

Nurturing for Talent Development and Impactful Research

NIE Higher Degrees Distinguished Speaker Series 2018

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ISSN: 2591-7218

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FOREWORD BY SERIES EDITORS

ASSOCIATE PROFESSOR MARY ANNE HENG AND
ASSISTANT PROFESSOR HAIRON SALLEH

GRADUATE STUDIES AND PROFESSIONAL LEARNING
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE



It is with great pleasure that we introduce the second publication of the NIE Higher Degrees Distinguished Speaker Series by the Office of Graduate Studies and Professional Learning (GPL) at the National Institute of Education (NIE), Nanyang Technological University, Singapore. This publication with the theme, *“Nurturing for talent development and impactful research”* is dedicated to all graduate students and the academic faculty who work tirelessly with their students.

The graduate school experience is a significant and exciting journey, yet also a challenging one. One challenge has to do with the development of talent among graduate students who aspire to contribute to their fields of study. Another challenge has to do with finding a research problem, one that is meaningful, worthwhile, achievable and impactful. This year, we invited Professor Rena Subotnik who is with the Education Directorate, and is Director, Center for Psychology in the Schools and Education at the American Psychological Association as the NIE

Higher Degrees Distinguished Speaker from 10 to 12 January 2018. This publication captures her key thoughts and ideas drawn from the Distinguished Lecture and Seminars she gave to NIE students and faculty. We were also delighted to welcome educators from the Ministry of Education and the Nanyang Academy of Fine Arts.

The Distinguished Lecture and Seminars revolved around important issues in the nurture of talent in schools and higher education, and insights into what it means to do impactful research. Professor Subotnik’s megamodel of talent development provided the conceptual framework for the development of talent based on domain specific abilities. In the Distinguished Lecture entitled, *“Talent development toward creative eminence in the 21st century”*, Professor Subotnik highlighted that the challenges posed by problems in the new century require a rethinking of the elements associated with the development of talent and creative productivity. In particular, the lecture

underscored that talent preparation is developmental in nature and teachable with guidance and practice. Professor Subotnik encouraged professors and education leaders to incorporate skills in mentoring their students, help students develop collaborative skills and resilience, and acquire insider knowledge of a domain.

In the seminar with NIE academic faculty and graduate students entitled, *“Talent development for STEAM: Applications from the psychology of high performance to academic domains”*, Professor Subotnik presented interesting research on multiyear students studying science and classical music that highlighted the differences between audition selection versus science testing, explicit versus no explicit psychosocial skills teaching, and other important applications from the psychology of high performance to academic domains. In the seminar, *“Nurturing young talents”*, Professor Subotnik provided new insights for identifying talent in the domain areas, and spoke about the variation involved in particular domains as to when abilities can be identified and nurtured, particularly in young children. The seminar with doctoral students from NIE’s EdD and PhD programmes entitled, *“Doing meaningful and impactful research”*, focused on valuable ideas for beginning educational researchers. She shared how randomised controlled trials (RCTs) can be designed and implemented with qualitative methods to analyse policy and research implications and get the most “bang” for all the hard work that goes into developing a RCT. Professor Subotnik also stimulated rich discussion among a panel of NIE senior professors to discuss what NIE could do to attract, develop and retain talented academics and researchers.

We would like to take this opportunity to acknowledge all who have contributed to this

publication. Foremost, our special thanks to Professor Christine Goh, Dean, Graduate Studies and Professional Learning, NIE, for initiating the NIE Higher Degrees Distinguished Speaker series, and for germinating the idea for this publication. Beginning with the first Distinguished Speaker, Professor Andrew Brown, University College London Institute of Education (2012), Professor Bruce Fuller, University of California Berkeley (2013), Professor Christopher Day, University of Nottingham (2014), Professor Andrew Tolmie, University College London Institute of Education (2015), Professor Charles Kinzer, Teachers College, Columbia University (2016), and Professor David Labaree, Stanford University Graduate School of Education (2017), we are proud to present the second publication of the NIE Higher Degrees Distinguished Speaker Series 2018.

Our grateful thanks to Professor Rena Subotnik, NIE Higher Degrees Distinguished Speaker 2018 for her big and provocative ideas on talent development, creative productivity, eminence research, and the importance of doing meaningful and impactful research. Our grateful thanks to the writing and editorial team from the NIE Doctor in Education programme headed by Ho Im Neo and comprised (in alphabetical order) Peter Lye, Ng Sue Chia, and Saravanan Sathiyaseelan who all did wonderful work in summarising the rich array of discussions and ideas in the talks. Our appreciative thanks to Dr. Andrew Pereira and Mr. Lim Soo How for their careful editing work and review, and to our wonderful colleagues, Jaslyn Ng, Nurhasni Binte Khamis and Noor Azizah Binte Mokhtar from GPL for their highly professional support.

And to all our fellow educators, we hope this publication will bring forth fruitful and enriching new conversations.

Associate Professor Mary Anne Heng
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National Institute of Education, Nanyang Technological University, Singapore
Series Editors, NIE Higher Degrees Distinguished Speaker Series, June 2018, Singapore

FOREWORD

PROFESSOR CHRISTINE C. M. GOH

DEAN, GRADUATE STUDIES AND PROFESSIONAL LEARNING
NATIONAL INSTITUTE OF EDUCATION
NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE



The challenges posed by the complex problems of the 21st century require new ways of working with individuals and institutions to enhance the development of talent and creative productivity - the theme of the NIE Distinguished Speaker Series 2018. The National Institute of Education (NIE) has gained respect as a world-class educational institute within the Nanyang Technological University that has earned a global reputation for academic and research excellence as top among the world's best young universities since 2014.

With the emergence of new domains in education requiring disciplined and interdisciplinary scholarship, graduate students need to learn to think bigger and to aspire as leaders and creative producers in their fields of study. To engage in meaningful and impactful educational research,

universities would need to determine appropriate opportunities to transform abilities into expertise for high-level scholarly productivity or artistry, a central message in the series of talks by Professor Rena Subotnik, NIE Higher Degrees Distinguished Speaker in 2018. In graduate education, it is important to build a culture that can attract and develop talented young scholars and intellectuals as well as stimulate the drive for lifelong learning among educational practitioners in schools and other educational settings.

This second publication is strong testament to NIE's role in nurturing for talent development and impactful research in graduate education. I am delighted to know that this publication is a result of the rich ideas and discussions from our students in the Doctor in Education programme at NIE in their

engagement with the talks given by our Higher Degrees Distinguished Speaker, Professor Rena Subotnik from the American Psychological Association from 10 to 12 January 2018. I am confident this publication will bring about much

deep reflection and inspiration in its readers, and specifically, our graduate students who are deeply committed to developing their talents in doing meaningful and impactful research.

Professor Christine C. M. Goh
Dean, Graduate Studies and Professional Learning

National Institute of Education, Nanyang Technological University, Singapore

PREFACE

PROFESSOR RENA F. SUBOTNIK

AMERICAN PSYCHOLOGICAL ASSOCIATION, USA
NIE HIGHER DEGREES DISTINGUISHED SPEAKER 2018



January 2018 was the occasion of my third memorable professional visit to Singapore. All three engagements made evident to me NIE's consistent commitment to self-improvement and drive to steer the future toward positive change.

The first visit, in 2001, was with the Ministry of Education to discuss student character development and education with the Gifted Education Branch. I returned 16 years later to consult with the Office of Educational Research (OER) at NIE on further engaging a broad range of Singapore youth in creativity and innovation. Happily, many of the ideas that were generated by both MOE and the international consultants during the first visit had been implemented with notable success. I once again had the pleasure of observing in a few schools and engaging in conversation with school administrators.

In addition, I met with OER scholars and was able to review the large bank of OER research on creativity

and innovation applied to various subjects and student populations. In a summary report submitted to OER, I argued for continuing to embed critical and creative thinking instruction in school and co-curricular subjects rather than as separate skills. I also argued for increased attention to psychosocial skills development that would help free students from self-defeating cognitions, habits, and attitudes.

The purpose of this last visit was to turn a systematic scientific lens on promoting talent more broadly, not only in the pre-university sphere, but in higher education as well. More specifically, I was asked to consider how NIE can enhance the preparation of faculty and students for creative productivity during times of shifting values and uncertain futures.

Pre-University

The Singaporeans I interact with know their country's resources and what remains to be done.

Those of us who come for a short yet intensive visit benefit from the insights and expertise of those we meet and the materials we are given to read. And yet, I worry when I hear concern from Singapore colleagues about their country's focus on traditional measures of academic achievement, and how this is stressing students, educators, and their families. The world I live in is one where achievement is very low, except for a segment of the population with upper middle-class aspirations (even if they don't have the associated resources). At least half of those who wish to attend university in the US are so poorly prepared that they need remediation in basic reading, mathematics, and writing. Clearly, neither high levels of stress exhibited in Singapore nor lax standards leading to poor preparation are acceptable conditions.

I would argue that Singapore's problem is one that can be solved because of manageable numbers of students in the school system, the centralized approach to education, the mission-driven approach that appears prevalent in NIE and MOE, and the talents of those working on these issues. I would like to propose alternative directions that can be taken and directed by NIE (with their partners at MOE) to help find a better balance between stress and academic preparation.

- Create subject matter instruments embedding items that promote creative productivity in addition to problem solving with important knowledge and skills. This approach is more labor intensive to score, but would reward all students for the kind of thinking that is most valued by the country. To be clear, I am not suggesting replacing tests of achievement, but enhancing them including items that must elicit creative and practical intelligence. Such items would not have right or wrong answers, but students would have to explain how to solve a given problem in their class or community that is related to the curriculum and meets criteria for usefulness, originality, or elegance. There are existing mechanisms for scoring this kind of work including the Future Problem Solving Model, although NIE has the expertise to come up with Singapore specific instruments and procedures.

- Continue the trend of testing out those who can show they have mastered the required curriculum in advance of high pressure school leaving points (primary and secondary). Currently, students at a few Singapore secondary school programs have been freed from preparing for the O-level examinations and can instead invest their time toward pursuits other than test preparation. Testing out might also include changes to policies for polytechnics and examinations, which appear to be the source of greatest stress for Singapore students. Can students, for example, take that set of tests or subtests more than once? Can they submit some evidence of mastery to substitute for some subjects that make up the examination (e.g. a published article, a book of poetry reviewed by a well-known poet or critic)?
- Finally, and in my mind, most important, provide psychosocial skills coaching for all students to deal with stressful situations like tests. There are also techniques available for managing time optimally, such as prioritizing assignments and expectations. Some other examples of valuable skills might include keeping out noise or visual distractions, contradicting internal messages that one is not good enough, and reinforcing growth mindsets.

My recommendation is to continue to pursue academic excellence on the part of students of all ages on the academic and arts fronts, with the caveats mentioned above.

To enhance creative opportunities, students of all ages and achievement levels need to be mentored in authentic activities, as well as provision of insider knowledge, training in social skills, and acquisition of mental skills like overcoming fears of failure and lack of confidence. This would mean working collaboratively with co-curricular programs and with institutions outside of school like universities, clubs, museums, hospitals, and corporations.

Higher Education

I discussed with NIE faculty and students the current pressures on universities and institutes, including a burgeoning array of new specialties and subjects

with great career opportunities such as behavioral economics. Several countries are also exploring constructive affiliations across professional schools such as engineering and the arts that share “the studio” as the center of instruction. Finally, many societal and scientific challenges can only be met by teams of experts rather than individuals, and students need preparation in the science of teamwork to be optimally effective under these changing conditions.

Unlike when I was in a doctoral program, today’s graduate student is expected to exit at completion with a few publications. The competition for academic positions is more severe as universities shrink the professoriate and rely on post-doctoral fellows and non-tenured adjunct faculty to conduct much of the teaching. Faculty are under pressure to produce more publications and more grants so that they can leave a mark on their fields.

In addition, according to Bertil Andersson, former president of NTU, foreign scholars will have to be recruited for the professoriate because there are not enough native born potential scholars to sustain universities and institutes in Singapore (e.g. only 30 percent of postgraduates of NTU are locals). Andersson claims that the lure of more financially lucrative jobs is greater than the magnet of scholarly life in Singapore universities.

What to do?

Attract and retain faculty and students:

- Help native and foreign graduate students and faculty learn the ropes. The insider knowledge needed for successful advancement in academe is not obvious and not equitably distributed. Those individuals who have had mentors that guided the process are lucky and rare. For example, how do you juggle pressures to publish

and conduct research with nurturing students and serving the community?

- Graduate students need to be introduced to gatekeepers in the professions and careers they aspire to enter. Those gatekeepers will be able to share what they seek in candidates, and what they consider central to and peripheral to excellence in the field.
- Invite gatekeepers to advise students on how to promote themselves tastefully, how to capitalize on their strengths, and to determine what are strategic risks that lead to creative work.
- Faculty collegiality is important. It sets the tone for students, and makes coming to work more pleasant and rewarding. The institution needs to make opportunities for enjoying each other’s company as easy as possible. These occasions don’t have to be typical celebrations, but could include discussions of faculty work in progress, for example, inviting feedback from colleagues and from graduate students. This is what aspiring playwrights and composers will often do, why not scholars?
- Provide special guidance to foreign students and professors on life in Singapore and how to enjoy and benefit from the experience optimally.
- Provide coaching for faculty wishing to enhance their presentation, negotiation, or grant writing skills.

The future can be daunting but is filled with opportunities to augment the already high-level visibility of NIE. I hope that some of the suggestions provided in these reflections will be useful. I strongly believe that the talent and will of the institution’s participants will lead NIE to find a good balance between mission-driven and entrepreneurial-driven work, increase the possibilities of interdisciplinary and inter-professional collaboration within NTU, and provide leaders and creative producers for new and traditional domains in education.

Professor Rena F. Subotnik

American Psychological Association, USA

ABOUT THE NIE HIGHER DEGREES DISTINGUISHED SPEAKER 2018



Professor Rena F. Subotnik began her position as Director of the Center for Psychology in the Schools and Education at the American Psychological Association (APA) in January 2002. Before she came to APA, she was Professor of Educational Psychology at Hunter College, where she coordinated the secondary education program and served as research and curriculum liaison to the Hunter College laboratory schools (grades PK-12). Her research expertise lies in creativity, innovation and talent development. She is co-author of “Rethinking Giftedness and Gifted

Education: A Proposed Direction Forward Based on Psychological Science”, “The Talent Gap”, and “Malleable Minds: Translating Insights from Psychology and Neuroscience to Gifted Education”. She is also author of “Genius Revisited: High IQ Children Grown Up” and “A Guide to Incorporating Multiple Methods in Randomized Controlled Trials to Assess Intervention Effects”. She received the Mensa Education and Research Foundation’s Lifetime Achievement Award in 2013.

TALENT DEVELOPMENT FOR STEAM: APPLICATIONS FROM THE PSYCHOLOGY OF HIGH PERFORMANCE TO ACADEMIC DOMAINS

PROFESSOR RENA F. SUBOTNIK

10 JANUARY 2018, SEMINAR, NIE, SINGAPORE



Introduction

STEAM is an expansion of the acronym STEM, which stands for Science, Technology, Engineering and Mathematics. The “A” represents the arts, and the focus of this talk is on applying learning from the arts to STEM. For this seminar, Professor Subotnik focused primarily on the psychology of high performance in the field of music, as applied to academics, particularly STEM. Professor Subotnik began by presenting the broad theoretical framework for her research. Professor Subotnik spoke of an earlier longitudinal study, *Genius Revisited* –

High IQ Children Grown Up (Subotnik, Kassin, Summers, & Wasser, 1993), which looked at the lives of a group of 300 high IQ, upper middle-class students in their 40s and 50s who graduated from Hunter College Elementary School, one of the most selective educational institutions in the United States. One important goal of the school was to “normalize” high IQ by helping children feel comfortable with their giftedness. Although many of the graduates went on to be professionals with great social values, the study also revealed that the graduates were not outstanding contributors

compared to others their age and of their social class. The lesson gained from the study for Professor Subotnik is that beyond having abilities, one needs a hunger for achievement to creatively transform one's discipline or field of work.

She also discussed Sternberg's (1997) Theory of Successful Intelligence where success is associated with strategically deploying analytical, creative, and practical abilities. For example, musicians need analytical abilities to read a sheet of music, and creative abilities to perform pieces in novel ways that distinguish them from other performers. They also need practical insights into how to ensure that their creative innovations are more likely to be well-received by the public.

Benjamin Bloom's (1985) well-known book, *Developing Talent in Young People* looked at the evolution of world-class sculptors, swimmers, tennis players, pianists, neurologists, and mathematicians and found three developmental stages that can be mapped on to teaching. The first teacher helps the child to fall in love with the domain. The second teacher models and inculcates the values, knowledge and skills of the domain. The third teacher helps the student find a special niche and original voice.

As a result of these studies, Subotnik argued for the following theoretical premises related to talent development in STEM/STEAM:

- Most abilities (cognitive, physical, and psychosocial) are malleable and need to be deliberately cultivated;
- The realm of elite talent or scholarly productivity and artistry exists beyond expertise and this is defined as ground-breaking performance or transformational ideas;
- Transiting from novice to expert and beyond, some key personality, ability and

skill factors become increasingly important and others decreasingly important.

The lecture went on to describe three recent interrelated studies:

- Study 1 compared the preparation of gifted musicians at the Juilliard School, a world-renowned classical music conservatory in the United States, with education and experience of same age science research awardees;
- Study 2, "Wisdom from the conservatory" looked beyond musical abilities, and focused on the importance of psychosocial skills and practical intelligence;
- Study 3, "Wisdom from gatekeepers" focused on influential individuals such as artistic directors and critics to find out what they thought students needed to become great performers.

Study 1

Professor Subotnik proceeded to speak about the differences between elite music and elite science education. First, admission criteria for academic programmes usually employ a standardized examination, one where the students do not know the questions beforehand. For Juilliard, however, admission criteria are explicit in that students attending auditions know what they are expected to perform. Explicit criteria posted on the website allow for preparation. Another notable consideration is that talent manifests at different stages for different instruments. For example, violin students can apply to the pre-university program as early as four or five years of age. Vocalists, because they rely on physical maturation of their lungs and vocal chords, tend to apply at around age 16. In other words, giftedness may not be visible at the same time for all domains.

A third difference between music and science education is that almost all teachers in music conservatories are practising musicians. However, not all science teachers have experience as scientists. Fourth, music instruction is mostly individual, and teacher selection is key. Studying young winners of prestigious awards for science research and scholarship to universities, Professor Subotnik found that, in general, almost all science students wanted to go to Harvard because of the prestigious university name but had no idea which professors they could work with. In contrast, young winners in prestigious music competitions knew which teachers they wanted to work with and determined their selection of conservatory based primarily on that.

Fifth, all students at Juilliard must perform in front of all the professors in the department at the end of each year for a pass or fail assessment. In academic domains, assessment is primarily based on the outcomes of examinations, and less often via performance-based approaches. Finally, Juilliard has a series of compulsory classes for students where students are taught how to behave in various situations related to their profession, handle stress and rejection, get an agent, get their professional picture taken, do taxes and other practical skills. Professor Subotnik argued that for talent development in any domain, there is value in promoting these types of practical skills.

Study 2: Developing psychosocial skills

Professor Subotnik collaborated with Linda Jarvin at the Paris College of Art in a study involving three world-renowned classical music conservatories: Curtis Institute of Music, New England Conservatory and Juilliard School. They conducted individual interviews with students and teachers in three departments (string, voice and brass), and six gatekeepers (four artistic

directors and two newspaper critics). **Table 1** translates the study outcomes into a series of transitions as one moves: (a) from ability to competence, (b) from competence to expertise, and (c) beyond expertise to eminence.

Factors that remain consistent over the talent trajectory are musicality, intrinsic motivation and persistence through bad and good times. Beyond these three, when moving from abilities to competencies, students have to learn fast and recognize patterns. This becomes important again when they reach the professional level:

When you're studying, it's good to be able to learn quickly because that will challenge the teacher. It challenges me whenever a student does his homework. I have a few students whom I have to teach the same things every week, but when you have a kid who comes in who actually practises, it keeps me on my toes. I learn just as much teaching him as he does studying with me. That skill should strengthen with age because you develop the mental capacity to analyse anything you encounter when you're playing. That's especially important when you're out of school. (Juilliard brass faculty).

Competence to expertise

As students move from competence to expertise, parental pressure is no longer required and can be counter-productive. On the other hand, parental emotional and financial support, remains critical for students. Initially, the teacher is responsible for the students' development, but over time it is the students who must become more responsible for monitoring their own strengths and weaknesses. In the course of this change, students may begin to challenge the teacher with his or her own ideas, and a good teacher will welcome thoughtful pushback.

Having access to practical insider knowledge and learning to “play the game” become more crucial as students transition from competence to expertise (Wagner & Sternberg, 1985). Building connections and playing the game well is also important for development in STEAM. The art of tasteful self-promotion to mentors and agents can be taught. In US schools with a good mentoring program, science students train on how to deliver an elevator speech. This is where they imagine themselves to be in an elevator with a very important person and have 30 seconds to pitch their idea. Elevator speeches provide excellent practice soliciting audiences to posters at a conference or science fair.

Expertise to Creative Productivity

For musicians, it is important not to become a diva. Gatekeepers expect a reliable professional who can quickly analyse musical structures and patterns, be flexible and have depth of understanding of the work. Being creative also means pushing boundaries. This in turn can lead to great acclaim or friction and challenges with the status quo.

In the conservatory, every student aspires to be a soloist but not all will succeed. For many, being in a quartet and orchestra is not a dream job but students have to accept that or lose their chance to perform. Teachers continue to capitalise on students’ strengths and students likewise will have to focus on developing their strengths further. Students have to learn to promote themselves through agents, mastering the game, learning how to engage patrons, and exuding self-confidence. Professor Subotnik again stressed that learning how to control one’s emotions and reduce distractions are teachable skills. She gave the example of chess players who use strategies to distract their competitors, and sportsmen acclimatising themselves to hostile

spectators. This also applies to musicians performing on stage.

On strategic risk-taking, Professor Subotnik shared a quote from a founder of the Juilliard String Quartet:

In performance, there is an absolute interesting knife-edge, where you have to go across a very thin place which drops on both sides. What I tell my pupils is, “One side is control and on the other side is letting go of control and losing it. You have to live in that thing, and you’ll constantly be losing [your] balance, and you have to correct it and be going along this very narrow path where you can’t let go. You have to get the audience to feel on the edge of their seats the way the performer must feel between the edge of control and letting go.”

Another study of participants in a violin competition revealed how important it was for participants to analyse who the judges were, avoid competing with the judges’ own repertoire and style, and be technically perfect. If they win the competition they are awarded a concert where they can finally let loose and show off their charisma and flair. A good mentor informs students about strategic repertoire and stylistic decisions in competition and other performances.

Study 3: Wisdom from gatekeepers in the talent development of classical musicians

Artistic directors and critics, in contrast with competition judges, found that performers with technical flaws can be interesting. They argued that two of the hardest things to teach are that of musicality and charisma. In musicality, nothing compares to the experience of a live performance with an emotionally engaged artist who invites the audience to listen to the music.

The following is a summary of insights from gatekeepers:

- The role of insider knowledge in developing expertise and exceptional talent needs to be made more explicit;
- Two important abilities appear to be innate (musicality and charisma) in differentiating star-level music talent from other levels of music performance or other domains of eminence. These are qualities that can be enhanced but not taught;
- Beyond musicality and charisma, factors contributing to exceptional talent shift over time, especially variables associated with practical intelligence and psychosocial skills.

In general, teachers and gatekeepers tend to agree overall on the developmental stages of musical abilities. Because teachers interact with a broader developmental range of musical talents than do the gatekeepers (who typically only hear exceptional talent, i.e., musicians having reached the stage of scholarly productivity or artistry), teachers sometimes have a more nuanced perception of the mediating variables that enable a musician to progress from one stage to the next.

There are two implications from this work for talent development in music and other fields:

- Social and personal factors play a key role in fulfilment of talent, especially at the most advanced levels;
- Because not everyone is “naturally” socially adept, talented young people need explicit exposure to practice with social skills as well as to insider knowledge from those who hold the keys to success.

Professor Subotnik engaged the audience in a discussion about application of these ideas to high performance in other domains. **Table 2** gives a comparison of differences between performers and producers. Exemplars of the performer category include singers,

instrumentalists, dancers, actors, and athletes. The producer category includes composers, choreographers, writers, and scholars/scientists/ academics. Academic domains are the least likely to convey explicitly the importance of psychological strength training, even though there is a tacit understanding that handling adversity and success productively and with grace, and demonstrating good social skills are helpful to engaging others with one’s ideas. Professor Subotnik’s key point is that highly relevant skills for success and talent development are not taught explicitly in academic domains, whereas parallel skills are routinely a part of coaching in performance domains such as the arts and sports.

Question-and-Answer Session

Associate Professor Mary Anne Heng served as moderator in the question-and-answer session that followed the seminar.

Audience Member 1: When does the teacher or adult start to worry about correcting mistakes that are technically incorrect? When do teachers start implementing all the additional requirements to get students to a higher level of learning?

Professor Subotnik: That is a million-dollar question. If school teachers had one-on-one instruction with students as is the model in music, they could probably determine better when students are ready. I would keep two things in mind. One is that you can use extrinsic rewards to initiate learning of material or skills that are not inherently interesting. And always be clear about what is the goal of mastering those skills and that knowledge. After a while, children may ask for more information and skills, and that is when teachers need to help bring them to another level of learning. In general, there is this natural point of wanting to discover more about things one is interested in.

Audience Member 2: Does that mean the teacher gives students time to find their way with their materials and allow time for the discovery bit before coming in to guide students with some criteria and prompts? It is more like giving some balance to the learning.

Professor Subotnik: Giving children total freedom is not always productive. Provide opportunities in class for both creative problem solving and those that require a right answer. Explain explicitly why each serves a purpose. For example, students need to learn established maths to do more creative things. Give young children challenging materials to excite them and give them time to address the questions they want to pursue.

Audience Member 3: On the point about gatekeepers and tacit knowledge, I was wondering if it is worth talking about who they are, and how we could invite them to work in our various educational settings.

Professor Subotnik: They could be journal editors, program officers for grants, or school administrators who hire personnel. In order to be successful in academia, one has to publish papers. The gatekeepers in publishing would be the editors and the reviewers of various journals. I once confidently submitted a paper for publication on the results of a major grant project to a prestigious journal and was dismayed when I received a notice of “reject and resubmit.” I did not resubmit the paper there, but rather to a less prestigious one. Later I learned at a panel of journal editors that “reject and resubmit” means what it says. They went on to say that they often reject 90% of papers they receive, but they will entertain resubmissions that integrate the given feedback. It would be good to have editors or someone from a search committee talk to students about how to apply for grants, and what to expect when submitting papers for publication.

Audience Member 4: Relating to restoring of one’s self-confidence, I was following a blog of a short story writer who wrote about the number of times he was rejected. I did not realise that as a novelist, you need to submit 500 times before even getting one’s story accepted. Similarly, with an artist I know, I asked how he became successful. He said that he had to keep on drawing many times and not give up despite being rejected over and over again.

Professor Subotnik: That is an excellent story. I once ran a programme for students gifted in chemistry. The students equated being good at chemistry with doing well in secondary school courses, but the curriculum did not reflect what happens in a real chemistry laboratory. Therefore, we set them up to work for a year after school in a lab. In another project, a Harvard mathematician expressed frustration with students believing that success in Mathematics Olympiads was reflective of what mathematicians do. Mathematicians may take years to identify and solve a mathematical problem, while the Olympiads devote three hours to a given problem. Clearly persistence and intrinsic motivation are essential to success in STEM, as well as exposure to authentic work environments. Sometimes it’s easier for STEM students to see and understand all the hard work and preparation that goes into arts performance. We can draw their attention to the parallels in STEM.

Audience Member 5: On the topic of not giving up especially in music and how students have to practise to perform, I have studied music for eight years and would want to recommend that parents send their kids to study music. I remember the wisdom of teachers telling their students when it is appropriate to move on, and not be stuck playing the same note over and over again.

Professor Subotnik: I would also recommend schools bringing in a sports psychologist to talk to academic students. Students tend to admire people with ability in sports and it would help to hear how sports psychologists work with athletes to teach them how to deal with losing confidence when they have a setback.

Audience Member 6: On the selection of students for highly selective academic schools such as the Hunter College Elementary School and from the findings of the study you shared, I would like to ask if there are any changes in the use of IQ tests to incorporate other admission criteria.

Professor Subotnik: No. This is because it is so competitive at the school that parents whose children apply will not accept criteria they think are subjective. They want a standardized test score to differentiate a child admitted from those who are not. However, IQ is used only to limit the pool of applicants to 300. The three hundred are then invited to come in for a classroom “audition” where they are observed for engagement and readiness for challenging work. The final number of admitted students is 50 per year.

Audience Member 7: I can see how your research is useful for the performing arts in Singapore and can provide a possible model for restructuring the curriculum. The model gives great depth to the dispositions and skills schools would want to develop. For the Nanyang Academy of Fine Arts in Singapore, the school has always invited successful artists to talk to students. Just as in music where persistence and resilience continue to be important even after one reaches eminence in performance, performers can go on to co-create and produce new work.

Professor Subotnik: Now let’s bring some of these ideas to academic arenas!

Questions for reflection

1. With reference to the model of talent development by Subotnik, Olszewski-Kubilius, and Worrell (2011), how could schools identify talents and help students develop abilities to competence?
2. In developing abilities to competence, competence to expertise and beyond, teachers must first lead. How do we get teachers to be motivated to do so?

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Table 1: Transitions from ability to competence to expertise and scholarly productivity/artistry

Ability to Competence	Competence to Expertise	Expertise to Scholarly Productivity/Artistry
<i>Instruction with emphasis on exposure and guided practice</i>	<i>Instruction with emphasis on moving beyond technical proficiency</i>	<i>Socialisation into the field and networking guided by master teachers, agents and other gatekeepers</i>
Learn fast, analyse patterns and structures	Solid foundations enabling you to quickly learn new materials	
Technical Proficiency	Technical Proficiency	
Parental support or pressure	Parental support	
Teachability	Teachability and ability to teach oneself	
Quality of student-teacher experience	Quality of student-teacher experience	
External rewards: Recognition	External rewards: Recognition, opportunity to perform, and financial independence	
Persistence in good and bad times	Persistence in good and bad times	
Intrinsic motivation	Intrinsic motivation	
Musicality	Musicality	
	Knowing your weaknesses and strengths	
	Self-promotion	Promotion of self through an agent
	Learning how to play the game	Mastering the game
	Social skills: Collegiality	Social skills: Collegiality and engaging patrons
	Restoring self-confidence	Exuding self-confidence
		Risk taking
Charisma	Charisma	Charisma

Table 2: Similarities and differences between performers and producers

	Performers	Producers
Similarities	<p>Must master the content within the domain. Need guided and deliberate practice and/or study. Must have commitment and motivation. Domain values are inculcated by mentors – what is considered beautiful, elegant, worthy of pursuit. Psychosocial variables limit or enhance success.</p>	
Differences	What you need to practice is more clearly defined – results of practice are seen more easily.	Tasks are more diffuse, long term and multi-component.
	Judgments of experts are trusted throughout the process.	<p>Judgments for selection in academic disciplines, at least at the pre-collegiate level, are not trusted, and objective tests serve as a stand in.</p> <p>Judgments of experts are trusted in fields such as composition, playwriting, and visual arts.</p>
	Physical abilities are important – you do not have them forever, which constrains the arc of talent development.	No physical delimiters.
	Greater winnowing and fewer opportunities over time.	Room for a greater number of producers, particularly in domains designated to target societal need.
	More current focus on mental skills training.	Little current focus on psychosocial skills training.
	The outcome of excellence and creativity is clearer—better sense of knowing the path and where you are going.	Clear only in some areas (e.g., academic publications, grants, awards).
	Domain is appreciated more widely by the public.	Appreciated by insiders.

NURTURING YOUNG TALENTS

PROFESSOR RENA F. SUBOTNIK

11 JANUARY 2018, SEMINAR, NIE, SINGAPORE



Introduction

In this seminar, Professor Subotnik focused on the nurture of young talents. Several complicating factors include: (a) difficulties in identifying talent in some domains, (b) variation as to when abilities can be identified or nurtured in young children, (c) determination of appropriate opportunities to transform abilities into expertise, and (d) availability of psychosocial skills coaching when challenges lead to loss of confidence or motivation. Professor Subotnik began her seminar by speaking about the misconception that the traditional measure of IQ is a predictor of adult talents. She then proceeded to elaborate on seven principles for nurturing creative productivity.

Principle 1: Abilities are necessary but not sufficient

Although IQ is a good predictor of traditional school ability, it is a mediocre predictor for outcomes beyond school. Furthermore, IQ is an insufficient predictor of an individual's potential for creative productivity. Hence, the new focus of giftedness represents a shift from being good *generally* to being good *at something*.

Professor Subotnik provided two illustrations of domain talent. She shared about Eliot Feld, an American ballet performer turned choreographer who recognised domain specific talent abilities (e.g., body proportion, flexibility, physical memory) as crucial to identifying children who could excel in a specific field like dancing (Subotnik, 2002). She then quoted

another example from a mathematical institute that developed an instrument for recruiting children to recreational mathematics clubs. It screens for a *mathematical cast of mind* (Krutetskii, 1976), which is defined as possessing a mathematical worldview predicated upon patterns, prediction and numbers. This worldview also includes mathematical insight, which is the ability to think outside the box, number-sense, and ability to translate concepts into symbolic systems. Hence, the nature and importance of domain-specific talents differ by discipline.

Principle 2: Opportunities matter

Professor Subotnik emphasised that opportunities matter and need to be developed appropriately. Referring to Benjamin Bloom's book, *Developing Talent in Young People* (1985), which studied the trajectories of highly talented individuals in their 40s from six different fields, she highlighted the following:

- In the earliest stage, the job of the teacher (sometimes a parent) is to help the student fall in love with a subject or topic;
- At the next stage, it is critical that teachers help the individual develop skills, knowledge and values of the domain;
- At the third stage, the teacher serves as a mentor to help the individual find a special personalised niche and voice.

There is a natural timeline for these teaching stages, although this varies according to individuals and domains. She highlighted the challenges of mapping teaching onto developmental trajectories both inside and outside of school where such opportunities are affected by:

- Chance and family values (e.g., high performers often having somebody from their family in that field);
- The first teacher making a huge difference (e.g., a parent in a field provides good guidance or knows a good teacher who excels in the field);
- The judicious use of pressure/support (e.g., pressure from parents may not be necessary but could be an important impetus for the child to overcome initial obstacles);
- The need for professionals with insider knowledge of various domains (e.g., someone in a school system who possesses knowledge on how to help the talented student pursue career aspirations).

Principle 3: Domain developmental variations

Professor Subotnik highlighted that different talent domains vary in terms of when talent begins, peaks and ends. **Figure 1** shows the talent developmental trajectories in and within three domains, music, athletics and academic domains.

The beginning of a talent trajectory in a domain depends on when talent skills and abilities emerge and coalesce. In music and sports, this is due to physical maturation. Identification also relies on the ability to recognise talent by systematic procedures (e.g., school programmes) or knowledgeable adults (e.g., parents). Professor Subotnik provided the example of how violin players could start their specialisation earlier as compared to vocalists who have to wait until their voices mature.

She noted that prodigies do not exist in areas like diplomacy, psychology, sociology and so on as development in these domains begin later.

	Childhood	Adolescence			Adulthood		
		Early	Middle	Late	Early	Middle	Late
Music							
Voice 1-Early Specialization	Start Peak	End					
Violin--Early Specialization	Start				Peak		End
Wind Instruments			Start			Peak	End
Voice 2--Later Specialization				Start		Peak	End
Athletics							
Sport 1-Early Specialization	Start			Peak/End			
Sport 2-Later Specialization		Start			Peak/End		
Academic							
Math	Start				Peak		End
Psychology				Start		Peak	End

Voice 1 exemplar is a boy soprano; Voice 2 exemplar is traditional vocal talent development
 Early Specialization includes gymnastics, figure skating, diving
 Later Specialization includes team sports, track and field

Figure 1: Trajectories for different talent domains

The developmental course of domain trajectories is affected by training and education, which is tied to the schooling system in many academic areas. Peaks are also affected by the amount of training and education needed to reach high levels of expertise. Research suggests that there is a much larger base of talent than is currently being tapped.

Principle 4: Talent development is a long-term process

Talent development activities, primarily in the form of enrichment, should be provided to *all* children as early as possible. Students who demonstrate sufficient effort and task commitment should be supported with progressive challenges and talent development opportunities, regardless of their age.

Supporters of talent in academic domains tend to think in terms of school level, such as getting their students into a good secondary school,

rather than long term career trajectories. Schools should enable children to advance in academic domains where they show interest and talent, with the understanding that children will show advanced development and achievement in some areas and age-appropriate development and achievement in others. Hence, teachers with high levels of content knowledge and technical expertise are needed even at the earliest levels of education or training to meet the needs of young, very advanced children. Such teachers are also more likely to be aware of after school and summer activities that can reinforce these interests.

Principle 5: Taking opportunities

Professor Subotnik suggested possible reasons for why children or adolescents do not take talent development opportunities:

- Having abilities in an area but not having an interest;

- Fearful that parents or friends would not approve of their participation (e.g., cannot get a job from pursuit in the talent domain);
- Do not want to specialise yet;
- Do not have strategies or insider knowledge to meet goals;
- Afraid of failure.

Fear of failure was found to be the biggest problem.

Principle 6: Mental skills

Professor Subotnik stated that mental skills are important to prepare students to be tough and persistent. She cited an interesting U.S. study that recorded inputs from thousands of high school students based on three attributes (brilliant or average, studious or non-studious, athletic or non-athletic). The hypothesis was that brilliance was the death of popularity. [A member of the audience noted that in China, brilliance would be the most preferred attribute.] However, most of the high school participants preferred people who were brilliant, but only if they were non-studious and athletic. She noted how unfortunate it is that brilliant people may need to mask their hard work.

She urged us to think about capitalizing on the natural admiration people have for performers by recruiting coaches who can share what they do to help children be successful in sports:

- Focus on avoiding distractions;
- Overcoming fears;
- Strategic risk-taking/dealing with chance factors;
- Persisting through bad and good times;
- Impulse control and delayed gratification.

Professor Subotnik emphasised that these skills can be attained with guidance and practice and are also useful in the academic domains. Elaborating on the issue of avoiding distractions, she spoke of Josh Waitzkin, an American chess player and a martial arts competitor. As a young chess player, Waitzkin came to realise that an opponent was subtly tapping a chess piece on the table during crucial moments of the game, and this form of distraction was a Soviet mind control technique. Once Waitzkin was told by another coach about the tactic being employed by his opponent, it was no longer a distraction. In another example of avoiding distraction, she cited the example of the how the American Olympic shooting team, prepared to go up against Chinese shooters who were national heroes favoured to win the gold at the Beijing Olympics in 2008. To prepare for the crowd rooting against them, US sports psychologists prepared iPod files of hostile crowd noises to listen to during workouts.

To deal with stage fright, she shared how musical performers in Juilliard's horn department were asked by one teacher to run up and down stairs to raise their heart rates before playing. This simulated the physical effects of stage fright to help performers overcome it. On impulse control and delayed gratification, she cited the "marshmallow test" conducted by psychologists in 1960s and early 1970s, testing five-year-olds on their ability to delay gratification. She mentioned that the results showed that children who waited and could control their impulse to eat the marshmallow turned out to be more successful in their lives. For chance factors, she related the example of Leonard Bernstein, a famous conductor who had a lucky break when a senior conductor became ill and Bernstein was asked to take over at short notice. Bernstein was ready and prepared for this chance opportunity to conduct and became an overnight sensation.

Principle 7: Social skills

Without excellent persuasion skills, it is difficult to get even the best ideas accepted and implemented. The science of persuasion may be associated with advertising and marketing as a form of manipulation. However, the science of persuasion, if harnessed creatively and ethically, can be very effective in reshaping thoughts and improving practices. Other important social skills include being a good and reliable colleague, as well as figuring out the “game” or insider knowledge in a particular field.

Professor Subotnik, however, cautioned that there is also a need to deal with envy and competition that comes along when eminent performers begin to push against boundaries and the status quo. She referred to a US study conducted on female university students in science where it was found that females tended to support each other when it was perceived that one of their group was not doing well. However, when one is doing better than everyone in the group, they were likely to withdraw their support. Males were shown to be supporters of those who were successful, but not of those having difficulties. Clearly, neither approach is optimal.

In summary, she recapped the following pertinent points:

- Talent is based on abilities that need to be developed;
- As one develops, abilities rest in domains, i.e., adults are not generally gifted;
- Opportunities must be offered both inside and outside of school;
- Children, parents, and teachers need to become familiar with the talent trajectories that are offered;
- Good psychosocial skills allow individuals to develop their talents optimally;
- Psychosocial skills can be taught.

Question-and-Answer Session

Associate Professor Mary Anne Heng served as the moderator in the question-and-answer session.

Audience Member 1: Mindset is a key factor that links an individual to a particular domain. Could you speak about this please?

Professor Subotnik: Yes, without a growth mindset, students will not put themselves in challenging situations that might threaten their identity as a talented person in a domain.

Audience Member 2: My wife has a student, a primary school boy who is into programming, but his mum does not allow the child to use a computer. The mother does not even have a computer in the house to prevent the child from using one at home. This suppresses the child’s natural talent.

Professor Subotnik: This is tragic but a great example of a mismatch between home culture and the child’s talents. The mother does have legitimate concerns about access to the internet, but these can be reasonably addressed.

Audience Member 3: I am coming from the area of science. How early should we begin to assess talents in science?

Professor Subotnik: In elementary school. You might look for mathematical cast of mind in potential physical scientists – children who ask about predictions, patterns, or counting. Future life scientists might be collectors of nature, categorizing what they collect in interesting ways. I do know that if we keep looking for globally gifted students, we might miss kids who are great in some things and not others.

Audience Member 4: I wonder if you can comment on the impact of media and other technologies on talent development?

Professor Subotnik: Existing literature shows the negative impact of such technologies on children's ability to concentrate and focus, but some kids certainly do creative things with these tools.

Questions for reflection

1. Which particular talent domains should be given focus in terms of talent development?
2. How do we assess talent in different areas?
3. Where do we find experts to teach psychosocial skills?

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TALENT DEVELOPMENT TOWARDS CREATIVE EMINENCE IN THE 21ST CENTURY

PROFESSOR RENA SUBOTNIK

12 JANUARY 2018, LECTURE, NIE, SINGAPORE



Introduction

Much has been written about the social and scientific problems that face the world in the 21st century, including climate change and economic inequality. Professor Subotnik's Distinguished Lecture entitled "Talent development towards creative eminence in the 21st century" focused on how higher education institutions can enhance the development of talent and creative productivity to tackle challenging problems of the new century. The lecture highlighted the evidence behind a talent development approach that features identification of domain specific abilities and a particular focus on the psychosocial skills that will be important for 21st century learning and

working environments (Subotnik, Olszewski-Kubilius, & Worrell, 2011). Based on a review of the existing psychological research literature, this model was conceptualised to apply to all fields of talent including performance domains, such as sports, music, and dance, and production domains, such as mathematics, writing, and psychology.

Using the talent development process for performance and production domains as a framework, the lecture focused on the issue of preparing leaders for the 21st century. In particular, the aim was to encourage professors and education leaders to incorporate psychosocial skills in mentoring their students and teams, as well as keeping them resilient in

the face of challenge. Professor Subotnik framed her lecture with the following questions: (a) How are scholars and performers typically prepared? (b) What aspects of performance training might be usefully adapted for scholars?

The challenges proposed by complex 21st-century problems require a rethinking of the elements associated with talent development. There is thus a need to explore new ways to develop talent in organisations. Professor Subotnik suggested that music performers, for example, may be better adapted to change due to their special preparation and training, which includes many experiences of rejection with follow up analysis on how to improve. Professor Subotnik invited the audience to draw inferences from her research on the talent development of music performers to their own growth and career trajectories.

Trends and paradigm shifts in traditional domains and academe

The lecture commenced with a horizon scan of trends that may affect academic careers and productivity. Key changes include the emergence of new domains and fields, and the changing demography of students, academics and professionals in the traditional domains.

Professor Subotnik provided the example of behavioural economics as an emerging field that melds domains such as psychology, economics and sociology. Traditional economic theory assumed that consumers were rational in their spending habits and decisions, Behavioural economics has challenged this view by providing evidence that social pressure or when you have last eaten will affect decisions on how one votes, buys a home, or pardons prisoners. The impact of behavioural change on economic decisions has had significant impact on politics and economics. Another emerging area brings together the fields of engineering and the arts.

Preparation in both fields requires complex interdisciplinary teamwork and intelligence in the form of studio design. This preparation process is crucial for students to adapt creatively to both engineering and arts-related scenarios.

The Hays Quarterly (2015) reported how the domains of digital marketing and sales, and traditional accounting creates a demand for students and professionals well-versed in both fields. This implies that experienced professionals in banking, cyber security and IT risk management sectors could apply their expertise beyond traditional domains. This would also signal a possible paradigm shift in the development of talents in new domains.

Professor Subotnik noted that former NTU President, Professor Bertil Andersson reported that Singapore's local population is unable to sustain projected growth in Singapore's academic sector given that NTU's graduate population of native Singaporeans is about 30%. Thus, there is a need to recruit from overseas. Also, it may be a case that Singaporeans have many other career options to choose from beyond academe and traditional professions. This diversity of choice makes it difficult to encourage Singaporeans to choose academia over other career paths. In the United States, schools are admitting students of more diverse backgrounds and abilities to make up for the enrolment shortfall. However, many of these students are under-prepared and this has implications for long term talent preparedness and retention.

In academia, the demands of high performance for faculty and students have, in recent years, started to include expectations for academic publishing and securing grants. The press for creativity together with the demand for high performance might limit the ways in which someone could stand out. This highlights the importance and challenge of talent retention and promotion of creative productivity. How

could universities and graduate schools better prepare students in graduate programmes as well as professors and staff with professional development? Professor Subotnik presented a case for harnessing insider knowledge and using coaching methods for psychosocial skills based on the central tenets of the megamodel model of talent development (Subotnik et al., 2011).

Talent development blueprint: Seven principles

Together with Paula Olszewski-Kubilius (Northwestern University) and Frank Worrell (University of California Berkeley), Professor Subotnik spent over a year examining psychology research on creativity and creative productivity in various fields. These included sports, mathematics, science and music. The search resulted in a synthesis of seven major principles for talent development in different domains as follows.

Principle 1: Individual abilities matter, but are not sufficient

Abilities matter, particularly abilities associated with specific domains of talent, such as spatial reasoning in sculpture or engineering. General abilities or IQ are good predictors of traditional school achievement, but they do not predict the full development of potential in creative productivity and outstanding performance. Notably, both general and domain-specific abilities are malleable and can be increased with training, study, and practice, but students have to be intellectually ready to pursue the work of achieving high levels of expertise and creativity.

Principle 2: Opportunities are critical at every point

Professor Subotnik discussed a book, *Developing talent in young people* by eminent educational

researcher, Benjamin Bloom and his team in 1985 who led a ground-breaking study with 140 world class performers or scholars under the age of 40 in six different fields: concert pianists, sculptors, Olympic swimmers, tennis players, research mathematicians and research neurologists. The individuals, as well as their teachers, parents and coaches were interviewed. The study revealed astonishing information about the development of talent in young people. All of the world-class professionals in this book had a first teacher who helped them fall in love with the subject which the individuals eventually excelled in. At the second stage of talent development, this interest was honed by another teacher who helped the individuals master the knowledge and skills as well as apply the values and dispositions unique to their areas of expertise. At the third stage of talent development, yet another teacher, an elite in the field would serve as a mentor to hone talent, commitment and passion into an original “voice”. These experiences offer insights into how world-class professionals are developed and the preparation needed to help graduate students discover their unique contributions.

Principle 3: Different talent domains have different trajectories

Professor Subotnik shared her research work with the Juilliard School, a world leader in performing arts education. She noted that by the time violinists enrolled in Juilliard at age 18, they would already have accumulated at least 14 years of experience as most violinists start playing at the age of four. Hence, many violinists who audition at the Juilliard School would already have an agent and are seasoned stage performers. In contrast, wind instrumentalists would only start when they are teenagers. This is because wind instrumentalists need developed lung capacity to play effectively.

Likewise, singers typically begin training in the late teenage years when their vocal chords and lungs are ready. This variation in the starting points of talent development in a domain is also observed in academics. For instance, while mathematics abilities can be identified in very young children, for a subject like psychology, early identification is more difficult. This is because the domain of psychology requires insights into human behaviour and emotional maturity, which need time to develop. This is also evident for athletes in their respective sports, with gymnasts starting very early and golf starting later. These comparisons show domains differ in their start, peak and end points.

Principle 4: Providing a pathway to outstanding achievement is a long-term project

While many abilities and competencies are developed in educational institutions, the talent development process is not limited to formal schooling. It very much includes co-curricular programming such as internships or apprenticeships. Finally, it doesn't end after formal education but continues in the form of coaching or mentoring.

Principle 5: Opportunities must be taken

Professor Subotnik reminded us that some people do not take up talent development opportunities that are offered to them. It is possible to be good in something but not interested in developing one's talents further. Non-participation might also result from concern that others may not approve of your participation in a domain. The most likely obstacle is that of a fear of failure. This is especially pertinent to people who are not used to being challenged or exposed to safe and constructive opportunities to fail.

Professor Subotnik referred back to her research on 80 participants in three world-renowned conservatories in the United States that nurture young music talents: Curtis Institute of Music, The Juilliard School and The New England Conservatory. She interviewed teachers, students and gatekeepers (comprising four Artistic Directors and two newspaper critics) in three departments (string, voice and brass) on factors associated with success in the classical music world. She pointed out that in competitive arenas, being an expert or a master of a field is not sufficient. Beyond expertise, lies the realm of ground-breaking performance or transformational and creative ideas. Ironically, while being highly creative is viewed as achieving the pinnacle of one's field, a creative individual may pay a price for challenging the status quo. It is thereby important for a creative individual to be prepared with the necessary skills to deal with possible confrontations and challenges to the creative work.

Principle 6. Mental skills are critical to the development of talent

There are several ways to develop psychological or mental resilience. These include avoiding distractions, overcoming fears, taking strategic risks and dealing with chance factors. To illustrate this, Professor Subotnik narrated the life story of Leonard Bernstein, a talented musician and music composer who became a world-acclaimed music conductor by virtue of a chance opportunity to stand in for another conductor. What was important was that Bernstein was not only supremely talented, but also ready and prepared to take on the role that was thrust on him. This example exemplifies the importance of learning to be ready for chance opportunities, taking strategic risks and persisting through both good and tough times. She also spoke about the "marshmallow experiment". In this experiment, child

participants are given a marshmallow and monitored for their ability to control their impulse to eat the marshmallow. In a longitudinal study based on the marshmallow experiment, it was found that children with a higher ability to delay gratification generally do better in life academically, socially, and even physically.

Principle 7: Social skills are critical to the development of talent

It cannot be assumed that a supposedly good idea will always win people over. As such, preparation for talent development should also include the cultivation of social skills such as persuasion, dealing with envy and competition and figuring out the “game”. Professor Subotnik shared an example of how as a teenager, Bill Clinton’s social skills made him stand out in a high school meeting with then President John F Kennedy. In the Juilliard School, performers are formally guided on how to behave in front of an audience, recruit patrons, handle performance stress, get an agent, complete tax returns and so on. These social skills are developmental in nature and trainable with guidance and practice.

Conclusion

What does it take to move from competence to creative productivity while remaining socially accepted? What aspects of performance training might be useful for adaptation by scholars? Research findings show that picking the right people to work and study with is vital to sustaining a more holistic talent development process. Further, coaching in psychosocial skills needs to be explicitly provided in academia. Those without access to insider knowledge are placed at a disadvantage. Bringing in the gatekeepers of a field can help in making explicit the insider knowledge of a field.

In closing, Professor Subotnik emphasised that collaborative skills will become increasingly important in this 21st century. The future is about building teams of experts working collectively on interdisciplinary problems. New advances in technology will see the emergence of new domains that require multiple areas of expertise to make progress on solving major and complex societal problems. New domains require both leaders and creative producers. Deep multidisciplinary expertise, cognitive diversity, creative thinking skills, psychosocial skills to manage stress and competition, the ability to work collaboratively, and finding personal meaning in chosen work, will become even more critical to developing childhood potential into adult creative productivity.

Question-and-Answer Session

Audience Member 1: Is it necessary for everyone to follow the seven principles of talent development given that not everyone is creative and has high IQ?

Professor Subotnik: The goal of talent development does not have to be at the Nobel Laureate level. The point is, as a teacher, you would want to contribute and be the best possible teacher in your domain. Most people would not be happy doing the same thing for 10 years without improving their game. If you are going to be a professional, you would need to focus on improving your game and sharing your discoveries in the classroom with other people. If you are going to a conference, you might write about what you do. This is creative productivity. If you change the way you and others operate to enhance the learning experience of your students, you are engaging in creative production.

Audience Member 2: In your view, what is the most important consideration for educators in reforming the current education scene for the

benefit of learners in a volatile, uncertain, complex and ambiguous (VUCA) world? Personally, I believe that fortune favours the prepared mind.

Professor Subotnik: Singapore is struggling with education related challenges that are different from what we struggle with in the US. I know you are concerned with the price of high stress for high achievement. In the US, we see the opposite whereby low educational standards result in children and youth who are not prepared to think critically because of insufficient vocabulary and problem-solving skills. In both cases, however, beyond academic achievement, it is important to have psychological skills and good values to live a meaningful life.

Audience Member 3: In my view and as an educator, I believe it is about mindsets. It is important to have a growth mindset that every child can succeed.

Professor Subotnik: The way to cultivate a growth mindset is to be challenged early on. When things come too easily and consistently early on in life, it may cultivate a belief that “If I have to work at something, I am not smart.”

Audience Member 4: I am enrolled in the Masters in Special Needs Education programme. What is your opinion of educating neuro-diverse children who are integrated into the same classroom as neuro-typical children? Should they be placed in a classroom specifically tailored to their needs? Would neuro-typical children benefit from learning alongside neuro-diverse children?

Professor Subotnik: The answer to these questions have become more nuanced in recent years such that some children can benefit from integration than others. Having a specialist on

hand in the room is really important. It is so hard on teachers with huge heterogeneity in their classrooms to manage without support. So, the idea is great, but the implementation has to be well conducted to reap the benefits of integration for neuro-diverse children and their classmates.

Questions for reflection

1. Professor Subotnik’s lecture drew attention to talent development as a long-term process with differing starting and peak points across various domains. In Singapore’s context, what are some assumptions about talent development and possible challenges to long-term talent development?
2. How could we tap on the findings of performers and music talent development to further enhance socio-psychological adaptability and resilience as well as develop tenacity for Singaporeans to take strategic risks?
3. How would you move from competence to expertise to creative productivity in your domain while maintaining social acceptability?

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DOING MEANINGFUL AND IMPACTFUL RESEARCH

PROFESSOR RENA F. SUBOTNIK

12 JANUARY 2018, SEMINAR, NIE, SINGAPORE



Introduction

The journey for beginning educational researchers is exciting and admirable yet fraught with challenges. One set of challenges has to do with choosing a research focus to address a specific gap in the body of knowledge and using a robust research method or design to defend the knowledge contribution to be made. In this seminar, Professor Subotnik shared some strategies with beginning educational researchers on what it means to do impactful intervention research. She highlighted how Randomised Controlled Trials (RCTs) could be designed and implemented with qualitative methods to analyse policy and research implications and get the most for all the hard work that goes into developing an RCT.

Professor Subotnik began by encouraging the recently matriculated graduate students to aspire in their career for the “gold standard” in research. She stated that RCT using multiple methods is one such gold standard, although it is not a design often used because of the high cost associated with it. Professor Subotnik focused on three topics important for graduate research: (a) finding a research question, (b) conducting RCTs with multiple methods, and (c) research issues with special populations.

Finding a research question

Professor Subotnik noted that *finding* a research problem or question to explore is the hardest part of the process as *problem solving* is usually

given more priority and practice throughout the educational process. Posing a good research question requires modelling, practice and great mental focus. However, once the research question is established, the research process can unfold accordingly. Professor Subotnik drew from Zuckerman's (1977) book, *Scientific Elite* that describes the development of Nobel Laureates in the United States. Zuckerman argued that the most important aspect in the mentoring they received lay in fostering "taste" in research questions. In other words, the question must be elegant. It must have the characteristics and qualities of being impactful, meaningful and achievable.

Comparing the preparation of a natural science and social science (or education) graduate student, the latter would typically have more responsibility in formulating the research question. In the example of biology, a principal investigator could typically obtain a grant and would provide the student with a relatively concise scope of inquiry as part of the dissertation requirement. For social science research in the field of education, the tradition is to have students develop research questions by themselves. While this is challenging, this would give students some space for creativity for addressing important issues.

Professor Subotnik elaborated on considerations when selecting a problem. Students need to be cognisant that some problems are not even researchable, and such an endeavour is therefore pointless. Furthermore, as every problem resides in a domain of interest, sufficient reading must be done for the student to know the field's problems.

A good understanding of the literature would allow one to improve on existing research and contribute to the advancement of knowledge in that field.

Professor Subotnik spoke about the various reasons why students pursue a graduate degree. If the aim is to join academia, then the dissertation can serve as the beginning of a life's work. Concurrently, the risk of challenging the status quo must be carefully assessed. It may be wiser to take on a risky inquiry after getting tenure in academia. Also, the selection of a research problem that is achievable within the timeframe of the degree programme is a key consideration. Because of the expense and extended time frame, RCTs might not be the best design to use for a dissertation, unless under the supervision of a funded principal investigator.

Conducting Randomised Controlled Trials (RCTs) with multiple methods

RCT is a research design that is optimally used to determine the effectiveness of an intervention under given conditions. However, RCTs are very expensive as there is a need to control all known variables involved in the intervention. This would mean not only financial costs but also ethical or political challenges (e.g. randomly assigning students to treatments). For example, there is a body of literature on girls underperforming in calculus classes. In one research study, an RCT was conducted requiring a random assignment of girls to either single sex or co-educational classes. However, the school found it challenging to assign the girls to a particular class type as the choice might not be available for one reason or other. There was also potential resistance from parents as it was likely that parents would demand that their children be selected for the experimental class if the intervention is perceived to support their child's development. These are the potential issues that a researcher must deal with for the inquiry to be scientifically rigorous.

Professor Subotnik advised that it might be best to start with theory building or intervention building using qualitative methods (e.g. interviews, observations) or quantitative methods (surveys). She shared a valuable resource by Grissmer (2016), *A Guide to Incorporating Multiple Methods in Randomized Controlled Trials to Assess Intervention Effects*, produced by The American Psychological Association. The document (<http://www.apa.org/ed/schools/teaching-learning/randomized-control-guide.pdf>) describes the rationale and processes for conducting RCTs. Professor Subotnik proceeded to talk about two classic research studies using RCTs that were described in the document and conducted in the United States.

The first research study was “Tennessee STAR”, which investigated the impact of smaller class sizes on academic achievement in the state of Tennessee. This research involved 6,500 kindergarten students in 79 participating schools. Students in a single cohort (the 1986-1987 entering cohort) were randomly assigned to one of three groups: (a) large class (average of 22 to 24 children) with teacher aide, (b) large class without teacher aide, and (c) small class (average of 15 to 16 children). All teachers in the study were experienced and randomly assigned to classrooms. The students were scheduled to remain in the treatment group from kindergarten through 3rd grade. Every year, mathematics and reading tests were administered to children to collect data on their achievements in these two areas. Other data comprised questionnaires and time logs for teachers and teacher aides. In Year 4 of the study, teachers rated each child who participated on a 28-item questionnaire that focused on behavioural data. As part of the research design, the children were also tested on mathematics and reading achievements in 8th grade and SAT on completion of secondary

school. The research team faced several challenges: attrition of students from participating schools, entry of new students and parental interference (where some parents insisted on their child being assigned to a smaller class).

Results of the research showed that participation in smaller classes, as well as longer exposure to smaller classes, led to statistically significant student achievement gains in both reading and mathematics above the other two settings. The positive effects continued into secondary school, even after returning to normal size classes. Most notably, the effect sizes were much larger for minority and disadvantaged students. Another interesting finding was that having a teacher aide in a larger class was positive but not significant statistically as teacher aides do not spend much time teaching, and teachers felt it required a lot of their attention to supervise teacher aides.

The research findings excited policymakers, which then led to political pressure to offer smaller classes to *all* early childhood students. Policymakers in California, holding a state surplus in the budget, decided to implement smaller classes in the elementary grades throughout the state. The consequences of applying research conducted in Tennessee to California led to several challenges. In terms of infrastructure, there were not enough classrooms and some classes had to be conducted in borrowed spaces such as store fronts, garages, and so on. There were also insufficient teachers available thus newly recruited teachers with least experience had to be hired, and experienced teachers in challenging schools opted to move to wealthier districts. This created a disruption and led to the unintended consequence of increasing the student achievement gap. Although the study indicated that smaller classes were more effective than larger classes, the conditions for

the success were ignored by policymakers. Hence, the value proposition of RCTs lies in the qualitative component, which provides the important explanation of *why* things work. The use of RCTs with multiple methods makes it a “gold standard” for research.

The second RCT study was entitled “Moving to Opportunity”. The MTO programme was designed to assess the impact of providing families living in subsidised housing in high-poverty neighbourhoods in the United States with the opportunity to move to neighbourhoods with lower levels of poverty. Unlike in Singapore, where the majority live in well-maintained public (subsidised) housing, public housing in the United States is typically for the poorest families. This research study was premised on the assumption that a family unit should thrive once they move out of a high-poverty neighbourhood. It was assumed that parents would have better job opportunities and children would do better at school. A total of 4,248 families were assigned by lottery to three groups: (a) Control Group received no new assistance and stayed in subsidised housing, (b) Experimental Group 1 could move to subsidised housing without geographic restriction, and (c) Experimental Group 2 could move to an area with poverty rate of less than 10%. Baseline interviews were conducted to collect demographic information. Interviews with all participating household heads as well as their school age children were also conducted. In addition, subsamples of children were administered achievement tests, and searches conducted for juvenile arrest records and so on.

The research findings were surprising in that despite the move to a neighbourhood with lower poverty level, there was no significant improvement in income and job opportunities across all groups. Qualitative interviews indicated that the adults in the study typically held jobs such as those in fast-food restaurants

that they came to know about through word of mouth. This meant it was difficult for people to improve their employment situation when they shifted to a neighborhood where few of their neighbours were employed in the fast food industry. There were also no effects among groups on children’s academic achievement and no difference in risk behaviour for boys. Follow up data collection found important outcomes:

(a) some positive effects on measures of adult and child mental health for those in the experimental groups, (b) girls in experimental groups had improved mental health and lower risk behaviours (e.g., arising from fewer incidents of sexual harassment), and (c) reductions in obesity for those in experimental groups but not in other physical health measures.

After a period of stay in the new neighbourhoods, some families decided to move back to their old neighbourhoods, giving reasons such as better job opportunities and higher comfort level for their children to be in the schools the parents were more accustomed to. The outcome of the research showed that the opportunity for families to move to a less poor area led to no significant improvements in parents’ employment incomes and children’s academic achievements.

What were the policy implications for the researchers in the “Tennessee STAR” and “Moving to Opportunity” (MTO) projects and what (additional) data should/could the researchers have collected? Professor Subotnik pointed out that we should expect differential effects across populations because of each person’s inherent and environmental history, and that qualitative data are important in helping to explore the impact of these factors on outcomes. Project STAR used observational data on why small classes worked, together with teacher and teacher aide logs, surveys and interviews on why teacher aides did not make a

sufficient difference in larger classes. The MTO researchers conducted follow-up interviews to test hypotheses of why girls fared better than boys in new neighbourhoods and why there were no effects on employment or income. However, the MTO research was conducted without sufficient preliminary research on the lives lived by participants (in terms of compliance and how they got jobs). Hence, the critical lesson in using RCT is the importance of using both quantitative and qualitative methods. In particular, qualitative methods help to uncover *why* interventions are effective (or not).

Research issues with special populations

Professor Subotnik turned next to research issues with special populations. The first step in studying special populations (e.g., gifted or special needs) is to have a clear and concise definition of the population being studied. An example showing the complexity of a concise definition is the concept of “giftedness”. Is giftedness based on IQ or is it about being talented in some demonstrable domain? The clarity and conciseness of definitions are paramount to doing research with special populations.

A key consideration is “ceiling” and “cellar” effects. One example concerns the potential benefits of any intervention for academically gifted students who are already top-notch performers. What would constitute the desired outcomes of success for an intervention programme for the gifted? Would this be about closing achievement gaps, outstanding performance or creativity? Another consideration is the selection of a comparison group. If the intent is to study Nobel Laureates, who would make a good comparison group? If the focal group of the study is NIE’s doctoral students, who would make a good comparison

group? One student replied that a comparison group could be graduate students from another country, to which Professor Subotnik asked if the institution in a different country is equivalent to NIE. Another student suggested that perhaps other doctoral students from NTU could be a better-matched comparison group for NIE doctoral students. Professor Subotnik agreed that this would be a more promising comparison group, although NTU does not offer education courses. She suggested doing a cross-sectional analysis, possibly comparing gender or different age groups.

Sample selection is also another important consideration. Convenience and large samples are the usual approaches. Convenience samples employ participants more easily accessible to the researcher. Researchers may have to explore their own networks if they are unable to obtain a cooperative sample for their study. In a study of schools with non-random samples, it would be important to ask if the results of the study will be generally representative of all schools. Another challenge might be low response rates despite a large sample size, and the effects on the study’s findings.

Conclusion

In her closing remarks, Professor Subotnik noted that it is important for researchers to have the tenacity and resoluteness to identify and address research challenges. She added that the intent of her seminar was not to discourage new graduate students, but to provide insights into the challenges and complexities in the research process. With the guidance of research supervisors, students must think about the meaningfulness of their study. Finally, it is important to have clarity in the desired outcome for a research study. For example, would this be about closing an achievement gap for lower functioning children or about creativity or some

other desirable outcome measure? What is fundamentally important is to ask an elegant research question so that the research will be impactful, meaningful and achievable.

Question-and-Answer Session

Professor Subotnik began the question-and-answer session by posing a question to the audience: “What needs to be studied?”

Audience Member 1: The effectiveness of different instructional techniques. What happens in classrooms? How teachers think about themselves as learners and professionals? What are teachers’ beliefs? What are teachers’ strategies and how do they choose and apply these strategies?

Professor Subotnik: These are all variables of interest. One current philosophical debate is about direct instruction versus inquiry, that is, when and how often a teacher should present instruction directly and when and how often children should find information for themselves.

Audience Member 2: The advancement of technology. How does it impact teaching and learning? Examples could include augmented and virtual reality. Much investment has been made in these areas, so it would be important to know how teachers can use technology to design lessons for students. Currently, there are limited effectiveness studies in this area.

Audience Member 3: It may be quite sensitive to determine the effectiveness of technology use in schools as it might be deemed a failed investment or a waste of public funds.

Audience Member 4: Even though technology is used, there is still a need to determine the benefits of direct instruction versus that of content creation. Who is creating the content? Teachers or students? The direction of inquiry would largely be dependent on the research question.

Professor Subotnik: These are the interesting questions. Even if you find out that technology is more effective, or not, the question then becomes under what conditions and for whom?

Audience Member 5: The aim of research in general is to improve the human condition. Does market research, which studies the human psychological process in an effort to lure people into buying more, improve human condition?

Professor Subotnik: There are two things to consider about the human condition. First, is the role of beauty. Without music, art, and great ideas, our lives will be very sterile. Second, some might think that the purpose of market research is manipulation, but what if we could harness it productively in education? Persuasion literature is interesting. There is this “nudge” theory where governments are using behavioural science and psychology to encourage people to be better citizens.

Audience Member 6: The use of digital devices by children and its impact should be studied.

Professor Subotnik: Younger people tend to have background music while they work and they are very productive. For me, digital devices are just distractions.

Audience Member 7: There was a survey done on NTU students on the use of digital devices. Seventy percent of students found technology distracting, but they still wanted more technology in their instruction.

Audience Member 8: It can be useful and distracting at the same time. The question is, “Under what conditions should technology be used?”

Professor Subotnik: In companies, you have people spending a huge proportion of time on texting and sending non-work-related emails. At the end of the day, they are more stressed as they did not get their work done. We are at a transition point now and there are lots of

interesting questions to ask. I think we should capitalise on the positive outcomes of technology and figure out how to manage it better.

Associate Professor Heng: To find a meaningful and worthwhile research problem, I would suggest that graduate students look deeply into your own lives, both in terms of your personal and professional experiences. Think hard and reflect deeply about something that you care about or are disturbed about, and discuss your thoughts and ideas with your colleagues, professors and family to get at what really matters to you.

Professor Subotnik: To add on, if you have a research question in mind, you can be more efficient going through your graduate programme by using your courses to build on the research. Connect the research question to the courses, for example, use the research methods class to think about how you can operationalise the research. Students who start their graduate programme with an idea could improve on it through the coursework. This could also save much time as it is always easier to write papers for your courses on the topic you are interested in rather than on different topics. At this juncture, Professor Subotnik asked Associate Professor Heng about the research question that fuelled her interest at the beginning of her doctoral dissertation.

Associate Professor Heng: As I was reading the literature for my doctoral research at Teachers College, Columbia University many years ago, I recalled being fascinated by Robert Sternberg's idea of tacit knowledge. In Sternberg's (1997) book, *Successful intelligence*, he said that in the real world, it is not uncommon for those who were "B" grade students in school to do better than those who were "A" grade students in school. What this means is that "B" grade

students may be less smart academically in school but may be street-smart and have practical intelligence to get ahead in life. Sternberg's research showed that the focus in schools tends to be on developing analytical or academic intelligence for problem solving, less on developing creative intelligence, and least on developing practical intelligence, that is, helping students apply what they learn in school in the real-world context of their lives. I am currently engaged in youth purpose research and am seeking to tap into students' tacit knowledge and understand what students make of their school and life experiences. The data is rich and valuable in helping teachers develop a more connected, purpose-focused and personally relevant curriculum for students. In other words, the research seeks to contribute to a more human experience of schooling in Singapore. This all began by my looking deeply and critically into issues about the purpose of schooling in Singapore (beyond that of high academic achievement) that I think matters.

Audience Member 9: I would like to ask about the replication crisis in research. As we are studying human beings, it would be difficult to expect identical replication. Are we too hard on ourselves if we use the standards that are applied to natural science to the social sciences?

Professor Subotnik: Unfortunately, no status comes in replicating a study. No one will advance in their career as a scholar by solely replicating what somebody else has done. However, several groups of scholars have recently obtained grants to replicate several big and important studies. They found that indeed some of the studies were not replicable. I think that it is important to recognise that human behaviour is idiosyncratic. Otherwise all of us would be better off studying physics! Also, research that does not have significant results tends not to be readily published.

Audience Member 10: What are the implications for future researchers?

Professor Subotnik: Conduct rigorous research and be humble. You do the best you can to write your research and make your data available. Have very clear description of the methods. Especially if you get funding from public agencies, you have to make your data available so that other people could replicate your study or use it for something else. If you are going to be part of the scholarly community, having learned how to do research, you should make your research study something you are really proud of.

Questions for reflection

1. As an educator, how will my students benefit if I stay abreast of current developments and lessons learned from educational research? What are the channels that are available? In your own sphere of influence, are there problems that deserve your time and efforts and that might require you to conduct a research study? If so, can RCT together with other methods be used to address the research problem?
2. In your own sphere of influence, are there problems that deserve your time and efforts and that might require you to conduct a research study? If so, can RCT together with other methods be used to address the research problem?

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THE NIE DOCTOR IN EDUCATION WRITING AND EDITORIAL TEAM



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A publication of
the Office of Graduate Studies and Professional Learning (GPL)
NIE/NTU, Singapore © 2018
ISSN 2591-7218