bored with the homework or when the work was not interesting to him, he would not do them. Although Alex's Year 1-2 Maths teacher tried different ways to engage him, Alex's Socrates Maths teacher, Mr Kong, left him to decide how he wished to work. He remembered Alex as an inattentive student who did minimal work in his Maths class. He felt that it was Alex's parents who wanted him to be in the Socrates Maths Programme more than himself. He observed Alex to interact with students in the regular classes more than his Socrates Maths classmates. Although Alex didn't think such interactions with teachers affected him negatively, his mother felt that it affected his general confidence. She said:

> I did find his confidence level affected in certain situations. I expected him to be even more confident dealing with certain things at times.

By Year 5-6, Alex reckoned that teachers would rather teach an enthusiastic student who enjoyed what he was doing. He realised that being responsible and inquisitive could influence his teachers' response towards him in a positive way. Alex began to enjoy his regular lessons more.

Peers

Alex's closest friends were classmates who were with him from Year 1. They were in the same House System and studied together in the Year 3-4 Socrates Maths Programme. Although they went on to different classes in Year 5-6, they remained close. Alex identified these friends as people who helped him stay interested in Maths. He described them as smart and people who enjoyed being competitive in a fun way. Alex said:

> Not to be elitist but they (referring to his close friends) are all quite smart. So I guess, for us, studying for exams is a bit like a game . . . . We all compete to see who gets higher, all for fun . . . . It's the fun-type of competitive spirit in us.

Alex remembered how he and his friends influenced one another to study. There was also mutual help and support from "experts" in the group. He said:

> We just study. We pushed each other a lot. My group of friends, the good part is that we are all super strong in different subjects so we can help each other out . . . . My two best friends aren't super good in Maths; they are good but they are not super good . . . . My best friend was in Biology and Chemistry Socrates Programme from Year 3 all the way to Year 6.

They were not selfish about what they knew nor were they afraid that a friend would score better.

Alex pointed out that parental attitudes towards studying and results probably influenced all of them. Trying hard was what mattered most to him and his friends. He said:

> I think our parents are all the same kind - all the happy-go-lucky, the "it's okay, just try hard; your results are not very important" type. But we'll study. That's why I think that's good 'cause I think over-stressing the kid will be quite bad. For us, we were happy-go-lucky so studying is still quite fun, still quite enjoyable.

When bored during lessons, Alex and his friends attempted random Maths questions they had picked out from the internet to entertain themselves. He said:

> We were bored during other lessons so we brought Maths questions to do in other lessons . . . . We just found other country's Olympiad (questions) and did them.

Alex described how he and his friends got excited about doing such Maths questions and how they reinforced one another's interest in Maths in the secondary school years:

> Yeah, just do together. As in, I am the kind who will not give up especially this kind of hard questions (referring to Olympiad-type questions). If I cannot do, I'll tell my friends. Then all will be excited and want to do them together.

Although Alex's circle of intellectual peers helped to keep up his interest in Maths, he felt inadequate at times. This was due more to the kind of "super smart" schoolmates he met in Sunnyrise. His mother shared:

> He is a survivor but I think he did feel a little bit inadequate along the way, like you know "wah, they're so good, so good in this and that", you know. And some people effortlessly, they get work done. Of course, he never blamed anything and all on himself but he knew that, wow, he always tells me, they are super smart. He said they're not human that kind of thing. So he was just amazed how smart these boys can be.

Alex's closest academic peers were also his social peers in Year 1-4. He described himself and those he hung out with as "typical guys" with an additional interest in Maths. He said:

> Most of us, we are quite regular guys as in we do the three big things. For most people, these are just sports, computer games and girls. For us, we enjoy Maths puzzles instead of computer games.

Alex's peers in Year 1-4 were all very bright and driven. In Year 1-2, his classmates were students who were from the primary Gifted Education Centres while in Year 3-4, he was in a class of students who took one or more Socrates subjects. This was not the situation when he went on to Year 5-6 as he was no longer in the Socrates Programme. He didn't do well enough in the Year 4 exam and was emplaced in a regular Maths class in the last two years of school. He also did not do well enough to qualify for four full subjects at A-levels and had to appeal to be allowed to do so. He was successful but that meant he was grouped into a class of "appeal students" and was not allowed to take any subjects under the Socrates Programme in Year 5-6.

There was clearly a disparity in abilities between Alex and his new classmates in Year 5-6 but he found a new role for himself. Alex described his new classmates:

> Not to be show-off or anything but I spent my Year 5-6 doing a lot of teaching in my class because my class was really very weak. Most of the people were struggling with the four A-level subjects. For me, I passed all my subjects. My results, I think my first CT (common test) was like ABCD (grades), which is OK. And I topped the class by a lot.

Instead of getting bored in his new Year 5 class, Alex soon evolved a tutor role for himself among his new classmates. He recalled:

> It was OK (referring to how he fitted into his new class). I became like a second tutor so everyday in class, I taught people . . . . It was interesting, quite fun.

Alex kept up with the same group of friends who shared his love of Maths during his earlier years in Sunnyrise. That kept him going. He said:

> We all know each other. We enjoy those kinds of interesting Maths questions, all those kinds of puzzles. They would just give me puzzles to do; then I'll go and do them.

Thus, in Year 5-6, Alex interacted with different groups of peers in different ways. He played sports, talked about girls and had fun with his Year 5-6 classmates, but for intellectual stimulation in Maths, he went back to the group of friends who enjoyed Olympiad Maths questions and mind-boggling puzzles. These were his best friends.

Unlike a few of the study participants who were inspired by their seniors in pursuing their interest in a specific subject area, Alex's seniors had little influence on his intellectual pursuits in Maths. His House Captain did inspire him to serve in the House Committee and this could have influenced him to serve as tutor to his Year 5-6 classmates on his own initiative.

School and School Culture

Before joining the school, Alex felt that there were lots of interesting programmes and competition opportunities in Sunnyrise School and that these were fun things to do since he liked doing challenging Maths questions and puzzles. He

wasn't disappointed. Looking back, Alex described his years in Sunnyrise School as "the most fun six years" of his life. He pointed to the good mix of academic challenges and regular schoolboy play as ingredients that made school very enjoyable for him. He said:

> It was very fun because I got to do a lot of challenging things in school and I also got a lot of time to play and enjoy basketball and everything.

Alex was in a number of co-curricular activities and in his House, he participated in a wide range of activities. After six years in Sunnyrise, he still thought of Maths as his area of strength and interest because he felt he learnt faster than other people.

Alex's own interest in Maths coupled with an appropriately challenging curriculum and like-minded peers in the Socrates Programme inspired him. The Socrates Maths class offered challenging problem solving which he enjoyed. When he was not selected for the Socrates Maths Programme in Year 5-6 because of his low GPA at Year 4, Alex borrowed notes from his closest friends who were still in the programme. He studied on his own and went to these friends when he needed help. This kind of peer support sustained his "study-on-your-own" approach to dealing with the lack of formal learning opportunities. He applied this approach to learning advanced Chemistry. He regularly read notes and other curriculum materials from the Year 3-4 Socrates Chemistry class on his own. He didn't enjoy the kind of work done in his regular Chemistry class. He found the pace too slow and there was just too much facts-and-regurgitation for him. By Year 4, Alex won a Gold award in the National Olympiad in Chemistry, distinguishing himself as the only student from a regular Chemistry class to achieve at that level. Yet he failed the regular Chemistry paper in the school final exam.

Alex felt boxed in by the minimum Grade Point Average (GPA) eligibility criterion for the Socrates Programme. He shared:

> For GPA, the school wants you to reach a minimum Grade Point (GP) for everything. All your subjects must be GP about 3.6 at the very least before they let you pursue your Socrates Programme. But for us, we just pursued

> that one particular subject. We ignored the other subjects because we got no interest. We study, yes, but it's boring.

This eligibility criterion became a hindrance and limited the talent development opportunities for him. He agreed that he could have pushed a lot further and learnt far more if he had been allowed to continue in the Socrates Maths Programme. A few of his friends experienced the same hindrance. He described his friends:

> Yeah, I guess for my kind of friends too. There are two main types of highly able, good-in-Maths students. One, like me, is self-motivated, as in we enjoy Maths. The other type is groomed by their parents from young. They start all the way from the Primary 1 Maths Olympiad preparatory course. By the time they reach Primary 6, they are definitely good already. They had six years of Maths Olympiad training.

Alex did not have the same type of formal training or deliberate practice when he was young.

Alex's distinction of the two types of students in his Socrates class was based on what he perceived parents of his friends did. One group comprised those whose parents pushed them in everything. This group achieved excellent GPAs and their Maths scores were also very good. Alex felt that the parents of these students put them in the Socrates Programme; their pushing ensured that the minimum GPA requirements were met. The other group comprised students who were in the Socrates Programme because they really enjoyed the subject and he belonged to this group. Alex's parents were not pushy and allowed him to pursue what interested him. So Alex spent time on work that he enjoyed doing and put in little effort on work that he did not enjoy. He ended up not meeting the eligibility requirement for the Socrates Programme at Year 5 and lost out on opportunities that could have helped further his interests in Maths.

Despite being somewhat disadvantaged when it came to TD opportunities in Year 5-6, Alex found his own ways to learn and be happy. He had friends who were in the same situation but they all found ways to learn on their own. Alex did feel a little disgruntled with the situation at times because he could have been stretched

more and things could have gone differently. However, he didn't let these things get him down.

Looking back, he wondered if there could be a case-by-case consideration to address the lack of opportunities for students like him. Besides missing out on the Year 5-6 Socrates Maths programme, Alex was also not permitted to take the higher A-level Maths subject (H3 Maths) initially. Undeterred, he navigated this lack of opportunity by self-teaching, again borrowing materials like textbooks and notes from his friends. He was later allowed to take the H3 Maths A-level examination in Year 6 because of his improved performance.

Alex acknowledged that the school's culture of excellence influenced him in some ways. He shared:

> I think the students' drive for excellence . . . . I think it is really present in the school . . . . It's like, "Wah, everybody (is) so good; we can be as good." It's like, "Everybody is so smart, wah, I cannot let them be so much faster than me. Better start studying."

This culture of excellence as manifested in the attitudes and aspirations of students in Sunnyrise made Alex more competitive but in a good way. It was all about healthy competition and becoming better among his circle of friends. They were willing to help one another to do well. He elaborated:

> Like I said, with my friends, we have a lot of healthy competition, like every test must get full marks; just study for fun, then get full marks . . . . My group of friends – we are all happy-go-lucky. It's not like, "Oh, I'm not going to share my notes with you or you'll score better than me." It's like, "Never mind, we'll just all share; if you score better, good, you score better."

Despite what Alex shared about healthy competition among his friends, the competitiveness of the larger school sometimes got to Alex. His mother shared:

> I think during his early years in Sunnyrise, he was looking forward to studying in the UK. So I said, "Good, I think you know since you met visitors from Oxford and Cambridge." He was pretty thrilled. I said, "That's

> a good dream." But I don't know what happened in upper secondary. He said "I'm not going to the UK. All the muggers are going there. It is stupid to see all the Sunnyrise people there." I said, "What's wrong with Sunnyrise people?" He said "Uni(versity) is not about studying; it's about seeing the world. Why do you spend your four years mugging to get on the dean's list, to be president of all kinds of societies?" He said that it will be the Sunnyrise culture again if you go to a top uni(versity).

Alex spoke with great fondness about the House system in the school. It was the one thing he enjoyed most and the one thing he learnt most from in school. The House Captain inspired him and he really bonded with his cohort peers and seniors who were in the same House. He identified the House System as the context that provided him with the opportunities and support to grow and mature as a person. As a Year 1 student, he was inspired by his House leaders because of their passion and commitment in leading and serving. The House leaders were role models to him and his classmates. They inspired him to take on a bigger role in the House as he grew older. He was exposed to a wide range of inter-House activities from academics to sports and the performing arts. He thought he had the "biggest take-away" from his House experience because in the House environment, students were not only from different year levels but were of every interest. So he learnt interpersonal skills, and how to manage and lead.

Scholarships

Alex was not too concerned about scholarships unlike many of his peers. It was more the fun factor that featured in Alex's school life rather than what scholarship boards or universities look for. Looking back, Alex had no regrets. What Alex did watch was which jobs or careers were more important to the Singapore economy. For instance, he perceived Business and Engineering graduates to command high starting salaries and so saw himself as a businessman over the longer term. Alex's father and his expanding businesses could have influenced how Alex viewed his university education and his options.

Yet, like his peers in school, Alex aspired to top universities in the US or UK, though the unsuccessful applications of peers he perceived to be more able and

"better-packaged" had discouraged him from trying for these universities. As a consequence, he ended up considering doing a Business and Engineering degree at the local university. He acknowledged that he would be compromising on pursuing his love of Maths but he was sure that the local university was not a place where he wanted to study Maths. Alex was influenced by faculty and university rankings in his decision-making. His perception that the Maths and Science faculty at the local university did not enjoy the same high prestige as those in top US and UK universities influenced his decision not to do a pure Maths course. Moreover, he perceived that top students from Sunnyrise School typically did not take up Maths courses at the local universities; they went for courses such as Law or Medicine.

Alex also linked university course options to possible careers and earning power. His considerations were thus influenced by what he perceived to be valued in the Singapore context and how the Singapore economy was linked to the global economy. What could get him the highest paying job was important to him. Interests could be pursued at leisure and he knew how to go about this.

Turning Points

Alex did not think there was any critical event or turning point in school that stood out or affected him. He considered his six years in Sunnyrise School to be generally smooth-running. He attributed that primarily to the very happy-go-lucky type of person that he was and still is. He picked himself up whenever things went wrong and would try again. Failing never deterred him. He figured that his father influenced him through the way he went about his business ventures. He elaborated:

> Yeah, I think my dad influenced me in that kind of thing. Like the businessman mentality – you fail a business, you don't sit down and mope; you start your next one straightaway. So you don't mope over your thing. It's also a bit bad because it makes you a bit rash at times but it's more the "just do" mantra.

Summary

What emerges from the case description of Alex is that Alex's environment for talent development in Maths offered him low opportunities and low progression as he moved into the last years of Sunnyrise School and that he ended up focusing on

activities that had little to do with advancing his abilities and interest in Maths. Despite the very promising early years and the first two years of Sunnyrise School, Alex did not thrive in the talent development process. In effect, he was in a “low opportunity progression equilibrium” (Hodgson & Spours, 2013, p. 6).

APPENDIX J

Analysis of Person Characteristics (Extract)

I provide two examples in this extract: one case study participant from the G20 group and another from the G90 group. Person characteristics that posed a hindrance to the proximal processes of academic TD are indicated with a negative sign, e.g., [-SR].

Case study participant	**Force characteristics (FC)** (*selective responsiveness* [SR], *structuring proclivities* [SP] and *directive belief system* [DBS] in relation to academic TD)	**Resource characteristics (RC) & demand characteristics (DC)**
Gibbs (G20)	***Primary school years*** • [-SR] took to leading others (had a strong sense of justice and would stand up for his peers in school when they were bullied) • [-SP] encountered "complexities" – some peers perceived him as bossy but he persisted, demonstrating the ability to deal with peer issues and complexities ***Sunnyrise School*** • [-SR] attracted by leadership opportunities in Sunnyrise School, not the academics • [-SP, -DBS] engaged in several leadership roles at the class and cohort levels; went for leadership training – illustrating the tendency to engage and persist in progressively more complex leadership situations • [-SR] Gibbs professed to reading science books in primary school for admission into Sunnyrise School via the Science early admission programme but there was little evidence of deeper engagement in the subject in Sunnyrise School • [SR] interest in History developed because of the peers he met in the	***Primary school years*** • [RC] capacity to learn on his own • [-RC] insecure nature (*mother: may be due to the greater attention mother gave to elder sister in the early years)*, needed affirmation from others; this characteristic carried into the later school years • [RC] professed to enjoy reading ***Sunnyrise School*** • [RC] confidence to learn on his own (note: however, academic excellence was limited to excelling in the A-level examination) • [-RC] high drive in *leading others*; skills and experiences enabled him to engage in developmentally more complex interaction in leadership (not academics) in the environment of Sunnyrise School; time and energy invested in leadership roles • [-RC] to some extent, he lacked the developmental assets of knowledge, skill and experience at the level of his Socrates History classmates especially at the start of the programme; had to work very hard to keep up with

Case study participant	Force characteristics (FC) (*selective responsiveness* [SR], *structuring proclivities* [SP] and *directive belief system* [DBS] in relation to academic TD)	Resource characteristics (RC) & demand characteristics (DC)
	leadership groups in Year 2 • [-FC on academic TD] focus of attention and responsiveness seemed to be directed more towards leadership than any academic area including History, especially in Y3-4. This was evident from the level of his responsiveness to interactive processes to do with leadership, e.g., ✓ he reflected on his leadership work routinely, e.g., reviewing the purpose and impact of the work done ✓ he had high expectations of the peers he led and worked with them ✓ he took initiative for his own learning ✓ he invested much more time and energy in his leadership roles • he increasingly derived his identity from his leadership roles than from his academic abilities from Y1-2 onwards • the developmentally generative dispositions were less seen in the academics, including his self-chosen Socrates History • [-SR] he was less attracted to what the Socrates History programme offered ✓ [-SP] little tendency to take up extended opportunities in the Socrates Programme ✓ [-DBS] lacked the propensity to conceptualise his experience in the Socrates Programme	his highly able peers ✓ in class, Gibbs adopted an approach of not taking himself too seriously; he would laugh at himself. He was earnest and would ask questions because he wanted to learn from the teacher and classmates. • [DC] diligence and self-directedness with school work developed trust in parents and teachers; left to pursue his interest in leadership because he was doing well in school; earned mother's and teachers' trust in his ability to balance academics and leadership commitment. However, the focus of attention on this characteristic did little for the proximal processes of academic TD.

Case study participant	**Force characteristics (FC)** (*selective responsiveness* [SR], *structuring proclivities* [SP] and *directive belief system* [DBS] in relation to academic TD)	**Resource characteristics (RC) & demand characteristics (DC)**
Jay (G90)	***Pre-primary and primary school years*** • [SR] love of reading; inquisitiveness • [DBS] displayed an interest to learn on his own, e.g., borrowed self-help books on his own. This self-direction and self-teaching habit started in primary school (showing an evolving belief in the self as an active agent in relation to self and environment) ***Sunnyrise School*** • [DBS] became increasingly self-driven in seeking knowledge – reflecting an increasing capacity and active propensity to conceptualise his own experience, e.g., Jay said: *Whatever holes there are in your knowledge, you must fix it yourself. You have to learn how to fix it. You cannot rely on teachers all the time, definitely not…. a lot of it is about self-driven reading.* • [SR] interest in Literature – a natural extension from his love of reading • [SR] interest in Science from primary school years – teachers who were willing to answer his "inconvenient" questions • [DBS] went on to take Y3-4 Socrates Literature and Socrates Chemistry; another example of his increasing capacity and propensity to conceptualise his learning experiences:	***Pre-primary and primary school years*** • [RC] quick to learn; excelled in primary school – external recognition • [RC] had a long concentration span compared to his age-peers • [RC] able to read on his own by two years old; developed a strong love for reading – this was central to self-teaching – reading was clearly a developmental asset that influenced his capacity to engage effectively in proximal processes • [RC] good work habits, instilled by mother during primary school years ***Sunnyrise School*** • [RC, DC] external recognition and affirmation of his ability - consistently outstanding and well-known among teachers for his academic prowess – contributed to an evolving sense of self-efficacy; won top placings in many inter-school and national-level science competitions, various Singapore Olympiad placings by the time he was in Y5-6; his immense capacity to learn attracted the attention of teachers who provided him with challenging opportunities • [RC, DC] immense ability to focus and engage at a deep level, psycho-social skills such as mental toughness, goal-setting ability, ability to cope in a competitive environment, confidence, openness, high drive, intrinsic motivation, optimism, automaticity in work, emotional

Case study participant	Force characteristics (FC) (*selective responsiveness* [SR], *structuring proclivities* [SP] and *directive belief system* [DBS] in relation to academic TD)	Resource characteristics (RC) & demand characteristics (DC)
	Jay explaining his decision to take Socrates Chemistry over Biology *I chose Chem because a lot of things that we accept in Biology are just taken-for-granted assumptions from Chemistry. So I wanted to go deeper into the rules and everything, and I thought Chem would be a more suitable place to start from.* • [++FC] strong force characteristics that set in motion and sustain the ways that Jay engaged with his environments, and therefore the ways in which he experienced proximal processes of development – frequently read beyond the syllabus because he believed that it was crucial to understanding the very heart of the subject. He said: *Actually if you don't read beyond and you just accept things, then it's very difficult because you are just memorising disparate facts. It's only sometimes when you read on, you truly understand why, for example, the mechanism works this way and not the other way …. These are things that are crucial to understanding. So, definitely some outside reading is necessary.* • [SR], [DBS] took A-level Literature at Advanced Level and Higher Advanced Level although	control • [RC] Jay's increasing mastery of core concepts and ways of thinking in these subjects and academic skills such as reading led to increasing passion, and sense of ability and self-efficacy to engage in tasks of progressively greater complexity • [RC] psychosocial skills – resilience and ability to deal with setback, for example, Jay trained for the International Chemistry Olympiad for most of Year 5 in Sunnyrise School but eventually failed to make the national team. It was hard-hitting for him. Jay shared how he dealt with the setback: *I mean, definitely there is disappointment but then you realise the extreme value of what you have spent an entire year mastering. And when you return to deal with your H2 (referring to the A-level Chemistry curriculum) which you have been neglecting, things are ridiculously easy. Because it's like everything makes a lot of sense now. And then, because I also did H3 (referring to Advanced Chemistry curriculum), that really helped me in my H3 as well….And actually just because there are three winners doesn't mean that there are seventeen losers.*

Case study participant	**Force characteristics (FC)** (*selective responsiveness* [SR], *structuring proclivities* [SP] and *directive belief system* [DBS] in relation to academic TD)	**Resource characteristics (RC) & demand characteristics (DC)**
	he was in the Science stream; clear about his purpose – which was purely to pursue an intellectual interest; not because it was important to a potential career or to university admission	• [RC] the experiences in the Singapore Olympiad training team in Y5 further built his academic preparedness for high level intellectual challenges, fortifying his self-efficacy further. Teacher described Jay as a "persistent fast and sharp thinker with a fierce inquisitiveness … passionate about the subjects he loves."

APPENDIX K

Checklist for Analysis of TD Outcomes

Criterion	**Basis of the criterion**
1. High level attainment in the given subject area (e.g., recognition at national or international event)	National focus on ability-driven education; nurturing many peaks of excellence, for example: *At the Teachers' Day Rally on 31 August 2006, Prime Minister Lee Hsien Loong articulated the vision that Singapore's education should focus on "many peaks of excellence" to ensure that all students with talents can realise their potential.* Superior achievement is a TD process indicator (Stanley, 1980).
2. Y4 results and progression into Y5-6 (a) Is there transformation of the student's aptitude into systematically developed knowledge and skills in the specific subject area? As the most basic indicator, how did the student do in the Socrates curriculum (e.g., subject GP) (b) What was the TD progression into Y5-6 like? Did the student stay in the Humanities or Science/Maths pipeline or leave it at different stages of their TD journey?	TD requires commitment and dedication to goals (e.g., Bloom, 1985; VanTassel-Baska, 1989; Sternberg & Davidson, 1985) Leaving the pipeline may be considered as wastage in the overall effort to develop peak performers.
3. Active engagement in special TD provisions To what extent did the student engage in the special programmes or activities that were a part of the special provisions in the Socrates Programme and other related activities? Were these sustained?	The student must display drive and dedication in the subject domain of interest; where the student invested his intellectual energy and time provides evidence for this (Gagne, 2009; Sternberg & Davidson, 1985) Rapid advancement is a TD process indicator (Stanley, 1980).

Criterion	Basis of the criterion
4. Participation in academic co-curricular activities (CCAs) To what extent did the student participate in related academic CCA/s or formal non-curriculum programmes in talent-related area/s (e.g., inter-House activities)?	This provides an indication of what the student did with his time outside formal academic programmes.
5. Teacher comments in the School Leaving Testimonial What were the teacher-observed person characteristics and behaviours by the end of Y6?	TD is also about nurturance of characteristics and behaviours that support the student's growth, e.g., towards eminence, or characteristics and behaviours associated with eminence. Teachers' comments in the School Leaving Testimonial provide useful insights on the characteristics and behaviours observed in each student. Such characteristics and behaviours may be associated with eminent behaviour in the literature on eminence.
6. Performance in the A-level exam How did the student perform in the GCE A-level exam? What was the student's performance in relation to his cohort peers?	The A-level exam is more about acquisition of basic knowledge, skills and attitudes that students need as they gear up for tertiary education at the end of six years of secondary and post-secondary education; a high-stakes examination in relation to progression to tertiary education and scholarship application.

APPENDIX L

Cross-Case Analysis of TD Outcomes (Extract)

Case study participant	Subjects and Achievements	Co-curricular activities (CCAs), leadership roles and other interest/s	Teacher comments on person characteristics in Year 6 school testimonial	University and scholarship information	Transitional TD outcomes
Alex (G20)	<u>Year 3-4 Socrates subjects</u> • Maths • Y4 enrichment module in Maths <u>Year 5-6 Socrates subjects</u> Nil; (did not quality for Y5-6 Socrates Programme; placed in Y5-6 Enhanced Class instead) <u>A-level subjects and results</u> • Chemistry A • Physics A • Maths A • Economics A • H3 Maths Pass <u>Other achievements</u> • Y4 Singapore Junior Chemistry Olympiad (Gold) • Y1-3 Singapore Maths Olympiad (participation) • Y5 American Maths Comp (Distinction) <u>Note</u>: Studied for SJChO on his own	<u>Year 3-4 CCAs and leadership roles (if any)</u> • Maths Club • Scouts • House Committee <u>Year 5-6 CCAs and leadership roles (if any)</u> • Canoe team • Bridge Club • Scouts <u>Other interest/s (if any)</u> • Chemistry	<u>Force characteristics</u> • curious • self-motivated • very independent learner <u>Resource characteristics</u> • grasped new knowledge quickly • read widely • strong analytical skills	<u>University placement</u> NUS Business School <u>Scholarship</u> Nil (did not apply)	• No national or international level attainment in Maths; participation stopped at SMO in Y1-3; best achievement in Maths was in the Y5 AMC (distinction) • SJChO Gold in Y4 – national level attainment through self-study of advanced Chemistry; notable • At Y4, a low GPA (3.05) & low Socrates Maths GP (3.2) halted progression to Y5-6 Socrates Maths programme; banded with bottom 20% of cohort in Y5-6 • engagement in special provisions in the Socrates Prog: chose only one Maths enrichment module in Y4 (the others were in sports and drama); however, managed to get himself into H3 Maths in Y6 • academic CCAs: although in Y1-4 Maths Club (4yrs), active participation was observed in non-academic CCAs throughout Y1-6: Scouts Y1-4; Bridge, Canoeing Y5-6 with representation at inter-school competitions • teacher comments on person characteristics focused mostly on positive *force and resource characteristics, less on demand characteristics* • A-level performance: 4 distinctions; a pass in H3 Maths, 60th percentile of his cohort • did not stay in the Maths pipeline - chose to do a Business course in university **Summary**: • did not grow strongly and vigorously in chosen subject (Maths) • self-fulfilment to some extent, e.g., tutoring less able classmates in Y5-6; took H3 Maths in Y6

Case study participant	Subjects and Achievements	Co-curricular activities (CCAs), leadership roles and other interest/s	Teacher comments on person characteristics in Year 6 school testimonial	University and scholarship information	Transitional TD outcomes
					• reached Level 2 and 3 provisions by Y4; but not actively engaged nor sustained in a systematic way • Although excellent A-level results, didn't quite flourish, didn't engage with vigour in the Socrates Prog and related talent-activities; fell off track end Y4
Jay (G90)	<u>Year 3-4 Socrates subjects</u> • Chemistry • Literature • Y4 enrichment in Literature-related modules <u>Year 5-6 Socrates subjects</u> • Biology • Chemistry <u>A-level subjects and results</u> • Biology A • Chemistry A • Maths A • Eng Literature A • H3 Eng Literature Distinction • H3 Chemistry Distinction <u>Other achievements</u> • numerous inter-school & national level competitions in Science and Chemistry; included project fairs • Spore Junior Chem Olympiad (Gold) • International Chem Olympiad training team	<u>Year 3-4 CCAs and leadership roles (if any)</u> • Red Cross (Chair) • Science Club (comm member) • Prefects Board (Exco) • House activities <u>Year 5-6 CCAs and leadership roles (if any)</u> • Biological Sciences Society (Exco) • Red Cross (senior leader) <u>Other interest/s (if any)</u> • wide-ranging self-pursued interests - e.g, History, Literature, Philosophy	<u>Force characteristics</u> • enthusiastic about learning • extremely hardworking • looked for ways to improve • persistent • fierce inquisitiveness <u>Resource characteristics</u> • outstanding student; intellectually talented • fast and sharp thinker <u>Demand characteristics</u> • passionate about subjects he loved • fierce inquisitiveness	<u>University placement</u> NUS School of Medicine <u>Scholarship</u> Public Service Commission Scholarship (turned down)	• Highest level attainment: *national training team* for SIChO in Y6 • SJChO gold in Y4; SChO Gold in Y5; achieved Gold awards in a spectrum of inter-school and national level science competitions in Y3-4 • brilliant performance in school GP 4.0 in both Socrates Chem and Lit in Y4, Y5-6 • sustained systematic and active engagement in special provisions in the Socrates Prog: accessed a spectrum of provisions up to Level 4 for Chem, including Science research attachment in Y5; Level 3 for Lit, including additional advanced and enriched literature elective modules in Y4; school structure did not permit Socrates Lit in Y5-6 but he took H3 Eng Lit in A-level exam • took up additional Socrates Biology in Y5-6, Biology-related enrichment electives, and competitions such as Biology Olympiad and Biomedical Challenge • academic CCAs: sustained active engagement in Science Club in Y3-4; joined Biological Sciences Club in Y5-6; despite key leadership roles in Y4-6 Red Cross and Y4 Prefects • teacher-described characteristics/behaviours in school testimonial included positive *force, resource and demand characteristics* • A-level performance: 4 distinctions; a distinction in H3 Chemistry and Eng Lit, 95 percentile of his cohort • PSC scholarship; medicine course in university **Summary**: • vigorous growth in chosen Chem area; successful,

Case study participant	Subjects and Achievements	Co-curricular activities (CCAs), leadership roles and other interest/s	Teacher comments on person characteristics in Year 6 school testimonial	University and scholarship information	Transitional TD outcomes
					steady progress, reaching national talent pool although did not get to represent country in SIChO; evidence of breadth and depth in engagement in Chemistry area • self-fulfilment: from achievements and recognition; relevance in medical course • accessed highest level provisions at Level 4

Note: Two examples are provided in this extract: one case study participant from the G20 group and another from the G90 group.

APPENDIX M

Cross-Case Analysis of Micro-1 Systems

G20				G90			
ALEX	**GIBBS**	**KNIGHT**	**MICHAEL**	**JAY**	**MARK**	**MATTHEW**	**ZACH**
Socrates Subject 1	**Socrates Subject 1**	**Socrates Subject 1**	**Socrates Subject 1**	**Socrates Subject 1**	**Socrates Subject 1**	**Socrates Subject 1**	**Socrates Subject 1**
In-class • Y3-4 Socrates Maths • Y6 Higher Advanced Maths (H3 Maths) *Objects and Symbols* • Y1-6 Distributed resources: internet resources (Maths Puzzles, Olympiad questions)	*In-class* • Y3-4 Socrates Hist • Y5-6 Humanities Prog • Y5 Electives – Bicultural Prog on Asia, Europe • Y6 Higher Advanced Hist (H3 Hist) *Objects and Symbols* • Y1-6 Distributed resources: print and internet (general)	*In-class* • Y3-4 Socrates Geog Prog	*In-class* • Y3-4 Socrates Hist • Y5-6 Humanities Prog • Y5 Electives – Bicultural Prog on Asia, Europe *Objects and Symbols* • Y1-6 Distributed resources: print and internet (History, general)	*In-class* • Y3-4 Socrates Chem • Y5-6 Socrates Chem • Y5 Electives – Chem Olympiad, other science-related modules • Y6 Higher Advanced Chem (H3 Chem) *Objects and Symbols* • Y1-6 Distributed resources: print and internet (Chem, Bio, Lit, general)	*In-class* • Y3-4 Socrates Hist • Y5-6 Humanities Prog • Y5 Electives – Bicultural Prog on Asia, Europe • Y6 Higher Advanced Hist (H3 Hist) *Objects and Symbols* • Y1-6 Distributed resources: print and internet (Hist, general)	*In-class* • Y3-4 Socrates Chem • Y5-6 Socrates Chem • Y6 Higher Advanced Chem (H3 Chem) *Objects and Symbols* • Y1-6 Distributed resources: print and internet (Chem, Geog, general)	*In-class* • Y3-4 Socrates Maths • Y5-6 Socrates Maths • Y6 Higher Advanced Maths (H3 Maths) *Objects and Symbols* • Y1-6 Distributed resources: print and internet (Maths, Phy, general)
				Out-of-class • Y5 Chem Olympiad (school-level trainers – teachers, elite seniors) • Y5-6 National IChO training team (school- and national-level trainers) • Y5 Research Attachment (external)	*Out-of-class* • Y5-6 National competitions/quizzes, e.g. UN essay competitions • International Symposium (prog, teacher, peers)	*Out-of-class* • Y5 Chem Olympiad (school-level trainers – teachers, elite seniors) • Y5-6 National IChO training team (school- and national-level trainers) • Y6 National IChO team (national- level trainers)	*Out-of-class* • Y5 Maths Olympiad (school-level trainers – teachers, elite seniors) • Y5-6 National IMO training team (school- and national-level trainers)

G20				G90			
ALEX	**GIBBS**	**KNIGHT**	**MICHAEL**	**JAY**	**MARK**	**MATTHEW**	**ZACH**
Socrates Subject 2	**Socrates Subject 2**	**Socrates Subject 2**	**Socrates Subject 2**	**Socrates Subject 2**	**Socrates Subject 2**	**Socrates Subject 2**	**Socrates Subject 2**
			In-class • Y3-4 Socrates Chem	*In-class* • Y3-4 Socrates Lit • Y6 Higher Advanced Lit (H3 Lit) • Y5-6 Socrates Bio	*In-class* • Y3-4 Socrates Chem	*In-class* • Y3-4 Socrates Geog • Y6 Higher Advanced Geog (H3 Geog)	*In-class* • Y3-4 Socrates Phy
				Out-of-class • Y5 inter-school Bio-related competitions		*Out-of-class* • Y3-4 Geog National Challenge • Y4-5 National Geog Olympiad training team (school-level trainers) • Y5 National IGeog final team (school-level trainers) Note: *Matthew was in the first ever IGeog team from Singapore.*	*Out-of-class* • Y5 Phy Olympiad (school-level trainers – teachers, elite seniors) • Y5-6 National IPhO team (school- and national-level trainers) • Y6 National IPhO final team (national-level trainers) • Y4 National Young Physicists Tournament training team (IYPT) • Y5 IYPT final team (national-level trainers)

APPENDIX N

Cross-Case Analysis of Micro-2 Systems

G20				G90			
ALEX	**GIBBS**	**KNIGHT**	**MICHAEL**	**JAY**	**MARK**	**MATTHEW**	**ZACH**
• Family (mother) • Network of family friends and contacts *In-class academic* • Y1-4 Regular academic classes • Y5-6 Academic Prog (Enhanced Class, teachers, peers; informal tutor role) *Objects and Symbols* • Y3-4 Print materials (Chem books/notes from Socrates peers) *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities (e.g., Maths Quiz, sports, drama) • Y1-6 Maths Club CCA • Y1-6 Scouts CCA • Y5-6 Canoeing CCA • Y5-6 Bridge CCA • Y1-6 CIP/Service	• Family (mother) *In-class academic* • Y1-4 Regular academic classes *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 Basketball CCA • Y1-6 Interact Club CCA • Y5-6 History and Strategic Affairs Society CCA • Y5-6 Community Service (Children's Home) • Y1-6 CIP/Service	• Family (mother) *In-class academic* • Y1-4 Regular academic classes (also social peers) • Y5-6 Academic Prog (Enhanced Class, teachers, also social peers) *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 Chinese Orchestra CCA • Y1-4 Debates CCA • Y3-4 Humanities Club CCA • Y4 School Publications CCA • Y5-6 Community Advocates CCA • Y1-6 CIP/Service	• Family (mother, twin brother) *In-class academic* • Y1-4 Regular academic classes (also social peers) *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 Water Polo CCA • Y2-4 InfoComm Club CCA • Y3-4 Science Club CCA • Y5-6 History and Strategic Affairs Society CCA • Y5-School Press CCA • Y1-6 CIP/Service – history-related, e.g., volunteer work at the Asian Civilizations Museum	• Family (mother) *In-class academic* • Y1-4 Regular academic classes • Y5-6 Regular A-level classes: Maths, Lit *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 Red Cross • Y3-4 Science Club CCA • Y5-6 Society of Biological Sciences CCA • Y1-6 CIP/Service	• Family (mother) *In-class academic* • Y1-4 Regular academic classes *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 School Choir CCA • Y5-6 History and Strategic Affairs Society CCA • Y5-6 Debates CCA • Y1-6 CIP/Service – history-related, e.g., volunteer work at Asian Civilizations Museum	• Family (mother) *In-class academic* • Y1-4 Regular academic classes • Y5-6 Regular A-level classes: Maths, Phy, Geog *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 School Publications CCA • Y2-4 Humanities Club CCA • Y1-4 Science Club CCA • Y1-6 Red Cross CCA • Y5-6 Alchemy Club CCA • Y5-6 Earth Club CCA • Y5-6 Bridge Club CCA • Y1-6 CIP/Service – Geography-related,	• Family (mother, sister) • Network of family friends and contacts *In-class academic* • Y1-4 Regular academic classes • Y5-6 Regular A-level classes: Chem, China Studies in English (an A-level subject unique to Singapore) *Out-of-class: larger school progs & CCAs* • Y1-4 House Activities • Y1-4 Fencing CCA • Y1-4 School Choir CCA • Y1-4 Maths Club CCA • Y1-4 Science Club CCA • Y5-6 Automatica (Physics) Club CCA • Y5-6 Maths Club CCA • Y1-6 CIP/Service – Maths-related, e.g., running a Maths Exploration Day for primary school

G20				G90			
ALEX	**GIBBS**	**KNIGHT**	**MICHAEL**	**JAY**	**MARK**	**MATTHEW**	**ZACH**
	Leadership roles • Y2 Class Monitor, Monitors' Council • Y2, Y4 Vice-Captain, Basketball Team • Y3-4 School Prefect • Y4 President of Interact Club • Y4 Prefects EXCO • Y5 Interact Camp in-charge) • Y6 School Orientation Prog (Group Leader)	*Leadership roles* • Y1 Monitor, Monitors' Council • Y2-4 School Prefect (social peers – younger school prefects) • Y4 Chairman, School Publications • Y4 Chairman, School Orchestra • Y4 Prefects EXCO • Y5-6 Class Representative • Y5-6 Events in-charge, Community Advocates	*Leadership roles* • Y1 Monitor	*Leadership roles* • Y2 Class Monitor • Y3-4 School Prefect • Y4 Prefects EXCO • Y4 Chairman, Red Cross • Y5-6 Cadet Officer, Red Cross • Y5-6 EXCO, Society of Biological Sciences		e.g., running a national environment workshop for primary school children	children *Leadership roles* • Y2-3 Class Monitor, Monitors Council • Y4 Group Leader, Choir • Y4 Chairman, Maths Club • Y4 Vice-Chairman, Science Club • Y4 Vice-Chairman, House Committee • Y5-6 Chairman, Maths Club

APPENDIX O

Cross-Case Analysis of Student-Peers Interactions (Extract)

Case study participant	Significant peer group/s	Formal or informal group	Year span	Nature of the peer group	Peer group functions
Knight (G20)	Y3-4 Socrates Geography class	Formal; organised by the school	Y3-4	Academic peers only	• **Time spent together:** ✓Scheduled academic periods, in-class activities in which the majority of instruction and participation occurred within the classroom. ✓Regular and sustained over Y3-4 • **Purpose/focus of peer group:** ✓Classroom peer group with a focus on the goal of TD in Geography • **Identity-definition for members (basis of connection and acceptance):** ✓perceived the class as a group of *like-minded* peers who were very interested in Geography ✓shared a common academic identity with his peers – felt that his peers brought class discussions to a higher level, leading to greater depth of learning and different perspectives in the subject. Knight said: *Socrates Geography, it was very interesting because you got to meet like-minded peers who are very interested in the subject. So, because of that, you were able to have discussions in class that were of a higher quality. You got to discuss more things in depth and of greater level with your peers. For me, it was good because they exposed me to different ways of looking at things. Very often, there were many "Aha moments" …. Yeah, so, the people definitely were the main factor and beneficial factor for Socrates.* ✓mutual support for one another's learning and progress in the TD process – Knight perceived that there was competition in class but found his Socrates classmates willing to help one another. He said: *Definitely you'll be stressed because of the competition around you but what I realised is that people actually were willing to help one another. There was this friendly competition but at the same time you help your peers as well to achieve the goal together*

Case study participant	Significant peer group/s	Formal or informal group	Year span	Nature of the peer group	Peer group functions
					• **Strength of peer network:** ✓There was a sense of connection to one another because of the time spent together in class, all focused on the goal of TD in Geography. ✓Peers served as a source of support for each other - students helped each other to stay connected in the group and stay focused on achieving group goals. ✓Knight felt he benefitted from the structured Socrates programme with frequent peer interaction and support in class, that gave focus to an area of interest ✓However, Knight was not totally immersed in this network of peers due to the time he spent with other groups. He didn't have access to many of the opportunities and therefore resources for TD. He may be said to be loosely affiliated with these students in reality. ✓Although he felt a sense of obligation to succeed, his time was invested in his leadership roles elsewhere.
	Regular subject classes	Formal	Y1-4	Social peers	• His social peers were students from his regular subject classes because he found them "*more down to earth"* and easier to talk to. *To hang out as a clique* [with Socrates peers]*, no, I don't think so. On the work basis, I do interact and work with those high flyers but on a friend basis, I usually relate better with people who are more average, really average …. Easily relatable I think, just being able to have and sustain a conversation well and be comfortable with one another's presence.*
	Leadership groups	Formal	Y1-4	Leadership peers	• Non-academic in nature; focus was on promoting student growth in leadership area • His leadership responsibilities bestowed upon him a specific identity that was non-academic in nature; not one that particularly promoted academic achievement or progression in TD • Knight adopted a particular identity in school but it was not one that promoted academic achievement or academic TD • Did not belong to peer groups in classroom based on TD academic identity

Case study participant	Significant peer group/s	Formal or informal group	Year span	Nature of the peer group	Peer group functions
Matthew (G90)	competition and Olympiad peers (in-class peer group within Socrates class); related academic CCA groups	Formal	Y3-4	Academic	• **Time spent together:** ✓curriculum hours in class as well as competition preparation and training ✓repeated interaction in competition preparation and training ✓regular and sustained over a significant period of time ✓individual gains as well as group gains, e.g., the drive to develop strategies for competitions; pushing each other to another level. Note: the Y3-4 Socrates class was a weak network for him because he was socially awkward around his Socrates classmates except for the few students who were in academic competitions. • **Purpose/focus of peer group:** ✓reinforcing strength and interest in Chemistry, Geography ✓competition training and sparring with the best of his peers ✓shared goal of excellence in competitions; promoted excellence and achievement goals ✓learnt to tap into multiple resource networks to support competition preparation ✓his teacher shared her observations of the synergy among group members: *Competition is where he drives you crazy, not in a normal class (referring to her Socrates Geography class). He will go all the way to find out so he will know more than you in the end. To win a competition, you need content and strategies. Matthew really comes alive. The four students (referring to Matthew's team-mates in national and international academic competitions) came together; they just blossomed and they ignited the fire in one another. They would teach each other. The sparring with each other actually pushed them to another level. You got people in the group who looked at maps since very young. So it spurred Matthew to go and find out. That is the part where you can really see his talent and gift.* • **Identity-definition for members (basis of connection and acceptance):** ✓like-minded interest in Chemistry, Geography ✓a drive to be the best; their identity was about being the best ✓took on role of trainer to younger peers – provided focus and direction to these peers

Case study participant	Significant peer group/s	Formal or informal group	Year span	Nature of the peer group	Peer group functions
					• **Strength of peer network:** ✓felt a sense of connection because of shared goal, interest, and the drive to be the best ✓all focused on achieving the same goals ✓a sense of obligation to succeed and to help others in the group succeed, including his juniors who were training for competitions
	Y5-6 Socrates class	Formal	Y5-6	Academic and social	• **Time spent together:** ✓Socrates peers became close friends because of repeated contact and interaction with the same set of peers over the years ✓learnt how to work better with others instead of focusing entirely on grades and results as in the secondary school years • **Purpose/focus of peer group:** ✓both academic and social ✓included hanging out after class, talking about things happening around school such as CCAs rather than just academic pursuits ✓provided social emotional support, e.g., when faced with a difficult period, Matthew went to these classmates because "*they were in the same situation as me; we struggled together."* ✓Note: Matthew's initial attempts at socialising beyond the Socrates group were unfortunately hindered by stereotyping by his non-Socrates peers. He said, "*We were seen to be all in our own world or just too smart. They were scared of us or found us too intimidating."* • **Identity-definition for members (basis of connection and acceptance):** ✓academic identity sustained over the years – "*the Socrates gang"* ✓strong academic identity with evolving interest/s in other areas in later school years • **Strength of peer network:** ✓felt a sense of connection to one another as a result of time spent together, including enjoying time as friends

Note: Two examples are provided in this extract: one case study participant from the G20 group and another from the G90 group.

APPENDIX P

Cross-Case Analysis of Student-Seniors Interactions (Extract)

Case study participant	Nature of relationship	Effects of relationship
Alex (G20)	• no direct contact with seniors who were Maths elites or with seniors in the academic area	• little influence on his interest in Maths
	• some face-to-face interaction with his House Captain in House activities	• role-modelling - House Captain inspired Alex to serve in the House Committee; might have influenced Alex to serve as Maths tutor to his Y5-6 classmates
Zach (G90)	• formal face-to-face interaction during planned training for the Olympiads and other competitions • regular and sustained interaction over a significant period of time	• 'conduits' for knowledge that are part of the tradition of the area/field o learnt '*what is good and what is no good'* in relation to advancing in the subject o taught him what to focus his energies on, whether learning something about subject matter or developing talent in general o broadened and deepened his understanding of the subject • helping him to envision possibilities, for example, Zach shared: '*They opened up my mind a lot …. There was one guy – the things that he did weren't really what most other people our age would do.'*
	• a strong bond developed over time	• a tight bond formed o from a sense of connection stemming from school tradition of senior-junior ties: seniors feel a sense of responsibility to help juniors succeed; juniors feel a sense of obligation to excel and succeed

Case study participant	Nature of relationship	Effects of relationship
		○ also connection from shared strong academic identity – that of strong drive to excel at the highest level • a social group formed at a later stage

Note: Two examples are provided in this extract: one case study participant from the G20 group and another from the G90 group.

APPENDIX Q

Cross-Case Analysis of Student-Teachers Interactions (Extract)

Case study participant	Quality of relationship with teachers	Examples of interactions with teachers
Michael (G20)	Did not think his Socrates teachers inspired him to engage deeper in the TD process – seemed to lack responsive attention in relation to student's goals – e.g., encouragement to work towards additional goals besides examination goals	• felt his Socrates History teachers facilitated his learning but were not quite the people who sparked his interest in the subject *I would say they helped facilitate my learning. I mean, everyone would need guidance from time to time but I wouldn't say that they are the ones who really sparked my interest….I think it was already there for me.* • valued his teachers for exam-taking guidance, not TD; perceived that interest to read was more important than his teachers. Teachers not the inspiration that got him into Humanities. *I read whatever extra notes they gave us …. I would do my own research. I wouldn't say it was like a self-driven, purposeful goal towards getting deeper into the subject. It was more of swimming with the currents. I would just go as deep as I could….I went deeper instead of just reading simply about medieval History. I read about historiography, the study of History itself, the philosophy of History.* • his Socrates History teacher felt that he was just moving along in class; he was very achievement-oriented when it came to examinations *He may have that interest; he may do other things without the teacher pushing but when it comes to the crux of giving up that interest for something else that is more practical, he will do what is practical….Before exams, he would come and talk to me …. It was really very exam-focused.*

Case study participant	Quality of relationship with teachers	Examples of interactions with teachers
Zach (G90)	close relationship of reciprocity with his Socrates teachers who were also his competition trainers – challenged and directed him to opportunities; helped in decision-making	• directed his efforts by providing opportunities such as competitions, extra-curricular training, lessons that stretched beyond the syllabus; such opportunities challenged and motivated him ○ Zach described competitions to be like windows to possibilities beyond the classroom, pushing him to learn more and motivating him. Success and rewards fuelled the appetite for more and pushed him to learn more. • advised and guided him in decision-making on what to spend time on. For example, Zach was initially so focused on Maths Olympiads that he thought of not taking the advanced mathematics class in Year 5-6 because the curriculum was not focused on Olympiad Maths but his teachers talked him out of it • the teachers role-modelled passionate commitment and drive for excellence – that motivated him to put everything he had into the competitions • felt that his teachers had particularly high energy levels when relating with them; attributed this to the synergy that flowed from greater student interest and capacity to learn

Note: Two examples are provided in this extract: one case study participant from the G20 group and another from the G90 group.

APPENDIX R

Cross-Case Analysis of Family Demographics, Climate and Values (Extract)

Case study participants	Family demographics	Family climate and values
Gibbs (G20)	• Two-parent family • One older sister • Housing type: 4-room public housing • Father's education: polytechnic level • Mother's education: polytechnic level	**Family climate** <u>*Quality of family relationships*</u> • close-knit family • respect for parents • mother was the key figure; close relationship – the first person Gibbs went to when he needed to talk about something; very supportive but felt she did not have the socio-cultural capital to help Gibbs navigate school • relationship based on mutual parents-child trust ("*I do my part, don't break their trust."*) • openness of expression and individuality within family ✓ granted a lot of autonomy in decision-making in the growing-up years as a result of accumulated trust between mother-child; Gibbs became more and more responsible with the autonomy given to him in response to the trust shown by his mother <u>*Parenting style and attitudes*</u> • low level of parental responsiveness in early years and school years: studied on his own even during primary school days • in the primary school years, Gibbs stayed with grandmother during the day when mother worked • little learning activities with mother • no parental pressure to study but he would study on his own after school every day • no behavioural supervision • no routines or rules established at home; no structure imposed

Case study participants	Family demographics	Family climate and values
		Values espoused / values modelled by parents • high priority on education • emphasis was not on being the best that you can be; being a good person was more important. Gibbs grew up feeling that who he is as a person is more important • mother had the notion that socio-cultural capital was needed to get ahead or excel in school; mother's comments at interview "*We are the family with no background …. I don't have strings (to pull).*" Note: Gibbs felt that his peers all read the "*atas"* books (referring to more scholarly books) while he read all the "*kiddie stuff"*.
Mark (G90)	• Two-parent family • Only child • Housing type: private condominium • Father's education: university level • Mother's education: university level	**Family climate** <u>*Quality of family relationships*</u> • close-knit family • respect for parents • mother played a dominant role; was particularly focused on child • very strong parental acceptance and warmth; Mark had the freedom and support of his parents to pursue his interests/parents encouraged him to follow his interest ✓ openness of expression and individuality within family ✓ mother practised autonomy granting and democracy in a loving and secure home; encouraged open expressions of feelings and thoughts; mother – "*I influenced him very much …. We spent a lot of time talking."* ✓ practised mutual respect and regard for each other's views <u>*Parenting style and attitudes*</u> • high priority on education • high level of responsiveness from grandparents and parents in the early years ✓ fostered early development of love for reading and interest-driven learning ✓ provided learning experiences and educational resources; visits to libraries from young

Case study participants	Family demographics	Family climate and values
		✓ provided initial introduction to Philosophy and other Humanities subjects when Mark was quite young, and ways of learning in that area; relaxed approach ✓ brought forth her knowledge, skills, experiences and interests from her own academic background in the Humanities • routine and rules for family life ✓ established a routine of intellectual conversations about school happenings; what was learnt in school; made links to the real world – parents' involvement in the talent area – conversations over dinner or family time allowed Mark to discuss, debate and explore ideas in the Humanities. **<u>Values espoused / values modelled by parents</u>** • high value placed on education • family believed that interest-driven learning leads to greater enjoyment of learning; driving factor for learning was not about pursuing academic achievement; "*let your children do what they are most interested in because interest is the key driver in succeeding at something."* • mother organised family life where intellectual conversations take centre stage; overall high intellectual interactions in the family – Mark enjoyed discussing and debating with his parents what he learnt in the classroom • consistent and coherent messages and behaviours in the family - adult role models in parents • Matthew socialised into reading, learning that is connected with the real world

Note: Two examples are provided in this extract: one case study participant from the G20 group and another from the G90 group.