JOURNAL OF THE WORLD FEDERATION OF ASSOCIATIONS FOR TEACHER EDUCATION

THEMATIC ISSUE

Educational Reform: Schools, Colleges, and Policy

EDITOR'S COLUMN

This issue of the WFATE Journal is thematic. The first article in the Journal of the World Federation of Associations of Teacher Education will serve to introduce the Association to the reader thanks to Dr. Maxine Cooper, our first President and our historian.

<div align="center">THEMATIC ISSUE</div>

<div align="center">*EDUCATIONAL REFORM: SCHOOLS, COLLEGES, AND POLICY*</div>

The past decades have been focused on reform: reform of the p-12 schools, reform of institutions of higher education, reform related to school choice, reform related to the actual substance of education, reform related to educator preparation, and on and on. WFATE is soliciting papers, research reports, and policy analyses related to the impact of the decades of reform on education.

The next two issues will be the proceedings for the Barcelona conference. The peer reviewed papers that came out of the conference are inspiring and informing. It is our hope that you will enjoy them. They do convey the challenges presented by speakers at the conference.

It has been a true joy working with the Board of the World Federation of Associations of Teacher Education. It is great to have professionals who are thoughtful and creative and who trust the process to work well. My thanks to the members of the Board of Directors (listed below),

We hope you enjoy the excellent articles and welcome any feedback from readers.

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For more information about the World Federation of Associations of Teacher Education, please go to our website: http://www.worldfate.org.

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CREATING COOPERATIVE ORGANIZATIONS BETWEEN TEACHER EDUCATION ASSOCIATIONS WORLDWIDE.

Maxine Cooper, Federation University, Australia

Joan Stewart, Federation University, Australia

Abstract

There are a number of independent teacher education associations positioned throughout the world. The World Federation of Teacher Education Associations (WFATE) was formed to bring together existing groups in the belief that we have common interests and values about teacher education that can formulate and enrich a professional learning community.

This paper presents a case study of WFATE and in doing so we develop new understandings of ourselves as teacher educators and knowledge makers in a global sense by bringing innovations into our own professional practices in a complex and dynamic global context.

We explore reflections arising from the Nairobi and Beijing Conferences in 2012 and 2014 respectively focusing upon the links between social justice and teacher education. We conclude with a reflection from the Barcelona Conference and plans for the Melbourne Conference. Finally, we pose the question – of how can we further develop WFATE as an international professional learning community of teacher educators?

CREATING COOPERATIVE ORGANIZATIONS BETWEEN TEACHER EDUCATION ASSOCIATIONS WORLDWIDE.

Initially we asked ourselves, what are elements of a strong professional learning community and how can we as teacher educators build links locally, nationally and internationally. Bolam et al. and Stoll et al. (2006) suggest a range of characteristics found in a strong professional learning community.

- shared values and vision;
- collaboration focused on learning;
- individual and collective professional learning;
- reflective professional enquiry;
- openness to new ideas
- inclusivity, mutual trust, respect and support.

Understanding ourselves as teacher educators:

Wenger (1998 p4) argues that "Learning as social participation shapes not only what we do, but also who we are and how we interpret what we do". Reflecting on this quote we came to understand that learning communities become areas for professional learning because the participants imbue activities with shared meanings. They were encouraged to develop a sense of belonging, and create new identities based, in part, on our relationships with one another.

We are an international professional learning group of teacher educators but we have recognised the need to clarify that we are using the word professional, not in the narrowly pragmatic or technocratic ways but rather in the broader social and socio-political ways, i.e. we are using the term professional in terms of visions for teacher education so as to reflect the importance of democratic communities and networks, always with the goal of better educated communities which will benefit society as a whole.

Thinking about the broader context:

The pressures of globalization keep increasing day by day. We are witnessing changing demographics with immense movements of people as a result of complex conflicts of wars and natural disasters leading to mass migration into many countries throughout the world. Immigration and migration have been at the forefront as social equity issues challenging economic and work structures. Added to this are the changes involving communities with new technologies and new ways of networking and learning.

We are arguing there is a need to explore new ways of people working together with a sense of a global professional focus and framework, as well as their being the need to establish teacher education networks globally with a focus on relationships that are supportive and sustainable. Finally, there is a need to work towards maintaining and enhancing local, national and international/global connections and communications.

Development of a case study of WFATE:

WFATE has been formed and developed since 2008 through representatives of teacher education associations in Europe, North America and Australia. Originally there was an Interim Committee composed of up to three members from each participating association who were appointed by their respective professional associations on, or after, the WFATE meeting at the ATE Conference in New Orleans in 2008. The constitution was implemented in 2010 and the formal Board of Directors was also organized at this time.

Alongside these developments, WFATE committee members met with UNESCO staff at the UNESCO Paris offices to develop strategic plans and a WFATE mission statement. Discussion focused on creating cooperative networks between teacher education associations worldwide. Committee representatives met with UNESCO in 2015 to continue to discuss the development of the WFATE constitution, related mission statement documents, specific aims and future international conferences. From this background work a statement listing the aims of WFATE was published. These aims are:

- To establish a worldwide community for teacher education
- To promote the development of teacher education associations throughout the world by:
    - Creating cooperative networks between teacher education associations
    - Sharing information, resources and expertise
    - Supporting countries and regions in developing teacher education institutions
- To represent the interests of teacher education associations to international bodies and organizations
- To provide equitable educational opportunities by promoting quality teacher education throughout the world (http://worldfate.org/about.php)

WFATE Conferences:

The inaugural conference was held in Chicago 2010. It was held in conjunction with the Association of Teacher Educators (America). At this conference the decision was made to hold the second conference in Kenya in two years' time (2012). Early meetings were held with African teacher educators and members of the Kenyan education community.

From these discussions the WFATE conference was held in Nairobi Safari Park Hotel from 7-9 November 2012 with the theme:
Educating all the World's Children: Challenges and Strategies for Teacher Development.

The conference strands provided for the participants were:

1. The role of teacher education in Education for All
2. Partnerships and networks
3. Preservice education: Policies for attracting and retaining quality teachers
4. Continuing professional development
5. ICT and teacher education
6. Balancing local and global issues: Knowledge creation, pedagogy, curriculum, professional experiences
7. Moving the Education for All agenda beyond 2015.

The next area of development was to invite new teacher education associations to become members of the Interim Directorate e.g. one from Kenya, after the conference was held there in 2012, Mexico, August 2012 and interest expressed from the Philippines in March 2013.

China WFATE 2014 Beijing themes and conference strands.

The overall theme was Teacher Education in Multiple Societies: Opportunities and Challenges. The overall theme was Teacher Education in Multiple Societies: Opportunities and Challenges. The strands included:

1. Bilingual education
2. Preservice (who is becoming a teacher and connection to field, curriculum of teacher education, content vs pedagogy)
3.   in-service education (mentoring, learning communities)
4. Cultural diversity
5. International Comparative Study of Teacher Education (national teacher education research, global social and political issues)
6. Specialization of teaching and teacher education
7. Teaching technology and subject teaching
8. Standards and Accountability

For the Barcelona WFATE conference the general theme was Innovation in Teacher Education within a Global Context. The subthemes initially included 12 strands which were finally joined together at the conference into some more focused ongoing research based groups.

1. Multiculturalism and Multilingualism

2. Technology and Mobile Learning for Pedagogical Innovations in Teacher Education

3. International - Local Teacher Education Networking Models for Knowledge Building Innovation Knowledge-building teams operating as collaborative innovation networks

4. Teacher Education Curriculum and School Curriculum

5. School-University-Educational Administrations Partnerships for Creative Initiatives in Teacher Education

6. A Distributed Leadership for School Innovation Management

7. Monitoring and Evaluating Innovations in Teacher Education

8. Change for Innovation in Teacher Education

9. Initial and Ongoing Teacher Education for Innovation

10. Health, Sport, Physical and Plastic Arts Education (circus, dance and theatre

11. Supporting STEM Education through Teacher Preparation and Professional Development

12. Strategies for Overcoming Inertia in Teacher Education

Summary of ongoing themes:

It is interesting to see which themes have continued to strengthen so far. There have been some insightful reflections from the participants at the various conferences that we have summarized below.

- the realization of how much teacher educators have in common, regardless of where we were from, we found that we faced many of the same problems and shared many of the same successes and joys'. (Anita Kenya Conference)
- the visits to the schools- primary, secondary and normal schools, the eagerness of the students to learn, the dedication of their teachers and administrators, and the goals for the future of the students that are the same goals we share for our students here at home. We are truly a global community of educators'. (Jenny Kenya Conference)
- to watch the show of hands in response to forming an AfriATE Teacher Educators Group. It was a very moving to have such as spontaneous vote of confidence at the end of the conference (Julie Kenya Conference)
- It reinforced my belief that the education of teachers is an art, a science, AND a belief in the innate goodness of prospective teachers and the children whom they teach. The enterprise of teacher education is a worthy effort and one that has so much meaning for me. It is the ultimate 'each one, teach one' (Anita Kenya Conference).
- my thinking was reinforced in that we are a community of educators that care about children and that the issues are not specific to any one area of the world or country (Peter Kenya Conference).
- It is always so when you meet with colleagues you get your own identity strengthened. You learn about your colleagues, but you always learn about yourself as well (Amy Kenya Conference).
- One of my strengths is communicating with people from many backgrounds, cultures and beliefs. I certainly got the opportunity to do that in Kenya and believe my world view was expanded by the opportunities I had to meet and know others (Jenny Kenya Conference).
- It was reinforced that I do have the ability to talk and relate to people from very different backgrounds. The common thread of caring about the education of children was the common denominator! (Peter Kenya Conference).
- I truly enjoy getting to know people -- those who are similar and those who are different from me. I think this is one of the inner qualities which is reflected in how I interact with others… During the conference, the times for formal and for informal interaction allowed me to exercise that innate curiosity and caring. I hope that this is sensed by others and that it carries into my daily work here at home (Anita Kenya Conference).
- To be in a developing country is a very special experience and you always learn from your experiences. The experiences I got in Nairobi built on my strengths, as experiences mostly do. I also got other perspectives on my own country, which strengthened me. The experiences from Nairobi, put a special light on my own country and the countries in Europe (Amy Kenya Conference).
- The innate kindness of all of the participants was the underlying current of the conference. The need to be truly "fair" is always a challenge since it is on others terms as well as my own. The conference and the related experiences in Nairobi made me think differently and more creatively about my daily interactions with others and the relationship of fairness to those interactions (Anita Kenya Conference).

- the participants all had the innate ability to demonstrate kindness and caring about the preparation of teachers and the overall well-being of all children (Peter Kenya Conference).
- The understanding of the cultural differences was a new learning for me which led to a stepping back to understand the African way of doing things rather than imposing our model and our ideas onto our hosts. There was an overwhelming sense of friendliness and goodwill throughout (Julie Kenya Conference).
- My interest is on learning more about education in general and teacher education in particular as they occur around the world. I particularly enjoy being in "unknown" places and being taken out of my daily comfortable routine. I truly enjoy the people who have made a commitment to WFATE and its mission -- they constantly challenge my thinking and engage my caring (Anita Kenya Conference).
- Learning more about teacher education worldwide and an opportunity to assist under-developed areas of the world become unified. The goal is tackling problems/ issues in the preparation of teachers and improving the overall health/wellness and education of children (Peter Kenya Conference).
- My life is enriched both personally and professionally by my contacts with colleagues from diverse backgrounds. Working on the Directorate has enabled me to establish strong connections with teacher educators I would never have had the opportunity to meet (Jenny Kenya Conference).
- Slow but persistent growth as more people in more places are introduced to and become involved in the Federation. (Anita Kenya Conference)
- I think that WFATE has all possibilities, but the WFATE will be no more than the colleagues involved can contribute. Personal engagement will be crucial. (Amy Kenya Conference)
- I truly feel we have just scratched the surface and have made so much progress, especially within the past 3 years. It is still slow, but the success of Nairobi, Beijing will be the impetus for future associations becoming members of WFATE. Together we will make a difference!!! (Peter Kenya Conference)
- I think it will take hard work to grow our organization so that it truly benefits all the teacher educators of the world. I think we have made a good beginning and with dedication we will expand our reach and thus benefit from the wisdom and knowledge of other teacher educators around the world. I am cautiously optimistic about our future! (Jenny Kenya Conference)
- It has not been an easy learning curve and money is always a problem for a new organization, however having delivered our promises we can now turn our attention to building an even stronger association. (Kenya Conference)
- Such associations become a vital link for teacher educators now more than ever with the down turn of the world economies and the political conservative swing against schools (Julie Kenya Conference)

What is social justice in education?

Most agree that it is equitable opportunities to access education - Education for All (EFA).

Is it also equitable access to quality teacher education programs?   WFATE believes it is.

The goals of UNESCO, a partner with WFATE, include the promotion of education, social justice and peace. The goal is to:

- Enable us to become more socially inclusive teachers and teacher educators
- Enable us to be more inclusive of cultural diversity amongst our colleagues, our preservice teachers and the students in the classrooms of our partnership schools.

Future plans include a Digital Equity Symposium to be held in February 2017, Orlando, USA and the Fifth Biennial WFATE Conference, is being planned for July 2018, and will be held in Melbourne, Australia. A positive outcome from the Barcelona Conference was the formation of focused ongoing research based groups. This process will be continued for the Melbourne WFATE Conference in 2017, thus enabling us to unite the organizations and the members in global research projects. The theme for the Melbourne Conference is still part of an educational debate but the outcome will be announced and published in the near future. We will also review the commonality of the strands from the previous conferences to maintain a certain sense of continuity and at the same time take a fresh and invigorating educational perspective overall.

Conclusions:

WFATE develops new understandings of ourselves as knowledge makers and teacher educators and brings innovations into our own practices as educators in a global world. It enables us to become more confident as knowledge makers and enhances our professional learning, particularly around social justice, equity and diversity in learning and teaching. Individuals have shared how they enjoy continually learning in a supportive but risk taking environment which helps us to deepen, extend and enrich our international professional learning community.

WFATE is a cooperative network and international professional learning community for all teacher educators and in this way it broadens people's worlds, builds common discourses around teacher education, enhances thinking about creative innovations and knowledge construction, sharing leadership ideas, creating public forums to dialogue, and critique professional ideas, researching and collaborating in teacher education. Being a part of the directorate of WFATE encourages us to share and act and develop transformative ideas that can build professional capital for teacher educators locally and globally. WFATE is about understandings of ourselves as knowledge makers and enables us to bring innovations into our own practices as teacher educators in a global world. We are a learning community and will continue to build on our strengths and develop our opportunities worldwide.

> *WFATE has reinforced my belief that the education of teachers is an art, a science, AND a belief in the innate goodness of prospective teachers and the children whom they teach. The common thread of caring about the education of children served as the common denominator! I believe my world view was expanded by the opportunities I had to meet and know others.*

The WFATE organization works to broaden people's worlds, builds common discourses around teacher education, enhances thinking about creative innovations and knowledge construction, sharing leadership, creating public forums to dialogue, and critique professional ideas, researching and collaborating in teacher education.

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TOWARDS AN ECOLOGICAL MODEL OF UNDERSTANDING EDUCATIONAL CHANGE IN SCHOOLS

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ABSTRACT

The implementation of educational initiatives is a complex process of change. Leadership for such change at school level is particularly a key concern amongst educational leaders and policy makers across different nations and cultures. School-based implementation of educational reform is an important contemporary educational issue as schools are empowered to develop their school-based practice with reference to the national policy or even initiate their own reform. It is found that conventional models of change including situational analysis and staged models fail to apply to contemporary schools which are open systems, involving non-linear interactions, rapid changes and fluid solutions. A lot of educational changes in schools nowadays, unlike many previous educational changes with well-confined or simple reform protocols, are unique in their approach to bring about change because they involve the adoption of measures in accordance with the nature of students, teachers and school context. Based on the ecological perspective put forward by Law, Yuen and Fox (2011), deep changes can only happen through a process of emergence that connects to different levels of context. It needs an "architecture for learning" which facilitates sharing of ideas and resources, reflects on and through practice, and deepens understanding across all levels within the schools and the community. The organizational learning resulted needs to connect with the "environmental conditions" which provides the niche for continuous development of the new initiative. In return, the new initiative may interact with the school environment for continuous change. This literature review aims to explore how schools in a complex environment implement and sustain change from an ecological perspective. This paper, illustrated in the context of gifted education, provides a new perspective about school change for school administrators and policy makers. It also formulates a theoretical framework for research study of any educational change in open systems.

TOWARDS AN ECOLOGICAL MODEL OF UNDERSTANDING EDUCATIONAL CHANGE IN SCHOOLS

Introduction

In the understanding of change by Daoism illustrated in on-line Encyclopedia Britannica (Ames, Seidel and Strickmann, 2012), "all things are subject to periodical mutations and transformations". Every new educational initiative, regardless the scope, level and geographical extension, is change. It is because it implies making something different or becoming different. It may range from a pedagogical innovation within a lesson to a curricular shift in one subject department, from a change of learning and teaching practice across a year level to a whole-school initiative or from a few schools to the entire educational system. This literature review tries to understand school change in the context of gifted education (GE) from an ecological perspective. The first part describes the unique nature of change in educational reform initiatives, including gifted education, in Hong Kong. The deficiency of various traditional change models is discussed in the second part. Complexity Theory, aligning with the ecological perspective about change, is illustrated in the third part. The core part of this paper is the exploration of using an ecological metaphor as a theoretical framework to understand the implementation of GE in school context. The concepts of species, population, niche and key features such as interaction, competition, feedback and adaptation in evolution in the context of school-based GE development will be illustrated. The last part may outline prospective research agenda.

Uniqueness of the change nature of gifted education and other educational reform initiatives in Hong Kong

Gifted Education (GE) has been introduced in Hong Kong for over two decades since the Education Commission Report No.4 (Education Commission, 1990) followed with the establishment of Fung Hon Chu Gifted Education Centre in 1995, GE Section in the Education Bureau in 2003 and the Hong Kong Academy for Gifted Education in 2008 as well as tremendous resources provided for teacher professional development, student programmes and parent support. Although the GE Policy Paper was published in 2000 with resources provided for schools, only a small percentage of schools put GE into the agenda of the school development (Cheung and Phillipson, 2008; HKAGE, 2009). The territory-wide survey conducted by the Education Bureau in 2013 also shows great disparities of adoption of GE amongst schools in Hong Kong (Education Bureau, 2013).

GE shares some fundamental similarities with other educational reform initiatives in spite of some degree of difference in its outlook. This paper, in addition to providing insight of understanding change in the context of GE, may contribute to the field of education by exploring the ways of sustaining other educational change initiatives. GE is often regarded as a unique educational reform initiative by its nature of voluntariness and lack of accountability. These two natures are always discussed amongst education practitioners in comparison with special educational needs (SEN) in inclusive educational system in which Hong Kong has implemented for more than two decades. First, GE is voluntary while SEN and many other educational initiatives are mandatory. Schools are encouraged to implement GE without any mandatory measures. On the contrary, SEN in the same inclusive education system, is compulsory. The legitimacy of SEN lies on two important government policy documents, Code of Practice on

Education of Disability Discrimination Ordinance (Chapter 487) published by Equal Opportunities Commission in 2001 and most importantly the Operational Guide on the Whole School Approach on Integrated Education (Education Bureau, 2008a, 2010). The Ordinance and the Guide illustrate how schools cater for the needs of different SEN groups. The school should follow the Guide that provides the definition of 8 SEN groups, identification system and screening tools, intervention measures, works of student support team in terms of data management, teacher professional development, support measures, assessment accommodation and home-school cooperation. Schools must meet the targets for SEN. Concerning teacher professional development, for instance, at least 10% of teachers in the school should complete the 30-hour basic course and 3 teachers complete the 90-hour advanced course. Extra resources are also given to school for SEN. Apart from various grants, a lump sum of $120,000 is given for the first 6 SEN students who needs intensive individual support and an additional sum of $20,000 per student is given for the seventh and more students. However, neither such mandatory resources nor mandatory guide and code of practice are given to schools for GE.

Second, GE, unlike SEN and other educational initiatives, lacks accountability. Schools are not required to report their provision for gifted students to the Education Bureau and any other agency. GE is neither mentioned in external school review (ESR) nor emphasized in school self-evaluation suggested by the Education Bureau. GE may not be put into school plan because the schools may have different developmental priorities or they even think that GE is irrelevant in their context. On the contrary, a set of strict procedures of accountability applies to SEN. The Operation Guide mentioned above describes the tasks across different key school players, including the school management committee, principal and student support team, and teachers and parents. Indicators for external school review are also provided. Each group has to fulfill various tasks and protocol in planning, implementation and monitoring, and evaluation. At the end of each school year, schools must submit their school report and the individualized educational plan of each SEN student who requires intensive support to Education Bureau. Other educational reform initiatives also follow various accountability measures. For instance, concerning the largest scale educational reform in Hong Kong in past few years, New Senior Secondary (NSS) reform, the student performance in the Hong Kong Diploma of Secondary Education is one of the indicators in ESR. Schools also use it as an accountability measure in their school management committee when reviewing school achievement.

GE shares an important common nature of change with other educational reform initiatives. Schools are given policy and guidelines, together with some resources. However, as school-based management is emphasized in educational reform initiatives in Hong Kong, fluidity in execution is found amongst GE and other educational reform initiatives. A lot of reform initiatives in Hong Kong have a clear goal and their guidelines provide a range of possible solutions at school level. Schools are given autonomy to implement according to their context. For instance, the Operation Guide for SEN outlines the 3-tier Support Model. Tier 1 is early identification and quality teaching in the regular classroom for students with transient or mild learning difficulties. Tier 2 is additional support for students with persistent learning difficulties while Tier 3 is the intensive individualized support for students with severe learning difficulties. In execution, different schools may adopt different implementation strategies. Tier 1 covers a wide range of teaching strategies that school may use differently, ranging from cooperative learning, tiered tasks, curriculum adaptation to different grouping options. At Tier 2, some schools may separate the SEN students to a special class under Intensive Remedial Teaching

Programmes (IRTP) in regular time-table while some schools conduct after-school training of executive functioning skills for SEN students. The choice of different strategies depends on teachers' competence, the number and nature of SEN students at the same level year and funding model that the school opts for. The execution of Tier 3 is even more diverse, depending on the nature of student, consensus of parents and teachers, school resources and teachers' competence. Policy and resources given with fluidity in execution in the NSS and information technology (IT) reforms is also noticed. Concerning NSS reform, the new curriculum structure and various support measures for the transition from the old curriculum to the new one are given. However, schools are given the flexibility to determine elective subjects available for their students. Some schools offer Applied Learning electives while some may not, depending on school objective, teachers' expertise, nature of students, availability of venue, collaboration of external parties etc. Even in other learning experience (OLE) as a common concern, different schools interpret and implement OLE in different ways. In the education reform about IT, the Education Bureau has published four policy documents, namely Strategy on ICT in Education (Education Department, 1998; Education Bureau 2004, 2008b) and consultation document in 2014 (Education Bureau, 2014). All these policy documents outline the implementation strategies, including infrastructure, e-resources, pedagogical practices, professional development and involvement of stakeholders. Schools are given tangible resources such as ICT infrastructure and curricular materials and intangible resources such as teacher training and networks. However, different schools may set their own developmental priorities and strategies. For instance, in the researcher's schools visit in June 2014, a school reported to focus on using iPad and tablet in pedagogical design, a school on enhancing the content management system as a learning platform, a school on flipped classroom, a school on online international collaborative learning.

GE, with its voluntary nature and lack of accountability, displays even more clearly about the nature of change in terms of fluidity in implementation. This exhibits the introduction of GE practices as a complex process of change. Even if the Education Bureau published the GE Policy in 2000 (Education Department, 2000) that introduced the Three-tier Operational Model, almost provisions and services (Levels 1 and 2) for gifted learners depend on schools themselves. Concerning Level 1 (whole class differentiation), strategies depends on school's curriculum and pedagogical orientations, time-tabling, flexibility of physical space, staff deployment and above all, teachers' belief and competence in adopting various differentiation pedagogies. Level 2 (school-based pull-out programmes) depends on the expertise of the teachers of the schools, availability of resources for outsourcing as well as the strengths and characteristics of the students. GE in Hong Kong is very different from other conventional educational reform initiatives such as education services for non-Chinese speaking students, SEN students and medium of instruction. The conventional educational reforms mentioned are usually introduced with a clear goal, specific infrastructure in terms of identification and external resources given, a set of common practices or exemplars provided introduced by the Bureau and some accountability measures. However, the GE Policy does not specify any school infrastructure and programme design for GE as school-based development is emphasized. With its fluidity in nature, a simple adaptation or diffusion model cannot be applied (Jerrett, 2009). The implementation of GE in school is very contextual, which is greatly influenced by leadership. The success of the introduction of GE in school relies on leadership on policy environment, school inputs and culture, teachers' attitude and competence, parents' and alumni support and connectedness with the community. According to Wheatley (1999) and Law, Yuen and Fox

(2011), successful change depends on the orchestration of these factors achieving a state of self-organization in which the change initiative co-evolves with the environment.

Insufficiency of traditional models of change

Can change models explain the school-based development of gifted education? The analysis of the contextual factors put forward by Senge *et al.* (2000), Fullan (2005) and Levin (2008) suggest that successful reform is attributed to the conglomeration of a number of factors including the education system, community, school culture and leadership, teachers, parents and students. Fullan (2009) supplements these factors with the contribution of corporate to the field of education. All factors can be categorized into three levels of contexts, namely community (national and regional educational policy), school (leadership, school culture, support from parents, alumni and community) as well as classroom level (the interplay of the intended, taught and learnt curriculum in which the roles of teachers, students and technology are important). These three levels are interacting and the boundaries among them can be unclear (Law, 2000). However, the model of analysis of contextual factors fails to provide a clear picture of how innovative practices emerge and sustain effectively. It overlooks the details of the nature of humans in terms of the responses to organizational instructions and societal changes. They also ignore the non-linearity of interactions and the unpredictable nature of outcomes which are the cornerstone of Complexity Theory and ecological perspective which will be illustrated later.

While the factor model of change is insufficient to explain change mechanisms, staged model of change is regarded as a model of explaining change process. The key staged models are summarized in Table 1. The traditional staged or "Newtonian" approach (Lewin, 1951; Berman & McLaughlin, 1976; Fullan, 1982, 2001) suggests that school change simply follows 3 linear stages, namely initiation, implementation and institutionalization or incorporation. Prochaska and DiClemente (1992), in a study of behavioral change, also claim that human behavior towards change may follow the cyclical pathway of pre-contemplation, contemplation, preparation, action and finally maintenance. Amongst all staged approach advocates, Kotter's staged approach (Kotter, 1990, 1996) is a popular change model. He recommends leaders to follow eight steps for any successful organizational change, and to establish direction, align colleagues and then motivate and inspire the majority to achieve the planned outcomes. The change process, according to Kotter, needs to be carefully planned in advance and the process should be articulated by the leader carefully in accordance with the plan. Berman (1981) further emphasizes that the stages may be overlapping at certain time. In sum, all these staged approach underpins the initial stage as the collection of relevant information, psychological preparation of the implementers, development of favorable conditions and clear vision.

Another popular staged change model is diffusion model developed by Roger (2003). Pedagogical innovations are suggested to follow Roger's 5-stage diffusion theory (Roger, 2003) that a learning object is invented and the early adopters try out and then spread the influence. The tipping point is found when the critical mass for scaling up reaches 34% when the early majority adopts the change. As a lot of GE resources and exemplars have been developed by the Education Bureau for schools, it is believed that change in a school may be a result of direct adoption of best practice that the school acquires from other schools. A pilot group in a school, facilitated by the teacher network run by the Gifted Education Section, may help diffuse the new practice to the rest of the school. Diffusion model is fully reflected from the popularity of this stream of thought.

There are some limitations of the staged models of change. In staged approach of change, school is viewed as a closed system which is not influenced by external systems. Within its context in terms of values, norms, structure and practice, change happens in a slow pace. With a strong focus on the centralized leadership and current structure, low variability and high certainty are found. Moreover, this staged approach overlooks the nature of individuals and group as well as the importance of the environment. Burnes (1996) finds that individual member's behavior is not just a product of external stimuli or instruction. Individuals may have their own interpretation of the stimuli including the instructions and reveals their own situation, in turn may lead to behavioral change. The individual behavior may also be influenced by the force of group pressure (Lewin, 1947; Strebel, 1998). They claim that the group dynamics and group norms, roles and values, instead of the well-planned stages, have a crucial impact on people's behavior in change. Dawson (1996) adds the interplay of group dynamics and open systems. It is because no school exists as a closed system. School's connectedness with the community and the education system may facilitate or hinder positive change. It is impossible to sustain change successfully without addressing the individual, group and the environmental factors. Therefore, in viewing the complexity of the nature of change and different players, it is impractical to have well-defined steps of the change process.

Table 1. Summary of important staged change theories

Stages of change	3-Stage Model (Lewin, 1951)	Stages of Innovation (Berman & McLaughlin, 1976)	3-I Model (Fullan, 1982, 2001)	Eight-staged Process (Kotter, 1996)	Stage Theory of Behavior Change (Prochaska & DiClemente, 1992)	Sub-processes (Berman 1981)
1	Unfreeze	Initiation	Initiation	Establish a sense of urgency Create the guiding coalition Develop a vision & strategy	Pre-contemplation; Contemplation	Mobilization
2	Transition	Implementation	Implementation	Communicate the change vision Empower employees	Preparation; Action	Implementation - clarification - adaptation

				Generate short-term wins		
3	Freeze	Incorporation	Institutionaliz-ation/ Continuation	Consolidate gains and produce more change Anchor new approach	Maintenance	Institutionaliza-tion
Remarks	*Stage-approach*	*Stage-approach*	*Staged-approach*	*Staged-approach*	*Staged but cyclical approach*	*Co-existence of the processes*

The diffusion model that influences change philosophy in the past decade is found deficient in practice. It is found that innovations, initiated by enthusiastic teachers or leaders, mainly as innovators and early adopters, are often not sustainable for a variety of reasons, including lack of continuous funding and resources, turnover, losing enthusiasm, changing position or role, lack of school support, displacement with the school developmental priority (Pelgrum, 2008; Luecke, 2009). Therefore, many innovations end at the first two stages of the Triple-I Model (initiation – implementation – institutionalization) established by Fullan (2001). In other words, diffusion may end up with gradual dissolution. It is because change may not be able to diffuse to major majority. Even if the change is adopted by the majority, the reform may lose its momentum and gradually disappear due to the reasons mentioned above. Therefore, changes involving changes in classroom practice are difficult to bear fruits when a lot of other factors are ignored, for instance, teachers' belief in student learning remains unchanged.

This mass production or diffusion model, viewed by Olson and Eoyang (2001), is a traditional model of change. It is basically a top-down approach. Clear goals and structures are set. Groups follow predictable stages of development. Every member should agree on a set of values. Intervention is introduced at different levels. Success is defined as closing the gap within a preferred time. This Newtonian model of change is far too simple because it deviates from the reality in which individuals, unlike machines, respond to the organization's instruction are always unknowable, unpredictable and uncontrollable. They may carry different values, beliefs and practices, and thus respond to instructions differently. The Newtonian model, the top-down approach, is proven insufficient. The alternative bottom-up approach is becoming popular. Although many scholars like Giles and Hargreaves (2006) and Leadbeater (2008) claim that individuals' innovation (bottom-up approach) should replace the top-down approach in order to contribute to success. Fullan (2008, 2010), in his latest work, demonstrates that an orchestration of democracy (bottom-up) and authority (top-down) is the key to successful change. Law, Yuen and Fox (2011) conclude that there is no difference between top-down and bottom-up approach. Instead, the most important drivers of change are the formation of a professional learning community within school to deepen the understanding of the underlying educational principles,

connectedness with the community and wider education system, and the search for available institutionalized support through external infrastructures.

The stage approach and diffusion model best apply in the change process with the four mentioned conditions: the problem is well-defined, the protocol is clearly developed as a fixed solution, tremendous support is given and continuous development is introduced or sponsored from the top.

However, gifted education has a very different change nature which is similar to the second change nature mentioned earlier where the problem is ill-defined, solution is fluid while support and continuous development greatly depends on schools themselves. First, even though there is a broad definition of giftedness as stated by the Education Bureau, schools may not necessarily cater for all kinds of giftedness. Schools may develop their operational definition or developmental priority of giftedness across the spectrum of cognitive, artistic, kinesthetic, and leadership domains. Second, even though the 3-tier Model is provided by the Education Bureau as an operational guide, schools have to develop their own strategies to identify the gifted students and cater for their needs. Even concerning the most popular Level 2 support (pullout programs), different schools have to decide their own programs in accordance with students' attributes, school resources, staff expertise, time-table, venue, and their own contextual opportunities and threads. There are no fixed solutions. For instance, in order to cater for the needs of the linguistically gifted students through pullout programs, schools may organize different activities or groups, ranging from drama class, musical performance, creative writing group, public speaking class, trans-disciplinary programs to mentoring scheme. Direct duplication of change initiative may not be possible. Even if a specific program is carbon copied from another school, the gifted students in the school are different in terms of ability and attitude while school context is different too. Certain adaption or improvisation is needed. Therefore, there is no fixed but fluid solution. Third, no tangible support and resources for continuous development are provided by the government for gifted education. Schools are fully responsible for the support and continuous development of the gifted programs. In this way, the internal dynamics mentioned later is more influential than the instruction of change from the top. Because change is more complex in the second nature of change, staged approach and diffusion model may not be able to apply in the change process.

When traditional Newtonian models towards change and change factors cannot fully explain school changes of the kind envisaged for school-based GE development, what change perspective should be adopted? Educational change in a school may be as a result of direct adoption of the best practice that the school acquires from other schools. It becomes popular nowadays as sharing amongst practitioners in the educational community is frequently organized (also by the Gifted Education Section, Education Bureau) and a lot of exemplars are printed in local curriculum guide (and given in the Gifted Education Section's website). Anderson (2010) finds that this stream of thought is still dominant in understanding and facilitating school change because a lot of school administrators find the direct replication of innovation very useful when the innovation well matches with the desired educational goal, the claimed benefits are well evidenced as well as the student background and resources provided are similar. The existence of all these pre-conditions, however, is rarely found.

Berman and McLaughlin (1976) further that modification of the design and content of the best practice is a more realistic model of change. They name that process as "mutation" while Anderson (2010) describes that process as "mutual adaptation". It requires the innovation developers or promoters to modify the innovation or program in response to their own context, including the resources available, technical expertise and infrastructure, school structure, student background and specific educational goal. This improvisation of imported innovation is regarded as mutual adaptation because "changes occur both in implementer behaviors and in the innovation as initially conceived and designed by those promoting the change." (Anderson, 2010:74). This lays the foundation of ecological perspective of change in school.

Ecological perspective comes from the concept of ecology. Ecology, by definition, is the study of the relationships between organisms and their environment. (Pimm and Smith, 2012). In viewing change in the context of school-based GE development, organisms refer to practices of GE in the schools by different stakeholders including principals, management team, teachers, parents, students, alumni and wider community. Ecological perspective of change in school is the study of the interactions amongst these stakeholders and that with the environment. Environment may cover different levels, namely school, district, territory-wide and international levels. The inter-relationship of the stakeholders and that with their environment may affect how GE is practiced in school. The unit of study is no longer individuals. The whole school and its environment are taken into account of and account for change. In the highly connected system, any change of one element or component in the system or that in the environment may impose change on others.

Complexity Theory

The notion of mutual adaptation and ecological perspective of change align with the complexity theory. Complexity Theory is particularly important in the understanding of the change mechanism in this Knowledge Era as schools or any organizations no longer solely apply proven solutions to known problems. Instead, schools develop in the situation in which groups need to learn their way out of unpredictable problems. This echoes the persistent state of disequilibrium featured in Complexity Theory. Thus, the learning, adaptive and creative capacity of organization suggested in Complexity Theory is crucial for school's sustainable development. According to Olson & Eoyang (2001), this approach moves away from the traditional approach of change. The school, as a complex adaptive system (CAS), depends on the connections among system agents (teachers in the context of school) instead of authoritarian instruction. The system agents do not follow predictable stages of development but adapt to uncertainties. Goals, plans and structures are emerging instead of being well-determined. Values consensus is never achieved. It is the importance of the process of self-similarity that matters. Self-similarity is the phenomenon of similar patterns that occur at the all levels of the organization. Finally, success is defined as fit with environment, rather than closing the gap.

In Complexity Theory, school acts as a complex adaptive system (CAS). Uhl-Bien, Marion and McKelvey (2007: 302) define CAS as:

> "open, evolutionary aggregates whose components (or agents) are dynamically inter-related and who are cooperatively bonded by common purpose or outlook … They are the clusters of interacting agents engaged in some measure of cooperative behavior."

Zimmerman, Plsek and Lindberg (2002) give CAS a simple definition: "complex" for diversity with a great number of connections between a wide variety of elements; "adaptive" for the capacity to change and the ability to learn from experience; and "system" for a set of connected or interdependent things. The "things" in a CAS are independent agents. A CAS has a densely connected web of interacting agents and each operates from their own knowledge.

Plowman *et al*. (2007) outline five characteristics of CAS. A CAS is made up of many interacting and interdependent agents with non-linear networks. The agents are sensitive to changes in initial conditions. They adjust their behaviour in the aggregate to their environment in unpredictable ways. They are active between the absolute stability and instability. They produce emergent actions which are unpredictable.

Complexity theory gives a new view of school-based GE development because the interaction amongst agents (i.e. teachers) plays an important role at the planning and implementation levels. Their practice heavily relies on their awareness, understanding and interpretation of the GE policy as well as the positive impact of interaction amongst them. According to Frost and Durrant (2003), teacher leadership, instead of centralized intervention, is the most crucial element in school change. Teachers are the change agents as they are viewed as leader. Their leadership is grounded with understanding of their professional role, collaboration, mutual support and external networking contributes are developed. Fullan (2002) also highlights the importance of teachers in the school change process. He claims that deep and lasting change is made by altering what teachers value and how they work together to achieve it.

The interaction of agents and the emergence of innovation are the self-organization process and outcome. Olson and Eoyang (2001) and Olson and Quade (2006) summarize the emergent patterns and conditions for self-organization. The most important element of self-organization is "transforming exchanges" or interactions that create connections between system agents. Olson and Eoyang (2001) define it as "meaningful contacts among agents forming the pattern in the system". Schneider and Sommers (2006) divide the interaction into interaction within organization and interaction across organizations. It is how the connections across significant differences transform team members by connecting members with each other and with other stakeholders. Interaction can be at any formats, linear and non-linear, formal and informal. More transforming exchanges may potentially speed up the process of self-organization provided that the exchanges are constructive and meaningful. Olson and Eoyang (2001) provide leaders with hints that transforming exchanges can be facilitated through encouraging feedback, linking communities of practice, reconfiguring networks and encouraging learning. Lundin (2009) refers this mutual inspiration as "social provocation" or Medici Effect which is an important factor for innovation. The sharing of creative ideas contributes to the innovative initiative. Hargreaves (2003) highlights that the learning from others, known as transferred innovation, compared with the "front-line innovation", carries more positive impacts on school change. It is because they may have better perceived peer support and confidence in implementation. Therefore, he advocates a positive school climate and emphasizes the importance of mobilizing intellectual capital (from each individuals), social capital (networks and trust) and organizational capital (making use of intellectual and social capital).

Olson and Quade (2006) and Olson and Eoyang (2001) illustrate self-organization with a matrix of predictability of outcomes and diversity of ideas, known as Landscape Diagram. With a high predictability of outcome and low diversity of ideas (like the traditional model mentioned

earlier), the system is well-organized because it is predictable, orderly and process friendly. However, no innovation emerges and sustainability of the innovation is low. Another extreme is low predictability of outcome and great diversity of ideas. This may lead to an unorganized state in which the decisions made are random and messy. The area between randomness and the organized state is the area of self-organization. The system in this area is adapting, emergent and pattern friendly. Self-organization occurs most productively in the balance of order and disorder, balance of being too constrained and too unconstrained.

This self-organization process gradually develops a culture of innovation in the school. Culture, defined by Fullan (2008: 126), is "the actions embedded in the norms, competences and practices of the organization". According to Cavanaugh and Dellar (1997), elements of school culture include teacher efficacy, an emphasis on learning, collegiality, collaboration, shared planning and transformational leadership. In a self-organizing system, self-similarity across levels is important. Self-similarity is "the phenomenon of similar patterns that occur at all level of a CAS" (Olson and Eoyang, 2001). It is the patterns that value adaptability, learning and creativity. The culture can be expressed at any fractal of the system.

School is regarded as a complex adaptive system where unpredictable, non-linear and dynamic processes of change are found. The modification and adaptation of the external innovation, as a result of a lot of exchanges and reflection amongst the implementers across various levels, allow the implementers to develop a deep understanding of the change. They may reflect or even challenge their educational belief, norms of social interaction and pedagogical principles (Coburn, 2003). It is evidenced that only a temporary alteration of teacher behavior is found and the change may be dissolved over time. The change may cease for loss of funding, low leadership pressure and support, presence of competing priorities and staff turnover (Anderson, 2010). Datnow, Hubbard and Mehan (2002) extend that mutual adaptation is a journey of co-construction. It needs the orchestrated efforts of the designer, advocate, facilitator of the innovation and the participants who enact the change. It is because action of change depends on the situated positions and roles. Therefore, the co-construction amongst policy makers, district officer, school administrator, classroom teachers, parents and community is important. It is also important to understand the unique school background, social dynamics and the structure of the school and hence examine the interactions amongst all these contexts with different roles. As different roles may respond to reform differently, the result may not be predictable. Change, therefore, is multi-directional and dynamic rather than unidirectional and linear. Therefore, any successful and sustainable adoption of innovation, with alteration to suit the local context, is an innovation in itself (Law, Yuen and Fox, 2011).

Ecological perspective of school change for school-based GE development

An ecological metaphor is used as a theoretical framework to understand the implementation of GE in school context. Viewing the fact that there is not any theoretical framework in understanding school ecology of school-based GE development, the school GE ecology is re-conceptualized. Hannan and Freeman (1989), influential theorists of organizational ecology, suggest "niche" as a fundamental element of an organizational ecology. *Niche*, according to them, is the set of environmental conditions in which a population survives or even reproduces itself. In this study, niche is the environmental conditions for GE practices in school; the species is GE. These two elements and other important ecological concepts would be explained below.

1. Species and population

GE is considered as the *species* in the school ecology for school-based GE development. However, there are different GE practices, which can be considered as different *population* groups within the species. GE practice is regarded as "service delivery components" mentioned in the School-wide Enrichment Model (SEM) (Renzulli and Reis, 1997) which is referenced by EDB in developing GE policy and resources for local schools (EDB, 2012). It is regarded as an influential and comprehensive school-based GE planning model for its comprehensiveness and applicability (Colangelo and Davis, 2003). SEM outlines the essential considerations of school-based GE programme design through the presentation of a cube with 3 dimensions, namely "organisational components", "school structure" and "service delivery components". GE practices, in the label of service delivery components in SEM include Level 1 implementation (differentiated curriculum), Level 2 implementation (pull-out programmes), Level 3 implementation (referral to offsite support), acceleration options, individual options, self-directed study and assessment of/for learning of the gifted learners, a total of 7 aspects.

There are various population groups of the species GE. Each of the 7 categories mentioned above may also contains a range of practices. Table 2 outlines the range of GE practices across all 7 aspects. Categories 1-3 are specified in the GE policy in Hong Kong (Education Department, 2000). The range of the practices is referenced to the training materials prepared by the HKAGE. However, the 3-tier operational model cannot fully cover all possible GE practices. The SEM mentioned above supplements categories 4-5, namely acceleration options and individual options. The range of provision option of acceleration and individual options listed in Table 2 has been frequently found in Hong Kong. Two more practices, self-directed study as Category 6 and assessment of/for learning as Category 7, are two strategies observed in Hong Kong in order to cater for learner diversity. Concerning Category 6, gifted student may be arranged for self-directed learning which is neither independent study in Level 1 nor school-based pull out programme in Level 2. For instance, in a local school, some gifted students are advised to take extra public exam subject with minimal support from their school. In another school, some gifted students do not receive any support for their own independent study. They, however, are given recognition upon completion. Category 7 is rarely found in Hong Kong even though it is quite common in some countries. On one hand, gifted students would be assessed continuously through different forms of recording. Portfolio assessment is a typical kind of it. On the other hand, in the researcher's previous experience, the gifted students are tracked through different forms of formative assessment. An independent education programme is then designed for the students. It could be Level 1 curriculum adaptation or other 2 levels or combination of all three level and other options, in which gifted students are periodically assessed and followed up with appropriate provision services. In order to capture this unique form of practice, Category 7 is created in accordance with the actual implementation context.

Table 2. GE populations: possible practices of gifted education in school

Categories	GE practices		
1. Level 1 differentiated instruction	School mechanism	Streaming	--
		Ability setting	High-Mid-Low
			High-Ave-Ave

			A separate class
		None	--
	Classroom strategies	Tiered task	--
		Anchor activity	--
		Curriculum compacting	--
		Questioning	--
		Independent study	--
		Station approach	--
		Grouping options	Homogenous
			Heterogeneous
2. Level 2 Pull-out (school-based)	Generic nature	--	--
	Specific KLA/ area	--	--
3. Level 3 Referral to offside support	To HKAGE	--	--
	To EDB	--	--
	To local universities	--	--
	To overseas universities	--	--
	To NGOs	--	--
4. Acceleration options	Subject skipping	--	--
	Grade skipping	--	--
	Early entry	--	--
	Dual enrollment	--	--
5. Individual options	Mentorship	--	--
	Apprenticeship	--	--
	Internship	--	--
6. Self-directed study	Online	--	--
	Face-to-face	--	--
7. Assessment for/of learning	Of learning: portfolio	--	--
	For learning: IEP	--	--

2. Niche

Concerning niche for school-based GE development, it is the contextual conditions for GE practices in school. According to Fullan (2009: 11), "The change process is about establishing the condition for continuous improvement in order to persist and overcome inevitable barriers to reform." The contextual conditions could be referenced to the contextual conditions for innovation at the school level outlined by Law, Yuen and Fox (2011). They conceptualize contextual conditions for innovation into 5 areas, namely school background, principal

leadership, school strategies, school ICT infrastructure, and government and community support. According to them, first, school background in the area of school vision, collaborative culture and experience in carrying out innovation are important. Second, lot of literature about educational change highlights the role of the principal in leading, catalyzing, supporting or impeding, hindering and disbanding innovation in school (Fullan, 2001, 2002, 2009; Law, Yuen and Fox 2011; Pelgrum, 2008). In the latest work by Law, Yuen and Fox (2011), they develop 17 categories of the principal's role in change. Principals are the key driver of change as they develop the vision of the change for the organization. They may also model the change through planning and allocating the resources, supporting professional development and monitoring and evaluating at different stages of the change in order to provide favorable conditions of innovation. They may also take an active role in change, including initiating and participating in the implementation of change as well as engaging members in learning of the innovation. They may also support and catalyze the change through maintaining good communication with parents about the reform, listening to teachers' view and welcome their contribution and encouraging team work amongst staff towards the goal of the change. Teachers thus can develop a deep understanding of change through constant exchange and sharing.

Fullan (2002) and Blase and Blase (2001) share the same perspective that effective principals for change should encourage collaborative creation and sharing of knowledge amongst teachers in the school. Blase and Bjork (2010) find that sustainability of change is favored due to increasing teachers' sense of efficacy as a result of a democratic environment created by the principal where teachers are able to express their views of reform. Fullan (2002), however, reminds us that principals in school change, in allowing nourishing exchange of ideas in which diversity is treasured, should also make the system coherent. It is because fragmented and piecemeal innovations without matching the organizational needs are less likely to sustain. The importance of the role of principals in leading change may be summarized in the four frameworks of Bolman and Deal (2010). First, principals are social architect focusing on the design of structure, strategy, environment, implementation, experimentation and adaptation. Second, they are catalyst and servant who are visible, accessible, supportive, empowering and sharing information. Third, they are advocate who clarify realistic objective, build linkages with other stakeholders and negotiate with them. Finally, principals in leading change are prophet who inspires others, discover and communicate a vision, capture attention and celebrate success.

School contextual conditions also cover school strategies, school infrastructure, and government and community support. According to Law, Yuen and Fox (2011), school strategies include technical support, resources planning, workload arrangement, staff development, team building etc. Fourth, school infrastructure refers to access to and availability of facilities, specialized equipment, new set-up etc. Fifth, government and community support includes government policy, funding, resources, support, community participation and support etc.

The five school contextual conditions for ICT innovation are applied in this study of school-based GE development. First, school background may include the school vision and objectives, GE-related experiences, culture and external connection etc. Second, principal leadership may

include educational vision, understanding of GE, role(s) and participation of GE practices etc. Government and community support may include government GE policy, resources (such as curricular materials, Quality Education Fund, Diversity Learning Grant by EDB), support (such as professional development provided by HKAGE and support service through school networks established by EDB) and the involvement of community in terms of alumni, parents and external connectedness. The elements of school strategies and school infrastructure can be referenced to "organizational components" and "school structure" mentioned in the School-wide Enrichment Model (SEM) (Renzulli and Reis, 1997). They can be combined as school infrastructure. SEM outlines the essential considerations of school-based GE programme design through the presentation of a cube with 3 dimensions, namely "26 organizational components", "school structure" and "service delivery components". The organizational components and school structure may include school-based GE policy and development plan, identification mechanism, progress monitoring, data (talent pool) management, parental engagement, community involvement, professional development as well as any important school infrastructure (e.g. committee, personnel, time-table, room allocation, staff deployment, resources). These eight aspects can be regarded as school infrastructure for GE development.

3. Interaction: architecture for learning as an important niche

Ecology is the study of interaction amongst organisms and interaction of them with their environment. When an ecological metaphor is used in this study, interaction amongst the key players of GE in school and interaction between the players and the contextual conditions are important. Learning amongst the key GE players is essential for positive change. "Learning" is always regarded as the most important element of making organizational change (Senge, 1990, Senge et al, 2000; Argyris and Schon, 1974; Fullan, 2008 and Kline and Saunders, 1998). The model about learning developed by Argyris and Schon in 1974 is much earlier than most of organizational learning literature. They believe that organizations learn through individuals' double loop learning. They bring the distinction between an individual's espoused theory and their action ("theory-in-use") as a primary concern of double loop learning. Four steps in the action theory learning process are identified: (1) discovery of espoused and theory-in-use, (2) invention of new meanings, (3) production of new actions, and (4) generalization of results. In double loop learning, assumptions of underlying current views and belief are critically examined when the organization faces problems. This is regarded as deep learning of the organization about the problems and alternative views.

In Fullan's Six Secrets of Change (2008: 76), learning "concerns how organizations address their core goals and tasks with relentless consistency, while at the same time learning continuously how to get better and better at what they are doing." Building continuous improvement in the organization is the cornerstone of the notion of organizational learning. Fullan supplements the concept of organizational learning by describing the content of learning. He highlights that learning should focus on classroom instruction that meets the learning needs of individual students. He also advocates situated learning instead of attending seminar or workshop. Many studies (Fullan, 2005, 2008; Cole, 2004, as cited in Fullan, 2008: 86-87; Allen and Cherry, 2000)

suggest that teachers can gain a deep understanding of the change and innovation when they are actually involved in innovative initiatives because they are learning in context. This action learning is far more effective than attending professional development programs which are regarded as superficial learning by Fullan (2008). Even the adoption of an innovation is an innovative process in which teachers should improvise the pedagogies to suit their own needs and learning situation (Fullan, 2005). Continuous learning should take place in the context in which they perform, observe and are observed. The learning focus should be on organization instead of individuals. In other words, the learning objective is not to find who to be blamed but where and why the system fails when they face challenges and problems.

Senge (1990:3), the mostly quoted academics about organizational learning, states that learning takes place "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together." An underlying principle for such organizational learning is that only the members who are adaptive and productive will excel in situations of rapid change. He defines five learning disciplines, namely personal mastery, shared vision, mental models, team learning and system thinking. Personal mastery is the learning to expand personal capacity to create better result. Shared vision is the development of a common purpose and the sense of commitment in a group. Mention models is the reflection and inquiry skills to understand our internal worldview that shapes our decision and actions. Team learning refers to the group dialogue and interaction that convert their group thinking into action to achieve the common goal. When this team learning is joined with systems thinking, according to Senge, there is the possibility of creating the understanding of their interdependency and complexity of the organization. This understanding facilitates members to focus on deep-seated structural issues for the sake of constructive change. Team learning aligns with the concepts of complexity theory mentioned above. The non-linear interaction and cross-pollination of ideas facilitate reflection of one's belief and action for continuous improvement.

Senge et al (2000) provides a strategic framework of change which is known as the interaction of deep learning cycle and organizational architecture. The organizational architecture is regarded as "domain of action" and consists of guiding ideas, innovations in infrastructure, and theory, methods and tools. The guiding ideas include the vision, values and purpose of the organization. This organizational architecture or change action heavily relies on the "deep learning cycle". The deep learning cycle, as a medium of organization learning, is the cyclonical interaction amongst new awareness and sensibilities, new attitude and beliefs, and new skills and capabilities acquired in productive dialogue. It is the substance of team learning that fosters the generation of new ideas and hence puts forward as action in the organizational architecture.

There are several fundamental limitations of Senge's framework of change. First, while the deep learning cycle is regarded as a locomotive of continuous change, what makes the deep learning cycle happen? It is believed that without a certain mechanism of facilitation, the deep learning cycle may not be in place. Second, the strategic framework is rather vague. For instance, infrastructure in the domain of action is ill-defined. Moreover, the framework mainly concerns

the deep learning cycle and action by organizational members, how do they relate their exchange of ideas and execution of new practice with their organizational context and societal environment? Third, the framework is basically a feedback loop of insight and decision achieved from the deep learning process to and from the action while the school structure is static. In other words, it is necessary for the new practice to fit in the current structure. In many occasions, modification of the current structure is necessary to foster change initiative. That implies a gap of the framework and the reality.

Based on the ecological perspective put forward by Law, Yuen and Fox (2011), deep changes of the kind envisaged for GE can only happen through a process of emergence that connects to different levels of context. Architecture for interaction purposefully for learning, with examples given by Law, Yuen and Fox (2011), may exist in different forms. To begin with, it is the transforming exchange amongst teachers. This professional communication is not only confined amongst the teachers within a particular department or subject matter, but also ideally engaged with exchanges amongst teachers of different departments or subjects. Transforming exchange may include formal and informal exchange of ideas. It may also include different forms of collaboration of individuals in order to facilitate deep learning from their peer. Careful design of committee/ department members, collaborative lesson planning with a focus on curricular and pedagogical improvement rather than logistic arrangement, lesson studies, co-teaching, peer observation, scheduled sharing session are the commonly found strategies. Luecke (2009) provides an additional option that expert(s) can be assigned periodically to work with different teams to foster learning. Fullan, Hill and Crevola (2006) claim that this professional dialogue and collaboration may result in establishing professional learning communities at the school level and developing a culture of peer learning and collaboration for continuous development. Community of practice, hence, is formed for further development of the change initiative. Second, engagement of students in teachers' learning is evident to build a positive architecture of learning. Teachers may work and learn along with students. The roles of teachers and students may change. Teachers are advisors and facilitators rather than instructors while students active acquire and act as collaborators with teachers. Reflection upon students' feedback and performance as well as teachers' role is valuable for organizational learning. Third, Law, Yuen and Fox's case study (2011) also shows that engagement of parents is powerful to support school change. Parents, in addition to showing spiritual support and being consulted, may provide assistance to school initiative and even come up with some feasible solutions for a problem. They may also enrich resources for the change initiative in order to facilitate learning in organization.

Architecture for learning is not restricted to the infrastructure for internal learning. Connectedness with external parties and communities should be taken into consideration. It is evident that professional exchange and even collaboration of teachers from different local schools has a remarkable input of professional learning amongst the participating teachers (Fullan, 2005; Law, Yuen and Fox, 2011). The GE school network with subject specific groups organized by the Education Bureau in Hong Kong is strategically established for this purpose. Luecke (2009) and Law, Yuen and Fox (2011) put the connectedness forward to that of

international professional development opportunities. It can be teachers' participation in external conferences, professional exchange with international practitioners and even working with international collaborators. Luecke (2009) supplements that external connectedness for organizational learning may include the invitation of external experts for internal training, the arrangement of site visits to observe best practice, meeting with local inventors in the field. All these learning opportunities through external connectedness is highly valued by Fullan (2005:70) as "lateral capacity building" which is more influential than the "vertical capacity building" at the government, school and internal management levels. All these learning opportunities within and beyond schools scaffold and deepen organizational learning. To wind up, architecture for learning is developed not only for supporting learning within the school but also facilitate learning with wider community. It is also important to notice that architecture for learning involve learning of all school stakeholders, namely management, teachers, parents, students, local and even international communities that collaboratively construct a shared vision while expertise of all parties are treasured and utilized.

The Advisory Committee on Teacher Education and Qualification (ACTEQ, 2003) suggests a spectrum of continuing professional development activities, as shown in Table 3. It outlines various modes of learning and activities. The author has added the examples to GE-related ones with reference to the local context.

Table 3. Learning architecture for school-based GE development: formal continuing professional development activities (adopted from ACTEQ, 2003)

Learning mode	Activities	GE-related examples
1. Local/ overseas conference, symposia, workshop, course	Conference, workshops	Biennial GE Conference
	Symposia/ briefing sessions	Introduction to GE seminar 29rganized by GES, EDB
	Workshops	Thematic workshop 29rganized by HKAGE
	Course	Professional Development Framework co-launched by EDB and HKAGE
2. Offshore study visits	Overseas study tour	GE visit tour to Singapore 29rganized by EDB
3. Higher academic study	Programs organized by accredited tertiary institutions	Diploma in Special Education, HKU SPACE
4. Job enrichment activity	Sharing of good practices within school	Sharing of good GE practices at staff meeting/ professional development day
	Peer observation	Class visitation for appraisal in which GE/ a GE element is focused
	Sharing of good practices outside school	Sharing of good GE practices at HKAGE for other teachers
	Sharing of professional reading and ideas within school	Sharing of GE insights at staff meeting/ professional development day

	Sharing of professional reading and ideas outside school	Sharing of GE insights at HKAGE for other teachers
6. Mentoring	Being mentor	Mentor colleagues at GE programs
	Being mentored	Being mentored at GE program
7. Action learning	School-based projects	QEF for gifted education
	Action study	An action research about school-based GE development
	Publications	Developing GE-related curriculum materials
8. Service	Membership of advisory committees under government	Being a member of Curriculum Development Council Committee (Gifted Education)
	Membership of professional association and education-related NGO	Being a member of Gifted Education Teachers Association
	Serving as trainer/ facilitator/ speaker of teacher training program	Being a contracted trainer in school GE network
	Education-related community service & voluntary work	A secondary school teacher as a voluntary instructor of gifted program for primary school students in HKAGE

4. Realized niche and competitions

Aldrich (1999) further divides niche into fundamental niche and realized niche. The former one stands for the carrying capacity that a population can survive. The later one is a population actually occupies. The realized niche is usually smaller than the fundamental niche because of a number of limiting factors present in the habitat. The limiting factors include the presence of predators, the unexpected change of the habitat and the ability the species make use of the available niche. For instance, a garbage station is a fundamental niche for the survival of mice. They can eat and rest in it without much restriction. However, people want to improve the hygiene by spreading pesticide, installing mousetrap and keeping some cats in the surrounding. Hence, the mice cannot go anywhere freely and look for their food. Some of them are even caught or killed. The realized niche is the actual environment in which the mice, after the change of habitat and presence of predator, can actually survive on. It is smaller than the carrying capacity of the original garbage station. In this study of school-based GE development, the realized niche is focused. It is believed that all schools may have the same fundamental niche, such as the same GE policy regardless the school types, districts and banding of students. All schools may also have equal opportunity to access to GE-related teacher professional development and parent support resources and services mainly provided by the GES and the HKAGE. However, different schools may have different abilities to make use of the available resources. Some schools may actively join the school GE network organized by the GES in order to inquire and conduct school-based GE programmes while some schools may ignore that and focus on other developmental priorities, such as SEN, which are regarded as predators.

Competition, therefore, is a key feature in organizational ecology, particularly on GE development in this study. It is because GE is not always the developmental priorities at school as it faces competitions with other educational initiatives. In the conversation with school principals and senior teachers over the past few years at work, quite a number of schools place GE at a lower priority than other educational initiatives. The popular priorities include catering for students with special educational needs (SEN), non-Chinese speaking students (NCS) initiatives, student admission (especially some schools putting a lot of effort on admitting students from the Mainland China), new senior secondary curriculum reform (NSS), medium of instruction (MOI), educational initiatives about languages, moral and civic education, ICT-related innovations, and some other school-specific priorities such as religious education, offering of alternative curriculum like IB curriculum. GE is usually in a disadvantageous position to school because some of the competing priorities are mandatory, such as SEN and NSS while some others receive extra resources from the government such as NCS and ICT. Some competing items, such as language competence and discipline, may not carry the nature of legitimacy and extra resources but they may be related directly to school accountability in the exercise of external school review and dissemination of public exam results. In this study of school GE ecology, this competition is regarded as inter-species competitions.

The species, GE, is not only facing competition with other developmental priorities, which are other species in the inter-species competition, it faces competitions amongst its different population groups, which refers to the intra-species competition. Table 2 above describes different GE practices as different population groups of the species GE. Population may adapt to the habitat according to the realized niche. As a result of comparing all different GE possibilities, schools may choose the best-fit option for implementation. For instance, concerning Level 1 differentiation, some schools report the use of school mechanism while others may focus on classroom strategies. For instance, a big primary school with 5 classes in each level reports to adopt ability setting as the only differentiation strategy in which students are grouped in similar competence in key learning areas at P.4 to P.6. However, another small primary school opts to focus on classroom strategies because the teachers believe that it is not practical to group students through school mechanism because there are only two classes at each year level. Since the small school also perceives the benefits of the cozy environment, very positive teacher-student relationship and strong support from parents, in addition to classroom practices, the school tries to introduce IEP for gifted students. The environmental conditions not only make an impact on the occurrence of GE but also the actual practice of GE. The inter-species competition may affect the extent of GE while the intra-species competition may affect the actual GE practice. Both inter- and intra-competition may result in different forms of GE development in the school.

Sometimes, competition may be positive for emergence of species. In an equatorial forest, in order to compete for sunlight and precipitation with many other trees which forms a canopy, only a few very tall trees break though the canopy layer as emergent. This species obtains most sunlight but they have to survive on strong wind and hot sun. It usually has thick truck for support and waxy leaves for reducing excessive sunlight. In an equatorial forest, keen competition gives the birth of the emergent layer. In complexity science, competition is known as adaptive tension (Maguire and McKelvey, 1999), which is the significant differences can be the variation between the organization and the external environment. With the initiation of adaptive tension, different CAS and agents may respond differently. Adaptive tension is the

difference between the organization's current state and what it needs to achieve so as to optimize its performance. Olson and Eoyang (2001) suggest that leader should focus on exploring contradiction, accepting contention and adversity, raising tough questions, encouraging workforce diversity and understanding significant differences between the organization and the external environment. The adaptive tension would be the stimulus of change.

In this study, the adaptive tension as a stimulus of change, inter-species competition and intra-species competition are considered as tension. In the exploration of emergence of GE practice, it is important to understand how the tension in these three areas contribute and influence the GE development in schools.

5. The feedback of species to the niche

Niche, in addition to determining species and its population, can be influenced back by species. The massive growth of a population may create a micro-climate that fosters the further growth of the species and related species. In a massively growing mangrove of Kandelia Obovata, a micro-environment is created for further growth of mangrove because the calm environment helps the droppers "catch" the soil during the low tide and germinate. The micro-environment also nourishes the growth of other related species such as mudskipper and tidal crab. In the context of GE development, for instance, a principal of a low achieving secondary school, without any prior knowledge about GE and high expectations on student achievement, piloted grade skipping for a Secondary One student upon the student's request. After a few years, GE sparkled in the school and amongst teachers after the student was highlighted by media for her outstanding university entry exam results and university admission at an age of 14. The school eventually developed GE by creating more GE infrastructure as favorable niche for GE development. EDB and HKAGE also used that example in teacher professional development and parent education. Another example is found in a local primary school where the researcher served 10 years ago. The school organized a gifted pull-out programme by outsourcing to an agent after receiving a number of intelligence assessment reports from parents. The taste of success inspired the school principal and some teachers to establish infrastructure such as drafting school-based GE policy, establishing talent pool and follow-up measures, as well as promoting professional development in GE. In other words, it is possible that the emerging species can make an impact on the niche.

6. Adaptation in evolution

A lot of ecologists study the result of competitions which is regarded as a distinguishing feature of ecology. In Gause's competitive exclusive principle (Gause, 1934), species may either extinct or occupy the place. However, Hardin (1960) has reservation on this because species may co-exist. In school setting, if GE and SEN are two different species and they are viewed as competitors because they are, reported by many principals, are in different school development priorities. However, these two species can co-exist. For instance, in the school when the researcher was the principal, at Grade 5, the Intensive Remedial Teaching Programme (ITRP, the most intensive school differentiation mechanism for SEN students) and Levels 1-2 gifted education provisions were introduced simultaneously.

Huxley (1942), one of the advocates of natural selection, provides a clear picture of the species in competition. He suggests that species may adapt to the environment in the process of evolution. A lot of literature attempts to illustrate change and continuous development. Hargreaves and Fink (2000) summarize the 3 dimensions of change as breath, depth and duration. Coburn (2003) re-conceptualizes scale in four interrelated dimensions, namely depth, sustainability, spread and shift in reform ownership. Dede and Rockman (2007) supplement the fifth dimension of scalability, namely evolution, which is more important than the first four dimensions. Evolution is one of the cornerstones of the concept of ecology. Evolution, illustrated in on-line *Encyclopedia Britannica*, refers to the process of "modification in successive generations" (Ayala, 2012). Diversity is the key feature that contributes to the process while the evolutionary process contributes to great variations on life. In the science of ecology and evolution, Ayala (2012) gives the following concise illustration:

> "All living creatures are related by descent from common ancestors. Humans and other mammals descend from shrew-like creatures that lived more than 150 million years ago … all plants and animals derive from bacteria-like micro-organisms that originated more than 3 billion years ago. Biological evolution is a process of descent with modification."

In viewing change in school setting, evolution implies learning from users in the process of adaptation or duplication. The adapters or users of the innovation would reflect on the design in accordance with their own contextual setting and create a learning community to evolve the innovation. In the study of Mid-Tier Projects by Dede and Rockman (2007), they generalize that participants' engagement, communication, conservation of resources, seeking continuing resources and obtaining feedback for further decision making contribute to successful evolution.

In addition, successful change and continuous development happen in the form of evolution. Evolution is the process of adoption and adaptation of new initiative that suits the contextual setting. Reformers who have obtained deep understanding of the nature of change and altered their educational belief perceive themselves as change agents as they have ownership of the change. They are flexible and reflective in the process of change and are willing to make change in due course of implementation and modify the initiative for its effectiveness (Dede and Rockman, 2007). Evolutionary process gives the rise of diversity but possesses three characteristics. First, sustainable change is not initiated by a sole agent. It needs a learning community for the depth mentioned and a community of practice for spread mentioned. In the change process of any school setting, Law, Yuen and Fox (2011: 225) find that "establishing an architecture for learning that supports and sustains emerging innovative practice" is important. Schools should provide opportunities to enhance interaction, sharing and support both internally and externally. That means learning is facilitated within and across all levels of the school and even the educational system. In this way, the change can be sustained as adaptive evolution of school ecology that matches the innovation takes place. Second, Evolution needs a favorable environment. In the work of Law, Yuen and Fox (2011) about ICT-related innovation, ICT is not the only element of implementation. It should incorporate the change in 5 other dimensions including the role of the teachers, the role of the students, the kinds of learning outcome observed, the curriculum goals and the connectedness of the classrooms with the outside world. In their analogy of ecology, new initiative is considered as new or keystone species which is the most ecologically fragile. It needs the alignment of the environment for its sustainable growth. Likewise, the innovation is unlikely to scale up unless other dimensions mentioned adjust

accordingly. It is the co-evolution of the new initiative and the existing school environment. Jarrett (2009) further adds that not only the internal environment should be considered, the external environment is equally important. He states that the physical environment, technological innovation, demographics, globalization and policy environment interplay with the organizational environment. School leaders may influence how they respond to the external environment in terms of the strategies for any organizational change.

To summarize, change is a multifaceted process in schools. Fullan (2001:44) regards change or implementation of new initiative as "re-culturing" in school. Leading a change involves creating a culture of change. It does not mean adopting innovations. It means the enhancement of the organizational capacity to seek, critically assess, selectively incorporate new ideas and practice as well as precisely adapt to the existing school context. That is the reason for "any successful and sustainable adoption of innovation has to be an innovation in itself" (Law, Yuen and Fox, 2011:227)

Evolution of change is an on-going process of continuous improvement. As shown in Table 1 above, a lot of staged change models suggest "institutionalization" as the final stage of change. In fact, due to the rapid change of social demand and societal context as well as changes of internal dynamics, continuous development is the norm in contemporary society. On one hand, continuous improvement of the innovation enables schools to minimize the student performance plateau effect. On the other hand, continuous improvement of the support system and organizational capacity should be enhanced to facilitate ongoing change (Fullan, 2008). Development of organizational capacity, according to Fullan, includes both internal organizational learning for vertical capacity enhancement as well as connecting with external bodies and communities for lateral capacity enhancement. The organizational learning plays a vital role in the process and it will be further elaborated later.

Prospective research agenda

The ecological model of change is not only a theoretical construct but also a theoretical framework for empirical study. One of prospective studies may explore and understand how GE practices emerge and further develop in different school ecologies. It aims to recognize patterns of GE implementation amongst them, ultimately to enrich the ecological model of change by suggesting ways of sustainable development of GE in schools that facilitates continuous evolution and development. In other words, it is to "inductively develop a theory or pattern of meanings" (Creswell, 2003: 9). Therefore, interpretive approach is adopted in accordance with the research purpose. According to Rowlands (2005), interpretive research aims to obtain knowledge through social construction that acknowledges the close relationship between the researcher and the research object as well as the contextual constraints. In interpretive research, independent and dependent variables are not pre-defined. Moreover, it targets to gain an understanding of the social context of the phenomenon and the process in it, rather than to test hypotheses (Walsham, 1995).

The multiple case study method may be adopted. Various school ecologies for GE development are to be identified and studied. As school ecology refers to the different combination of *niche* and *form* explained above, it is valuable to understand how and why different GE implementation (form) is found at similar organizational structure and environmental conditions (niche). In other words, the researcher would like to explore why GE development (output)

varies amongst schools with similar input. For instance, with similar organizational structure and the same policy environment, a school may have introduced both Levels 1 and 2 GE initiatives while another school may only focus on Level 2 pull-out programmes. The ultimate aim is to find out the crucial features of continuous development of GE in different school ecologies.
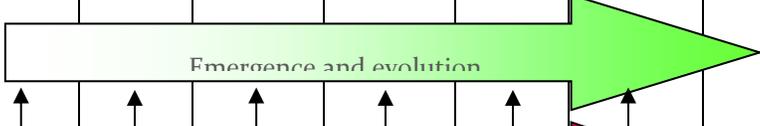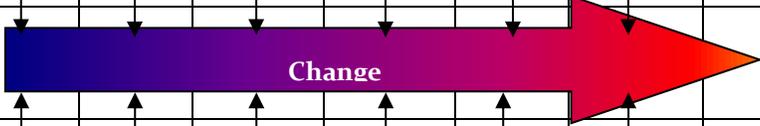
Each school case can be treated as a separate instance in which data is analyzed with reference to the theoretical framework. Embedded multiple-case design is adopted in order to provide rich information for analysis. That means in each case study school, various units of analysis are identified to provide a holistic explanation of the emergence of GE practice in that school. The units of analysis in each school include school system, departmental/ committee, special group and individuals. This structure of unit is applied to all case studies schools with some contextual differences. For instance, special group in School A may be a special internal task force of GE initiative while that in School B may be a spontaneous collaboration of a few science teachers and an external expert for a new GE programme. The main unit is organization as a whole, the smallest unit is the individual staff members, and several intermediary units, such as departments/ groups are also important.

Data would be collected in a school year. The year-long research period at the school allows the researcher to have sufficient time for investigation in order to deeply understand the GE development throughout the school history, from tracing the history of GE implementation to continuous development in which involves series of change as well as planning for the next school year. An in-depth study with focus group interviews, observation, document analysis and continuous contribution of participatory teachers (Citizen Science mentioned below) are introduced in order to capture rich information that can reflect and explain the change process. The study was divided into 2 periods, first term of an academic year (named as T1) and the second term of the same academic year (named as T2) in which the data will be collected accordingly.

The study will be conducted in two time periods with continuous investigation during the interval. The data collection is carried out in two different time periods, namely T1 and T2 mentioned above. The graphical presentation of the T1 and T2 design is shown in Figure 1. Data is collected in 2 periods of time. It is because the comparison of findings in the 2 periods can show the degree of change and its change mechanism is explored. Period 1 (T1) is about the first semester of school year in which some GE initiatives may be found or even piloted. The research work in T1 is important to trace the background of the school's GE practice, including the history of GE in the school, the emergence and continuous evolution of existing GE practices in chronological order. It describes the emergence and continuous evolution of various GE practices in the school ecology. T1 also focuses on the environmental conditions (niche) at each stage. The combination of the environmental conditions and GE practices shown in different stages provides a clear account of the evolution process. It is not only snapshots of the school ecology in different stages, but also acts as a collection of snapshots to help understand how the niche influences the species and its population. In order to understand why different GE populations emerge and develop in their way throughout different periods of time, examination of adaptive tension, inter-species competition and intra-species competitions at each stage with reference to the environmental conditions and GE practices is conducted. Because interaction of organism and interaction of organisms with their environment is a core feature of ecology, a close investigation of how individuals and groups interact with each other and with external

environment for school-based GE development is conducted. The formal interaction channels, known as architecture for learning, are systematically studied. Finally, it is critical to understand if there is any learning resultant from the learning architecture that re-shapes the environmental conditions for continuous GE development in the school. T2 is about the second semester of the same school year. It is the common practice of Hong Kong schools that self-evaluation is conducted in that period for planning for the next academic year. The data collected in T2 is the continuation of that in T1. The research work in T2 aims to understand how GE practices continuously develop in accordance with the change of environmental conditions. The elements of tension and interaction are explored in the explanation.

Figure 1. Data collection timeframe and data structure

	T1						T2
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 Term 1	Year 6 Term 2
GE practices (Population)							
Environment conditions (Niche)							
Adaptive tension							
Inter-species competition							
Intra-species competition							
Interaction within school							
Interaction outside school							

Sherer and Spillane (2011), in their study of the changing roles of organizational routines over time, designed a similar data collection structure. They spent 90 days in each of the year from 1999 to 2003 (4 school years). Significant features of leadership, lead teachers and new instructional routines are spotted in each period of time, including that since 1989, are recorded. The horizontal understanding (the change about a single issue across time), vertical understanding (relations amongst various factors within a particular time period) and combination of both contribute to the understanding of the process of change and key patterns are identified. The periodic data collection as snapshots and analysis of the collection of chronological snapshots contribute to the understanding of the change process.

Citizen Science is a popular research approach recently adopted in socio-ecological research, such as the study of urban ecosystem (Cooper, Dickinson, Phillips and Bonney, 2007), ecosystem-based ornithology (Aslan and Rejmanek, 2010) and wetland ecosystem (Calheiros, Seidl and Ferreira, 2000). As defined by Cooper, Dickinson, Phillips and Bonney (2007), Citizen Science is a research method that incorporates the public into scientific data collection and interpretation. In Citizen Science model, a group of volunteers participate in professional research in which methodologies have been developed by or in collaboration with professional researchers while training is provided. In the prospective study, two voluntary teachers will be recruited at each school. They are identified as enthusiastic teachers in GE. They may include the principal, GE coordinator and passionate teachers who have certain degree of GE understanding.

A user-friendly instrument can be developed for two teachers from each school on a voluntary basis. They will make use of the instrument to record interactions amongst the school stakeholders for GE development and interactions of them with the community. They will identify the interaction channel for GE development, record the resultant learning and examine how the feedback to the management changes the school infrastructure for further GE development. Their records will be collected on a monthly basis while any further difficulty and issue will be discussed individually.

Participatory methodology is a key feature of Citizen Science in which the participants play a vital role in data collection and data interpretation. This insiderness is controversial as it may carry some potential limitations. First, by no doubt objectivity may not be maintained. The researchers' own perceptions and interpretation shade the truthfulness of the research (Labaree, 2002). Second, in the view of Ravitch and Wirth (2007), insider action researcher should engage in ongoing negotiations of his or her identity, roles and relationship, in which that he or she should not focus on the objective of leading school change.

Insiderness, however, carries various credits to ecological studies. For instance, the participant would have greater access and deeper understanding of the school context and he is able to identify a number of critical factors that are determined by the circumstances of the moment. Moreover, it is easier for the insiders to nurture a trustworthy rapport with the colleagues and students in the research. They, furthermore, are able to disclose any advanced knowledge about the community's culture, its political and power structure, and its normative rules and belief systems. These are considered as local knowledge which is important in complexity science and ecological studies. The participants, as data collectors, can also make acknowledgement of any problems that arise as a result of being insiders. In this case, there is a measurable advantage inherent in seeing things from the inside that is not otherwise achievable by an outsider. In this way, Calheiros, Seidl and Ferreira (2000) view Citizen Science with the active involvement of participants as a rigorous research methodology that integrates local knowledge into understanding an ecosystem and it is an important approach to guide the process of scientific inquiry.

When school is viewed as an ecology in which agents interact amongst themselves and with the environment, Citizen Science provides a valuable insight in understanding school change process. In complexity science or ecological perspective, change is made through the accumulation of many interactions, especially the transforming exchanges which are positive. These are usually physical, spatially and temporally discrete (Odum, 1982). In particular, it is extremely difficult for researcher from outside to identify and interpret the informal interaction that contributes to change. Transforming exchanges include all dynamic interactions among teachers like meeting, informal chat, email, memo, phone interaction like call and Whatapp, virtual interaction like email and Facebook, and other forms of contact. It is impossible for the researcher to track all transforming exchanges for privacy and practical reasons. The self-report done at the post-test may not be adequate enough to understand the reality of teachers' interaction. Without the application of Citizen Science model, the limitations above are found in the researcher's former study (Lam, 2009). Therefore, with the facilitation of the participation of teachers as research participants in terms of data collection and interpretation, both formal and informal transforming exchanges can be identified and analyzed.

Conclusion

A common feature of viewing change from Complexity Theory and ecological perspective is that change is a complex process that involves teachers as adaptive individuals with non-linear interaction with each other, wider communities, internal norm practice and regulations as well as the policy environment. Diversity is the origin of creative or adaptive nature. It is the process of annealing that the tension leads to interaction for the emergence of creative and adaptive measures. Organizational learning in due course is believed as a crucial factor of positive change. It is not only a learning culture, Law, Yuen and Fox (2011) suggest that architecture for learning, engaging all possible school stakeholders, is important as the system can facilitate organizational learning to take place. However, change initiative is always fragile and easily loses its momentum. From an ecological perspective, the change initiative needs favorable conditions for germination and growth. That means it needs an adjustment of organizational management infrastructure to fit the change for further development and its sustainability. Therefore, in order to understand change mechanism, the unit of analysis should not just emphasize individuals' isolated mind. Instead, the social and contextualized nature of cognition and meaning to the participants is much more important. The unit of analysis of organizational change is the organization as a whole in which the participating members particularly teachers in the process of change continuously and mutually interact with other members and the wider community. The learning resultant from the interaction may have an impact on the adjustment of school structure. In return, the adjustment will feedback to the members for further reflection, purposely for consolidation or further adjustment or even rejection.

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TOWARDS AN ECOLOGICAL MODEL OF UNDERSTANDING EDUCATIONAL CHANGE IN SCHOOLS

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Abstract

Practices of teachers in the K-12 classroom have been established to include differentiated instruction (DI) as a means to meet the needs of students. However, practices in higher education (HE) have limited opportunities for faculty to model DI. Previous research on DI in HE has centered on the practices that are utilized with students in open dialogue and intentional design. This study explored teacher candidates' level of familiarity with DI, perceptions of DI in HE, and intended future use of DI in their classroom instruction. Findings suggest that a difference exists with students' level of familiarity between programs and years in a program.

TOWARDS AN ECOLOGICAL MODEL OF UNDERSTANDING EDUCATIONAL CHANGE IN SCHOOLS

Teachers in K-12 settings are challenged to meet the diverse needs of their students. This often occurs through the process of differentiating content, process, and product. Differentiation is the process by which a teacher designs and implements lessons that are "adapted to meet students' individual and diverse need in order to facilitate student success" (Santangelo & Tomlinson, 2009, p. 308). The term differentiation has been established as having a place in the standards for the teaching profession at the K-12 level as evident but the use of the term "differentiated instruction" in state standards for the teaching profession (Alabama, 2014; Connecticut, 2014; Hawaii, 2014; Massachusetts, 2014; Missouri, 2013; Montana, 2013; Nebraska, 2011; New York, 2011; North Carolina, 2013; Ohio, 2005). In considering the preparation of teacher candidates, one must consider how differentiation is taught in both in theory and in practice. What is the current use of differentiation within higher education classrooms?   This study investigated the perceptions of teacher candidates in regard to differentiated instruction (DI) in their higher education (HE) classrooms.   Did candidates feel they were taught the concept of differentiation, and did they feel it was modeled?   Are teacher education professors modeling what they teach in terms of differentiation?

As teacher evaluation takes hold in initial licensure and professional evaluation, a major component is the performance of teachers, in particular their ability to differentiate their instruction to meet the needs of all students in the classroom.   Both national teacher performance assessments (edTPA) and state standards for the teaching profession (Alabama, 2014; Connecticut, 2014; Hawaii, 2014; Massachusetts, 2014; Missouri, 2013; Montana, 2013; Nebraska, 2011; New York, 2011; North Carolina, 2013; Ohio, 2005) call for teachers to engage in differentiation for the purpose of meeting student needs, "Teacher's differentiate instruction to support the learning needs of all students" (Ohio Department of Education, 2007, p. 12).

Prior studies and articles (Chamberlin, 2011; Chamberlin & Powers, 2010; Gould, 2004; Griess & Keat, 2014; Huss-Keeler & Brown, 2007; Pham, 2012; Sands & Barker, 2004; Santangelo & Tomlinson, 2008) have been the starting point for the discussion of whether or not teacher candidates have been exposed to the theory and practice of differentiation. Brimijoin (2002) has moved the conversation forward to look at the experience of preservice teachers in regards to exploring their experiences with differentiation in the classroom. In being able to master the competency of meeting the needs of all students in the classroom, teacher candidates must have a working understanding of differentiation.   The current state of teaching includes DI as part of standards for the teaching profession in many states (Alabama, Connecticut, Hawaii, Massachusetts, Missouri, Montana, Nebraska, New York, North Carolina, Ohio).   This study contributes to candidates building competency by exposing the current practice of differentiation from the candidates' perspectives.

Four research questions frame the study: (1) What is the level of familiarity of DI for preservice students by program; Early Childhood Education(ECE), Middle Childhood Education (MC), Adolescent and Young Adult (AYA) and Intervention Specialist (IS)? (2) What is the level of familiarity of DI for preservice students by year in program (freshman, sophomore, junior, senior)? (3) What is the difference in student identification of courses that model DI by program (ECE, MC, AYA, IS)? (4) What is the relationship between exposure to DI (through modeling) and plans for future use in classroom instruction?

Curriculum Differentiation vs. Differentiated Instruction

Differentiation, both within instruction and curriculum, has become a common part of the culture of K-12 schools (Rice, 2012). This term, differentiation, has been used in a number of ways to mean a number of different things. When looking at education literature there are three main ways that this term can be used: curriculum differentiation, differentiated instruction, and then there are researchers that simply use the term differentiation alone to encompass everything (Kanevsky, 2011). Curriculum differentiation refers to students enrolling and participating in a variety of different courses (Ayalon, 2006) or a completely different educational program than other students based on their personal academic ability levels (Schofield, 2010). Differentiated instruction (DI) concerns what is taking place, educationally and instructionally, within one specific classroom that has a variety of ability levels within it (Tomlinson, 2000b). For the purpose of this study we are going to be discussing and referring only to DI.

Definition of Differentiated Instruction

DI is considered to be a different way of thinking in comparison to a typical standardized method of teaching (Tomlinson, 2000b). This educational practice is based around a specific set of attitudes about how children learn, with the most general belief being that all students are individuals and no one student learns in exactly the same way as another student (Tomlinson, 1999). Parsons, Dodman, and Burrowbridge (2013) describes DI as being a "different way to offer content, engage students in learning, and provide opportunities for varied end product" (p. 39). When using DI, teachers essentially become allies with their students in planning out an educational plan more suited to their individual wants, needs and personal interests. Educators hold high expectations for their students while using DI, constantly pushing them to achieve their goals and continue to exceed them. They need to know their personal interests, readiness to learn (Tomlinson et al., 2003), strengths, individual learning style, and academic needs (Beecher & Sweeny, 2008). They need to be able to appropriately challenge and support all of their students in ways that will benefit each student best (De Jesus, 2012). The goal of DI is not to compare the students to one another, but to acknowledge the progress each student is achieving, no matter how small or large, without bias (Tomlinson, 1999).

According to Tomlinson (2000a), there are four different areas within the classroom in which an educator can differentiate: the content being taught, the process in which the

content is being presented, the products that are being created by the students, and atmosphere of the learning environment. One, a few, or all of these areas can be altered at one time depending on the needs of the specific child in question. DI is, by design, not intended to only be used if a child is struggling to keep up in class; differentiation is also for a child that is not being challenged enough (Coleman, 2001). According to King-Sears (2008), instruction that is only differentiated for students on the lower end of the ability spectrum is not truly differentiated instruction. DI is not a substitute for quality education practices; rather, it is an additional tool that can be used to enhance already high quality practices (Tomlinson et al., 2003).

Differentiation in Higher Education

The major body of work on DI has been to establish the place for differentiation in the K-12 setting (Rice, 2012).   A number of studies have been conducted and articles written that demonstrate differentiation is occurring in higher education classrooms (Chamberlin, 2011; Chamberlin & Powers, 2010; Griess & Keat, 2014; Hirsh, 2013; Huss-Keeler & Brown, 2006; Joseph, et al., 2013; Mok, 2012; Sands & Barker, 2004; Santangelo & Tomlinson, 2008; Varasvsky & Rayner, 2013;). Of those studies conducted, two common themes exist: faculty documenting their approach to teaching and instruction in a specific course (Chamberlin & Powers, Huss-Keeler & Brown, 2007; Griess & Keat, 2014; Joseph, Thomas, Simonette & Ramsook, 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009; Mok, 2012; Varsavsky & Rayner, 2013), and studies centered around education majors (Chamberlin & Powers, 2010; Huss-Keeler & Brown, 2007; Griess & Keat, 2014; Joseph et al., 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009).

Huss-Keeler and Brown (2007) studied the role of differentiation in math methods course for early childhood majors. Their research focused on graduate students in a cross listed course. Huss-Keeler and Brown (2007) used the approach of differentiation to tackle a common problem in higher education, small class sizes requiring the combination of multiple classes to create cross listed or double numbered courses, in this case, a course for both math methods and math elective students in early childhood education.

Adding to the current issue of candidates from multiple points in the process of different programs of study, Greiss and Keat (2014) explored the intentional design of an early childhood course using differentiation to meet the needs of graduate, undergraduate and non-degree seeking students.   Their exploration was through the eyes of two separate faculty members who taught the same course in different years (2005, 2011).   Both instructors discussed the issue of intentional design to meet the needs of the students, as well as juggling the candidate expectations and course requirements.   The findings suggest that differentiation was intentional from the instructors' perspectives as a means for meeting student needs. Course evaluations are mentioned in the article but references to student identification of specific examples of differentiation are absent.

Studies that describe the use of differentiation in higher education have also been done with multiple licensure areas (elementary, secondary and special education) at the

graduate level (Sands & Barker, 2004). Similar to past studies (Griess & Keat, 2014), the emphasis of intentional design and instruction of teaching differentiation by modeling differentiation was explored by Sands and Barker (2004) with an overview of how they utilized one class session during a term to teach differentiation by modeling differentiation. A major theme of Sands and Barker's study included pre-service teacher candidates who "appreciated concretely doing and experiencing the topic we were covering in class. In other words, they felt that our teaching was authentic in that we were practicing what we were preaching" (p. 42).

Continuing research with early childhood majors, Santangelo and Tomlinson, (2008) explored three areas of research in DI at the graduate level: how does DI support student learning, how do students perceive DI in a higher education course, and what strategies help students achieve the outcomes of the course? Their self-study found that students were successful in achieving the objectives of the course through DI. The students also were able to articulate, through open questions, how they felt DI helped them to be successful. Finally, the three areas in which students identified DI as being important to their success included students as diverse learners, students as having diverse "interests, experiences, and goals," and students having "diverse personal circumstances" (Santangelo & Tomlinson, 2008, p. 317). Joseph and associates also explored the use of DI in a second year undergraduate education course.   Using a control and treatment group (those in course with DI), students were surveyed and grades were compared. Findings suggest a difference between the grades, with the students in the DI classroom "generally obtaining higher grades then their counterparts who were taught in the traditional whole class instructional setting" (2013, p. 37).   Regarding data collected through surveys, Joseph and associates (2013) also found that the majority of students make comments suggesting they would use differentiation in their future classrooms.

In considering the impact of DI on student learning, Santangelo and Tomlinson (2008) state that the use of DI had "a positive and meaningful impact on student learning" (p. 316). In another study, Chamberlin and Powers (2010) also found DI to have an impact on student learning.   Chamberlin and Powers (2010) studied the use of differentiation on student learning in a math course designed for undergraduate early childhood education majors. Their findings suggest that the differentiation was a means to instruct students and played a role in impacting student mathematical understanding. Student perceptions were also studied by Chamberlin and Powers (2014), who looked to compare the perceptions of students in the treatment group (course employing differentiation instruction) to students in the control group. They found that those students in the treatment group responded in a manner that was consistent with students identifying practices in the classroom reflective of differentiated instruction.   Chamberlin (2011) further explained the findings of the Chamberlin and Powers (2010) study by focusing the research at asking students how they plan to integrate differentiation in their future instruction. Findings suggest that students are likely to use those strategies modeled in the course in their future practice (Chamberlin, 2011).

While the majority of studies investigating differentiation in higher education have been conducted with teacher education candidates (Chamberlin & Powers, 2010; Huss-Keeler

& Brown, 2007; Griess & Keat, 2014; Joseph et al., 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009), and an evaluation of a professional development for university faculty on DI (Sikka, Beebe, & Bedard, 2011) , a few have looked outside the education major (Ernst & Ernst, 2005; Hirsch, 2013; Mok, 2012; Varsavsky & Rayner, 2013). Mok (2012) used take home assignments for an undergraduate course in programming. The findings suggest that student were more motivated to engage in their assignments due to DI. Exploring science course work, Varsavsky and Rayner (2013) employed alternative assessments for students who required more challenging work. Neither Mok (2012) or Varsavsky and Rayner (2013) documented student gains, however both studies looked at the perception of students in regard to motivation and engagement. Hirsh (2013), in studying the use of DI in an RN-BSN program, also found that DI had an impact on engagement.   Ernst and Ernst (2005) studied undergraduate students who found the modeling of DI throughout a political science course a means for creating challenging and rewarding learning opportunities that supported student interest.

Gould (2004) suggested that university faculty must both model and share with pre-service teachers their differentiated instruction in university courses.   Pham (2012) established the need to integrate both the practice of differentiation and the theory into teacher education courses.   Through her review of the practice of differentiation and application to differentiation in higher education classrooms, Pham emphasizes the role of differentiation as a "new pedagogy that can promote practical integration and knowledge transformation" (2010, p. 17), and as an approach that is necessary in the university classroom where the diversity of learners is ever expanding (Lightweis, 2013).

Review of research at the higher education level reveals that differentiated instruction (DI) is a means for meeting the needs of diverse students and diverse student needs (Chamberlin, 2011; Greiss & Keat, 2014; Santangelo & Tomlinson, 2008), both those with a range of teaching experiences but also combining courses with different requirements (Huss-Keeler & Brown, 2007), an appropriate approach to teaching about differentiation (Sands & Barker, 2004), a means to help students make gains in their understanding of content (Chamberlin, 2011; Chamberlin & Powers, 2010) and an instructional approach designed to help student achieve the objectives of a course (Santangelo,& Tomlinson, 2008). The review of previous research has demonstrated a foundation of faculty documentation of how differentiation has occurred in their courses (Chamberlin, 2011; Chamberlin & Powers, 2010; Griess & Keat, 2014; Huss-Keeler & Brown, 2007; Sands & Barker, 2004; Santangelo & Tomlinson, 2008; Mok, 2012; Varsavsky & Rayner, 2013). Addressing differentiation from the perspective of the teacher (higher education instructors and faculty), Santangelo and Tomlinson (2012), surveyed teacher educators to assess their perceptions and use of DI practices. Findings suggest that modeling is not occurring consistently in higher education settings.

Lacking in the literature, however, is an abundance of studies that look at the view of differentiation from the student perspective.   Chamberlin and Powers (2010), Chamberlin (2011), Ernst and Ernst (2005), Joseph, et al., (2013) and Santangelo and Tomlinson (2008) remain the few voices in documenting student perceptions on

identification of differentiation in higher education courses, while Chamberlin and Powers (2010), Chamberlin (2011), Edwards, Carr, and Siegel (2006) and Joseph, et al., (2013), remain the only studies that evaluate student's opinions on their future practice in using DI in their future K-12 classrooms.

Methods

To identify students' familiarity of differentiation, their perceptions of DI in higher education and to gather data regarding their licensure program; Early Childhood Education (ECE), Middle Childhood Education (MC), Adolescent and Young Adult (AYA) and Intervention Specialist (IS) and year in the program, a survey was created with ten questions. Students were asked to determine their level of familiarity on a scale of 1 to 10, with 1 being unfamiliar and 10 being familiar. Familiar was explained to students as their basic understanding with the specific concept of differentiated instruction (DI). In prior studies, candidates were asked about their experiences in a specific course, the one in which the instructor currently had the students enrolled (Chamberlin & Powers, Huss-Keeler & Brown, 2007; Griess & Keat, 2014; Joseph et. al., 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009; Mok, 2012; Varsavsky & Rayner, 2013). This study looked to expand that view by asking students to review their course work over their entire program and determine the number of courses in which instructors modeled differentiation, thus veering from the past research in which candidates were asked to reflect only on an individual course. Prior to asking students to determine if they had witnessed DI being modeled in higher education courses, it was necessary to determine their level of familiarity with DI.

Few studies (Chamberlin & Powers, 2010; Chamberlin, 2011; Edwards et al., 2006; Joseph, et al., 2013) have asked students about their future practices. For this study, candidates were asked to predict their future use of differentiation in their classroom. They were asked to respond to the question, "How often do you, in general, plan to use Differentiated Instruction in your future classroom?" Students selected one of four responses: never, rarely, often, or always. Finally, demographic questions were used to determine candidates' gender, year in the program (freshman, sophomore, junior, senior) and licensure program [Early Childhood Education (ECE), Middle Childhood Education (MC), Adolescent and Young Adult Education (AYA) and Intervention Specialist (IS)].

Participants

A total of 316 undergraduate students from a Midwestern Catholic institution were surveyed on their perceptions, experiences, and level of familiarity with differentiation. Of the 316, 90 failed to complete the survey and demographic questions and 8 students identified themselves as undecided with their licensure area. Surveys not completed or grouped as undecided were not used in the data analysis. Students were enrolled in one of four different programs (ECE, MC, AYA, IS). Student results were also grouped based on their years in the program (Freshman, Sophomore, Junior, Senior). Breakdowns of program and year are presented in Table 1.

Table 1   Participant Program and Year in Program (N=219)

| | Year in Program | | | | |
	Freshman	*Sophomore*	*Junior*	*Senior*	*Total*
ECE	18 (8.2%)	34 (15.5%)	4 (1.8%)	49 (22.4%)	105 (47.9%)
MC	5 (2.3%)	3 (1.4%)	4 (1.8%)	21 (9.6%)	33 (15.1%)
AYA	8 (3.7%)	11 (5.0%)	7 (3.2%)	22 (10.0%)	48 (21.9%)
IS	4 (1.8%)	5 (2.3%)	0 (0.0%)	24 (11.0%)	33 (15.1%)
Total	35 (16%)	53 (24.4%)	15 (6.8%)	116(53.0%)	219 (100%)

Data were collected during in multiple education courses.   All surveys were collected during the course time and reminders were given for students to not include their names on the surveys.

Data Analysis and Results

Level of Familiarity

On a scale of one to ten, teacher candidates were asked to rate their level of familiarity with DI. Analysis of the data revealed that the data (level of familiarity) was non-normally distributed, therefore a Kruskal-Wallis Test was run first for the independent variable of year and a second analysis was run for the independent variable of program. In both analyses, the level of familiarity was run as the dependent variable. For the first analysis, the year in the program was significant, Kruskal-Wallis Test = (3, N= 219*)* =125.6, $p < 0.05$, at the 0.05 alpha level. The effect size was 0.58.   Follow-up tests were conducted to evaluate the pairwise comparisons among the four groups. The results of these test indicated a significant difference between all years in the program, see Table 2 for means, medians, and standard deviations. Mean ranks are presented with each year comparison. Freshman (32.99) differed significantly from the sophomores (52.10), U= 524.5 , p <0.025, A= 0.28. Freshman (19.91) differed significantly from Juniors (38.53), U= 67.0 , p <0.025, A= 0.12, and Freshman (21.86) differed significantly from Seniors (92.34), U= 135.0, p <0.025, A= 0.03. Pairwise comparisons found that Sophomores (31.47) differed significantly from Juniors (45.20), U= 237.0 , p <0.025, A= 0.29, and Sophomores (36.13) differed significantly from Seniors (107.33), U= 484.0 , p <0.025, A= 0.07. In the final pairwise comparison, Juniors (33.27) differed significantly from Seniors (70.23), U= 379.0 , p <0.025, A= 0.21.

Table 2   Year in Program with Familiarity Scale Scores

| | Year in Program | | | |
	Freshman *(N=35)*	*Sophomore* *(N= 53)*	*Junior* *(N= 15)*	*Senior* *(N=116)*
Means	2.62	4.35	6.13	8.26
Median	2.00	4.00	8.00	8.00
Standard Deviation	2.01	2.30	2.38	1.41

For the second independent variable, program (ECE, MC, AYA, IS) was significant, Kruskal-Wallis Test= (3, $N= 219$) = 10.37, $p = 0.016$, at the 0.05 alpha level.   Follow up tests were conducted to evaluate the pairwise comparisons among the four groups.   The results of those test indicated significant difference between the two distributions of ratings for multiple program areas. The mean rank of familiarity for the ECE (65.75) and IS (81.42), using a Mann-Whitney U test was significantly different, $U= 1339.0$, $p <0.025$, $A= 0.38$, between MC (48.18) and AYA (36.06) $U= 555.0$, $p <0.025$, $A= 0.73$, and AYA (34.00) and IS (51.18) $U= 456.0$, $p <0.025$, $A= 0.28$. See Table 3 for means, median and standard deviations for program with familiarity scale scores.

Table 3   Program with Familiarity Scale Scores

| | Program | | | |
	ECE (N= 105)	*MC (N= 33)*	*AYA (N= 48)*	*IS (N=33)*
Means	6.04	6.84	5.68	7.27
Median	7.00	8.00	6.00	8.00
Standard Deviation	3.07	2.85	2.51	2.75

Student Identification of Modeling of Differentiation

Students were asked to identify the number of specific courses in which they felt the instructors modeled differentiation. As the data was not a normal distribution, a Kruskal-Wallis test was run to determine the difference between programs with number of course as the dependent variable.   Analysis revealed a significant difference, Kruskal-Wallis= (3, $N= 219$) =9.68, $p = 0.02$, at the 0.05 alpha level.   Multiple Mann-Whitney U(s) were run as follow up tests to determine which programs were significantly different. Mean ranks are presented with each significant difference. The results of the analysis revealed that a difference existed between ECE (82.54) and AYA (64.88) $U= 1938.0$, $p <0.025$, $A= 0.48$, MC (48.73) and AYA (35.69) $U= 537.0$, $p <0.025$, $A= 0.72$, AYA (36.29) and IS (47.85) $U= 566.0$, $p <0.025$, $A= 0.35$. A breakdown of the programs and number of courses is presented in Table 4.

Table 4   Program with Number of Courses with DI Modeled (% per program)

	Program				
	ECE	*MC*	*AYA*	*IS*	Total
	(N= 105)	*(N= 33)*	*(N= 48)*	*(N=33)*	*(N=219)*
0 Courses	34 (32.3%)	9 (27.2%)	22 (45.8%)	8 (24.2%)	73 (33.3%)
1-3 Courses	47 (44.7%)	14 (42.4%)	24 (50.0%)	19 (57.6%)	104 (47.5%)
4-6 Courses	22 (20.9%)	8 (24.4%)	2 (4.2%)	4 (12.1%)	36 (16.4%)
7 or More	2 (1.9%)	2 (6.0%)	0 (0.0%)	2 (6.1%)	6 (2.7%)

Student Plans for Future Use of DI

As a follow-up to students selecting a response (0, 1-3, 4-6, or 7 or more courses), students were asked to list the courses in which they felt differentiation was modeled. Using the student's listing of courses (total number) in which DI had been modeled and the student's plans for future use, a correlation was run to determine the relationship between number of course modeled and student's plans for future use. As the data was not normally distributed, Spearman R was conducted. Analysis revealed a weak, positive correlation between number of courses that modeled DI and students' plans for future, which was statically significant Spearman R= (219) = 0.284, p = 0.000). **The strength of the correlation would be described as low (Best & Kahn, 2006).** Squaring the correlation coefficients indicated that 8% of the variance in number of courses that modeled DI as identified by students was explained by the student's plans for future use. Table 5 presents the breakdown of student's future plans for differentiation by program.

Table 5   Program with future plans for differentiation with program percentages (N= 219)

	Program				
	ECE	*MC*	*AYA*	*IS*	Total
	(N= 105)	*(N= 33)*	*(N= 48)*	*(N=33)*	*(N=219)*
Never	4 (3.8%)	0 (0.0%)	3 (6.2%)	1 (3.0%)	8 (3.6%)
Rarely	2 (1.9%)	2 (6.0%)	8 (16.6%)	0 (0.0%)	12 (5.4%)
Often	83 (79.0%)	20 (60.6%)	30 (62.56%)	14 (42.4%)	147 (67.1%)
Always	16 (15.2%)	11 (33.3%)	7 (14.5%)	18 (54.5%)	52 (23.2%)

Discussion

This study looked to access the current climate of the higher education classroom by looking at the perceptions of teacher candidates and their experiences in the HE classroom. Previous research on the topic of differentiation in higher education has focused on faculty describing their practices with integrating differentiation in specific university classrooms, with only two studies previously exploring student perceptions of

education majors (Chamberlin & Powers, 2010; Santangelo & Tomlinson, 2008). The purpose of this study was to document the students' views of differentiation beginning with their familiarity with the topic, as well as their experiences in university classrooms with faculty modeling differentiation. The final areas to be addressed were students' plans for future use of DI in their own classrooms.

A foundation of understanding students' familiarity of differentiation, considering both their program and their year in the program, established that a difference existed between year in the program as well as specific programs. Reviewing the data, the means of the four groups, Freshman ($M= 2.62$), Sophomore ($M= 4.35$), Junior ($M= 6.13$), and Senior ($M= 8.26$), demonstrated that students are growing each year in their level of familiarity. The growth of students between years is encouraging and speaks to the content and learning occurring in University classrooms. Differences appear between specific programs, ECE ($M= 6.04$) and IS ($M=7.27$), MC ($M=6.84$) and AYA ($M=5.68$), and AYA ($M= 5.68$) and IS ($M=7.27$) on student levels of familiarity with DI.   In reviewing the differences, it could be suggested that differentiation plays an important role in specific programs meeting the needs of individual students. Past research on differentiation in higher education classrooms has been most documented with students in early childhood education (Chamberlin & Powers, 2010; Greiss & Keat, 2014; Huss-Keeler & Brown, 2007), while a few studies have explored DI in multiple licensure areas (elementary, secondary, and special education) (Joseph et. al., 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009).   Future research must be conducted to make an accurate assessment of differences between programs and the implications of those differences.

Students were asked to identify specific courses in which they felt differentiation had been modeled.   As past research had looked at students reviewing a specific course in which they were enrolled to assess differentiation (Chamberlin & Powers, Huss-Keeler & Brown, 2007; Griess & Keat, 2014; Joseph, et. al., 2013; Sands & Barker, 2004; Santangelo & Tomlinson, 2009; Mok, 2012; Varsavsky & Rayner, 2013), this study was unique in asking students to think back across their program for courses that had instructors modeling differentiation.   A review of the number of courses and the programs in which candidates were enrolled revealed that a difference existed between ECE and AYA, MC and AYA, and AYA and IS.   In comparing ECE and AYA, the majority of ECE students [71 (67.6%)] felt that they had one or more courses in which DI had been modeled, while only a little over half [26 (54.2%)] of AYA students felt DI had been modeled.   In comparing MC, only nine (27%) felt that they had not seen DI modeled, in comparison to AYA where 22 (45.8%) felt they had not seen DI modeled in a higher education classroom. Finally, 25 IS students (71.7%) reported that DI had been modeled in a HE classroom, while in contrast 22 (45.8%) AYA students felt DI had not been modeled in a higher education classroom.   Of the total students surveyed, 73 (33.3%) felt DI had not been modeled, while a total of 140 students (80.8%) felt DI had been modeled in 1-6 classes.   As this study did not ask students about types of classes, education general courses or program specific courses, the findings need to be further reviewed for course titles, content, and program.

The final question addressed by this research was future use of DI in classroom instruction, specifically student's plans to utilize DI in their own classes and the relationship to number of courses where DI was modeled.   Prior research has been limited on studies that addressed student future use (Chamberlin & Powers, 2010; Chamberlin, 2011; Edwards et al, 2006; Joseph et al., 2013).   In previous studies, students have been asked to rate their level of frequency for future use (Edwards et al., 2006), complete a survey with statements on their agreement to differentiate (Joseph et al., 2013), or have written open ended responses on their future plans to differentiate (Chamberlin, 2011). The total number of candidate 199 (90.8%) who plan to differentiate either often or always is comparable to prior research (Joseph et al., 2013) where findings indicated that 88% of respondents planned to use DI in their future teaching. This study looked to determine the relationship between number of courses in which candidates identified differentiation being modeled and their future use in the classroom. The analysis failed to detect a strong relationship between the two variables. Best and Kahn (2006) refers to the relationship as low (p. 388).

Two areas that support the relevancy of this topic are the survey findings documenting pre-service teacher candidates' exposure to differentiation and their implications for policy change to encourage instruction in higher education to model differentiation. Intended outcomes of this research are changes in instruction to support the expectations of the standard. Findings of this study suggest that teacher candidates are becoming more familiar with DI over the course of their years in an education program.   Differences do exist between programs in candidate's level of familiarity of DI. Differences also exist between programs with the number of courses in which candidates felt DI was modeled. As it has been suggested that modeling DI is important in Higher Education (Gould, 2004; Lightweis, 2013; Pham, 2012) it is recommended to future investigate the specific courses in which candidates document the modeling of DI. As the current trend of teacher assessment (K-12) requires the documentation of instruction to meet the needs of students, it is to be suggested that higher education institutions will adjust to better meet the needs of their students through the use of differentiation.

Limitations of this study include the limited number of candidates in specific licensure programs.   Although this study is a key point in overall program evaluation for the specific university, the strength of this study would be improved by the inclusion of candidates from a range of universities and licensure programs.   Future research should continue to look at the overarching view of students from a range of university and licensure programs, and investigate their experiences for their developmental understanding of differentiation, as well as its identification and application.   The final direction in which this research should be considered is offering professional development for faculty (Sikka, Bebbe, & Bedard, 2011) as a means to support student learning in higher education.

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Differentiated Instruction Survey (Future Teachers)

Directions: Please circle your responses for each question.

1. Are you familiar with the teaching strategy known as "Differentiated Instruction?"
    a. Yes
    b. No
    c. Not sure

2. On a scale of 1 to 10, with 1 being unfamiliar and 10 being very familiar, how would you rate your understanding with Differentiated Instruction? Please circle your answer.

   (Unfamiliar) 1 ___2 ___3___4___5___6___7___8___9___10 (Very familiar)

3. In your own words, can you define differentiated instruction?

4. In how many of your past/present education classes have you learned about using Differentiated Instruction?
    a. 0
    b. 1-3
    c. 4-6
    d. 7 or more

What was the class title, course number or instructor?

5. In how many of your past/present education classes have you had an instructor that modeled Differentiated Instruction?
    a. 0
    b. 1-3
    c. 4-6
    d. 7 or more

What was the class title, course number or instructor?

6.   In courses where the instructor differentiated instruction, what area(s) were the focus of the differentiation? (Circle all that apply).
        a. Content
        b. Process
        c. Product
        d. Learning Environment

7. How often do you, in general, plan to use Differentiated Instruction in your future classroom?
    1. Never
    2. Rarely
    3. Often
    4. Always

Demographic Questions

8. What is your sex?
    a. Male
    b. Female

9. What is your current year?
    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior

10. In what type of education program are you enrolled?
        a. Early Childhood Education
        b. Middle Childhood Education
        c. AYA
        d. IS

SUPPORTING THE RE-BALANCING OF INITIAL TEACHER EDUCATION WITHIN UNIVERSITY AND SCHOOL PARTNERSHIPS

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ABSTRACT:

The change in emphasis in the leadership of initial teacher education (ITE) within school-Higher Education Institution (HEI) partnerships means that experienced teachers in schools are taking on increasingly more responsibility for educating teachers in many countries (Whitty, 2014). Our research encompasses school-based and institute-based teacher educators and the student-teachers who worked with them in a school-HEI partnership in England. A phenomenological approach was employed, seeking to identify the meanings being constructed by the participants through use of a questionnaire, semi-structured interviews and a focus group. Findings suggest that the participants recognized the unique contribution made by both school- and institute-based teacher educators and of the value of working collaboratively in teacher education.

SUPPORTING THE RE-BALANCING OF INITIAL TEACHER EDUCATION WITHIN UNIVERSITY AND SCHOOL PARTNERSHIPS

INTRODUCTION

There has been a shift internationally towards more flexible, school-based routes into teaching (van Velzen and Volman, 2009; Musset 2010; Zeichner, 2012; Whitty, 2014). Musset (2010) proposed that these new routes should be part of a comprehensive design where traditional and alternative programmes should not be seen as competing, but as complementary. However, Zeichner (2012) suggests that this shift has arisen from attacks on the participation of universities in the preparation of teachers. He purports that this change is endangering the professionalism of teachers by narrowing their role to that of technicians who are trained to implement a collection of teaching strategies, but do not develop a deep understanding of their students, the context or the relational skills they will need to be effective teachers in whatever context they are working in. Ellis (2010) similarly warned of the danger of school-based teacher education in England providing an impoverished understanding of school-based experience. Here the political drive is towards increased school-based teacher education through School Direct. In this scheme places are allocated to schools who then choose an HEI or another accredited provider to work with in order to provide the training package needed. In some cases, the student-teacher is employed as an unqualified teacher. Whitty (2014) describes these changes and suggests that they are leading towards 'local' and 'branded' professionalisms that are breaking up the national provision of ITE and may lead to an impoverishment of teacher education. The European Commission report (2013) also expressed disquiet that there is a risk of fragmentation of the profession of teacher educators because of the current considerable challenges in ensuring consistency and quality in the content and provision of teacher education. The concern is that the political forces working within the system of teacher education could have an impact on how well those in school-HEI partnerships are able to collaborate in the provision of high quality teacher education as there is a shift in the balance of power that will affect how the partners position themselves.

The change in emphasis in the leadership of ITE within school-HEI partnerships means that experienced teachers in schools are taking on more responsibility for educating teachers in many countries (Zeichner, 2012; Whitty, 2014; White et al. 2015). In England there is no specific vision for School Direct about how partners in ITE should work. Within this new landscape we are seeking to develop a school-HEI partnership in England that transforms ITE through new ways of partnership working that are 'characterized by a culture of inquiry, reflection, and effective collaboration among all stakeholders' (Ikpeze, Broikou, Hildenbrand, & Gladstone-Brown, 2012, p.276). This School Direct programme is developing through schools and an HEI working in partnership together. The schools are contributing to the academic programme through experienced teachers taking on the role of teacher tutor to provide structured support for the development of subject knowledge for teaching or for other aspects of professional

learning, to complement the taught sessions provided at the HEI. These teachers are working alongside institute-based teacher educators (IBTEs) to plan, and then are working in their own schools with individual or small groups of student-teachers. School-based teacher educators (SBTEs) are defined here broadly, as experienced teachers employed by schools who facilitate the learning of other teachers, whilst IBTEs are employed by the Higher Education Institute.

An understanding of how effective partnerships work in ITE is imperative in the current context. Our research in this partnership context involved SBTEs and IBTEs and the student teachers who worked with them. The SBTEs were also working as teachers and carried out their teacher educator role in their own school. In this research we are interested in a small group of SBTEs who are leading taught sessions for student-teachers as teacher tutors. Some of these teacher educators are also carrying out the role of a traditional mentor or cooperating teacher. This could be viewed as a new group of SBTEs, where previously this term has been largely synonymous with mentors (European Commission, 2013).

Initial analysis of the research data from these participants revealed indications that SBTEs and IBTEs were positioning themselves as complementary partners in ITE in this School Direct programme. Following this, we decided to look further into the data with the research question 'how do SBTEs and IBTEs work within the new programme in terms of the quality of communication, cooperation and collaboration?' Good communication is required for working at a basic cooperative level. Evidence suggests that teacher educators in schools are likely to have little contact with those in HEIs, which can prevent the sharing of knowledge and good practice between different settings (Bullough, 2005; Caena, 2012; Ikpeze, Broikou, Hildenbrand, & Gladstone-Brown, 2012; European Commission, 2013). Cooperation occurs between partners who are working as free agents and choosing to work towards a common goal. Watkins (2005; 35) suggests 'collaboration is a more extended process than cooperation, because it needs people to bring something important together: in communities this is likely to be something of themselves'. This is not only working towards a shared outcome, but having a shared process to get there. Collaboration is less likely to be associated with competition than cooperation. We concur with the ethos of Henneman, Lee and Cohen's (1995) understanding of collaboration:

> 'Collaboration is a complex, sophisticated process. It requires competence, confidence and commitment on the part of all parties involved. Respect and trust, both for oneself and others, is key to collaboration. As such, patience, nurturance and time are required to build a relationship to the point where collaboration can occur' (p.108).

It is collaboration at the level of the individuals involved that is of particular interest here, rather than collaboration at the level of the institutions that are in partnership together. The findings have been analyzed through the themes of communication, cooperation and collaboration. The theme of collaboration was expanded to consider competence, confidence and time. The understanding gained from this research may inform future developments in school-led provision to ensure the student-teachers have the best

learning experiences possible through enabling genuine collaboration to develop at the level of individual SBTEs and IBTEs in school-HEI partnerships.

METHOD

Research management and approach

This research project was designed and implemented by researchers in a HEI School of Education in England. The research team included the IBTE with responsibility for managing the School Direct programme (project lead) who worked with the research participants and had understanding and insights into the programme and the roles of the participants, and two researchers who are not teacher educators and were not known by the participants. These two researchers conducted the data collection activities in order to reduce any impact that the project lead's role in the programme might have on the participants' responses.

Fourteen participants, SBTEs, IBTEs and student teachers who were engaged in the School Direct programme took part in this small-scale research project. Although as Patton (2002, p. 46) asserts it is not possible to 'generalize from single cases or very small samples, one can learn from them – and learn a great deal, often opening up new territory for further research…'. The purpose of this research project was to understand each participant and learn from them and their unique situation. It draws on a phenomenological approach starting with the participants' real life experiences and reflecting on these events, being attentive to the details and considerate of what may be significant (van Manen, 2003). The researchers sought to understand from each participant's perspective in order to retain the integrity of the phenomena under investigation. Davey (2013, p. 34) noted that 'the closer the researcher is to the phenomenon under study, the more accurate and valid their interpretation is likely to be'.

Research participants and data collection

School-based teacher educators. All thirteen members of the cohort of SBTEs (teacher tutors) were invited to take part in the project. Eight (62%) responded by completing an emailed self-completion questionnaire; three men and five women. Seven of these respondents taught in secondary schools and the remaining respondent in a primary school. The respondents included teacher educators with experience of mentoring and those with and without prior experience in leading the professional learning of teachers and student teachers.

Using purposeful sampling, five of these eight respondents were invited as '*information-rich cases* for study in depth' (Patton, 2002, p. 46, emphasis in original) to take part in a telephone interview. Drawing on their responses to the questionnaire these five teacher tutors were identified as participants from whom 'one can learn a great deal about issues of central importance to the purpose of the inquiry' (Patton, 2002, p. 230). They were seen as SBTEs who described significant impact on their own professional learning through their involvement in their new role; felt they had benefitted from working with an IBTE; and recognized they had significant expertise to contribute to the development of student teachers that would be difficult to provide in other ways.

Two secondary SBTEs responded to the invitation to contribute further to the research through a telephone interview. The schedule for these interviews was developed using the responses to the email questionnaire. The participants' opinions were sought on a range of issues relating to school-based teacher education and the role of teacher educators, for example, who should be involved in preparing teachers; their multiple roles in school; their role as a teacher tutor; professional learning/support for the role of SBTE; and their sense of professional identity as a teacher educator. Open-ended questions were used in order to obtain descriptive data that would aid understanding, emphasizing their 'meanings, experiences, and views' (Pope & Mays, 1995, p. 43). The intention was that the SBTEs would benefit from reflecting on their practice with an interested partner during the interview with a research fellow who recorded the interviews digitally, partially transcribed them and sent them the resulting 'key points' for revision and comment. Interviewees were assured that when data were disseminated as direct quotations they would be re-checked for accuracy.

Institute-based teacher educators. The two IBTEs who had worked closely with these SBTE interviewees took part in semi-structured face-to-face interviews with the same researcher using an interview schedule derived from the one used for the interviews with SBTEs. The same recording, transcription and verification process was used as for the SBTEs.

Student teachers. Eight student teachers were invited to a focus group to share their experiences as members of this first cohort of students engaged on the School Direct programme. They were taught by both SBTEs and IBTEs. Four attended the focus group.

Data analysis

This paper focuses on the findings from the self-completion questionnaires and interviews with teacher educators. Consistencies between the data collected through the interviews, questionnaires and focus group support the trustworthiness of the responses (Yin, 2009). The interviews were designed to benefit all involved (Cohen, Manion, & Morrison, 2007) and the participants were seen as 'conversational partners' (Rubin & Rubin, 2005, p.14).

The project lead read and re-read the data texts and grouped the data according to areas of questioning before carrying out 'categorizing analysis' (Maxwell, 2013, p. 107). During the first stage of categorization, data relevant to each of the main categories derived from the research question (quality of communication, cooperation and collaboration) were identified for closer scrutiny. These categories provided 'organizational categories' that were useful for sorting the data that were of interest for further investigation (Maxwell, 2013, p. 107). The highlighted data were subsequently explored in greater depth and placed into 'substantive categories', which are 'primarily *descriptive*' and closely related to the data; and during this stage the content of the data was examined (Maxwell, 2013, p. 108, emphasis in original). New insights emerged through this process of repeatedly reviewing the data.

Ethical considerations

This research was approved by the appropriate university ethics committee with delegated authority. Participants were assured that they could withdraw at any time and that their involvement, or otherwise, in the research would not affect their association in future with the School Direct programme. They were aware that their responses would not be anonymous within the research team because of the unique nature of their work with the School Direct programme; however, confidentiality would be maintained during dissemination of the research. For this reason, participants have been given the following pseudonyms. The SBTEs responding to the email questionnaire: Francesca (Primary); John; Peter; Sara; Pooja; Sofia; Tracy and Mark. Sofia and Mark also took part in interviews. The IBTEs participating in interviews: Graeme and Jodie.

RESULTS AND DISCUSSION

Communication

Collaboration is built on good quality communication. The structure of the programme provided opportunity for communication between partners. Listening to the teacher educators participating in the research there was evidence of good communication between stakeholders in the partnership, as shown by the following extracts. The participants' comments relate to aspects of the programme that are not specific to the new way of working between SBTEs and IBTEs, but were just as likely to reflect the communication between SBTEs working as teacher mentors and IBTEs. As an IBTE, Jodie recognized that 'The school does most of the practical…training and I am a link between the university and the school so I go in every half-term and I observe a lesson, talk to the teacher mentor who's doing the training, talk to the professional mentor who is overseeing the training...' Jodie then reveals that the reality does not always live up to expectations as she explains that she always tries to meet with each one (the trainee, the teacher mentor and the professional mentor) on their own so that they each have a 'chance to offload' but actually setting up three individual meetings is difficult. However, Jodie continues by describing in detail the nature of the communication that she was having with SBTEs: 'Having watched a lesson with the trainee I then meet with the teacher mentor and the trainee, three of us... I have to judge whether the mentor is being too prescriptive, just lecturing the trainee…or the other end of the spectrum, which is not good is a kind of laid back approach…not analytical or detailed in any way. So for the prescriptive ones, I have to sort of curb their desire to talk and intervene and keep asking the trainee for an opinion, and if necessary modelling the feedback for the mentor... If they are being too laid back, I would ask the mentor some very specific questions…can I see the records of your last meeting, this was a goal what have you done to help her achieve it…' Here she reveals that she sees her role as supporting the mentor, as a critical friend, to enable the trainee to succeed, leading to her communication with the SBTEs being very purposeful.

Sofia had the role of mentor to a student-teacher and was also taking on the new role of teacher tutor for some of the subject knowledge development aspects of the programme.

She felt that 'The mentor sessions that existed, as in being able to come together and converse and have dialogues, were brilliant'.

Although not directly stating that dialogue around teaching had been important, Francesca commented that the role of SBTE 'has impacted on me as I feel personally that teaching can be quite an insular career where it is easy to become involved deeply in your own day to day teaching and as our career is so fast paced by working with the School Direct it allows you to reflect and improve your own practice'.

In each of these cases the communication being alluded to could have occurred on any programme of ITE, and is not specific to the new way of working that we are exploring, where SBTEs are leading some academic aspects of the programme. However, it does reflect the quality of underlying relationships within this partnership. These examples of communication do not reflect anything more than cooperation between SBTEs and IBTEs.

Cooperation

Cooperation occurs between partners who are working as free agents and choosing to work towards a common goal, but does not imply the partners are working to find common ground, a shared way of working together to get to the common goal. The teachers identified different ways in which they cooperated in the education of the student-teachers. These included:

- teacher mentor, taking on the day-to-day mentoring of a student-teacher one-to-one for the school-based training
- professional mentor, supervising the professional learning of student-teachers and overseeing the quality of teacher education within their school
- teacher tutor, planning, leading and evaluating at least one aspect of the academic course, for instance: subject knowledge development days in school; seminar groups; school-led training sessions and one-to-one tutorials to support students in the directed tasks that focus on developing their subject and professional knowledge for teaching.

In each case the roles of teacher mentor or professional mentor were carried out by following the tried and tested procedures, including attending developmental sessions to understand procedures and to develop skills. These roles can be taken on by teachers cooperating in the programme rather than collaborating with the IBTE. The role of teacher tutor was new and was in common for all the participating SBTEs. The teacher tutors were involved in planning and developing this aspect of the programme with IBTEs.

Collaboration

Previously we identified that in this programme SBTEs and IBTEs position themselves as complementary partners in ITE. We are considering partnership at the individual level rather than the institutional level, so references made here to complementarity and collaboration are not directly comparable to the use of these terms with respect to institutional partnerships by Furlong et al., (1996) and Smith et al., (2006). These comments by SBTEs, revealing the value that the participants saw in working together, reflect those of the other teacher educators participating in the research: 'There must be a place for both…the teacher will facilitate learning in a practical environment that is conducive and realistic to what they should expect in a years' time and the university provide structure a well-rounded experienced, suitable assessment and the status that the training requires' (John) and 'I can see the benefit of both University tutors and practicing teachers. The experience of University staff is invaluable, and adds to the academic rigor of the course, however, practicing teachers are more likely to be able to add more personal advice based on their experiences, and may be able to challenge the literature because of this' (Pooja).

There was an appreciation of what each other can bring: 'My trainee would have been affected by the lack of [subject] pedagogical training if I had not been invited to create it' (Sofia), and 'University tutors build up subject knowledge on a formal approach and have a better understanding of it, than some teachers and advisers. [University] tutors have better knowledge of best teaching approaches through research and also because of their experiences through multiple observation' (Mark). The students in the focus group also felt that both SBTEs and IBTEs had a valuable contribution to make to the programme.

There was evidence of collaboration in the participants' responses around the role of teacher tutor: '[IBTE] has empowered me with our work on subject knowledge. Creating the directed study has been insightful and focuses the course back to [subject] pedagogy' (Sofia) and 'Having a subject specialist, another subject specialist to bounce ideas off has been invaluable, absolutely invaluable... I don't think either of us could have done it as well by ourselves' (Graeme).

Mark recognized that he had a crucial role in the development of the programme. 'Throughout the course I've met mentors of trainees at different points and we've been able to discuss…how we approach the training... With the mentors in the schools and myself and [IBTE] we've managed to break down exactly what we are going to do when and because we've done it through consultation it has been much more effective'. He also expressed disappointment that 'more of the schools directly involved in teacher training through schemes such as School Direct related to [subject] did not feel up to participating in the training of teachers. Colleagues from the schools that have taken the trainee teachers also felt under equipped to teach a [subject] curriculum'.

Initially, in this programme, collaboration between IBTEs and SBTEs may have had elements of 'contrived collegiality' as discussed by Hargreaves and Dawe (1990, p. 227) as there was a requirement to work together at the beginning of the process. However, the comments made by the participants illustrated that 'what began as contrived meetings...

evolved into spaces for more genuine collaborative activity wherein teachers challenged each other, raised questions, and shared ideas for teaching' (Datnow, 2011, p. 156).

Competence and confidence in the role of teacher educator

Henneman, Lee and Cohen's (1995) definition of collaboration as a complex and sophisticated process, identified the need for competence, confidence and commitment on the part of all parties involved. The teachers shared some of their developing competences through their answers, including an understanding of

- how teachers develop
- working with adults
- pedagogical approaches
- subject knowledge (and being able to break it down to help students develop depth of understanding)
- the wider school curriculum
- new resources and approaches

Some teacher educator skills were developing, including:

- being able to broker learning opportunities 'between trainees and other teachers who could learn from each other' (Tracy).
- mentoring skills such as 'observation, difficult conversations and providing myself as a critical friend' (Francesca).
- interpersonal skills as 'you have to read situations when you are in them and you have to respond accordingly' (Jodie).

There were several instances of SBTEs developing their confidence 'The session got such a great response and built up my confidence' (Mark) and 'being involved in the development of the course has made me far more confident in driving forward a teaching and learning agenda' (Tracy).

The issue of time

Patience, nurturance and time were also highlighted by Henneman, Lee and Cohen (1995) as vital to developing a collaborative partnership. The development of new partnerships in ITE, in the current landscape, in England is rapid. Research conducted in the USA in a professional development school partnership concluded that poor communication, differing aims and ways of working, often resulting from the speed with which these new partnerships are established are barriers to effective partnership working (Ikpeze, Broikou, Hildenbrand, & Gladstone-Brown, 2012).

Some funding and time was set aside to develop this new way of working, so that SBTEs would be able to plan their contribution to the subject and professional knowledge development of the student-teachers. Mark found that 'the school has given me time to make sure that I am fully prepared to support the developing of the programme, [which] has been really useful', yet he also shared the challenge that this has been within his

school: 'It's been nice to have people coming into the school, it's been nice to see development of the subject in the school quite quickly because of our involvement. But I do think that sometimes because the amount of involvement, people see that as a negative thing because sometimes lessons do need to be covered, planning needs to take place…'. This reveals how school/HEI partnerships are vulnerable where there are differing priorities and a fast-changing landscape. The students felt that there were time constraints for SBTEs to do this aspect of their work because of their dual role as teacher and teacher educator. Sofia also found time a challenge, saying 'One of the things that you have to do is be prepared to devote time that isn't necessarily allocated time'. She recognized the time-consuming nature of the role and went on to declare 'I think that the role is limited by the other restraints of your other jobs… I prioritize being a mentor because I want to contribute to outstanding teachers going into the workplace... Maybe I've sacrificed other things in my job to make some kind of a balance or maybe my social life'. This reveals the commitment of this SBTE to ITE, but it is also a concern as lack of allocated time will threaten the sustainability of collaboratively working in school-HEI partnerships because it is too demanding on teachers in the workplace.

CONCLUSIONS AND IMPLICATIONS FOR PRACTICE

Effective partnerships are needed to design new and creative initiatives that will best prepare teachers for current contexts. This research has explored the nature of a new partnership between schools and an HEI in the context of the rapid development of diverse school-led ITE programmes at the level of individual collaboration between SBTEs and IBTEs. Some of the challenges and benefits of this way of working have been revealed through analyzing the data through the themes of communication, cooperation and collaboration. The new aspect of partnership working between SBTEs and IBTEs in developing academic aspects of the programme provided an opportunity for collaboration that was enriching for all, and went beyond the traditional communication and cooperation between IBTEs and SBTEs regarding mentoring and supervising school-based training for student-teachers.

By listening to the voices of teacher educators and their student-teachers we are finding an appreciation of the unique contribution made by both SBTEs and IBTEs and of the value of working in collaborative partnerships in teacher education. We recognize that SBTEs and IBTEs are not necessarily equal within the programme in terms of role and responsibility, however all partners are valued for the contributions they provide and are invited to participate in working collaboratively to develop the programme. There is some similarity with the assertion made regarding collaboration between students and HEI tutors by Cook-Sather, Bovril and Felten:

> 'In student-faculty collaborations, we need to acknowledge that our roles, expertise, responsibilities, and status are different. And they should be. Partnership does not require a false equivalency, but it does mean that the perspectives and contributions made by partners are equally valued and respected and that all participants have an equivalent opportunity to contribute' (2014, 7).

The roles, expertise and responsibilities in SBTE-IBTE collaborations, are also different, but all partners are valued and respected and have equal opportunity to contribute. At this time of rapid policy-driven change, the traditional balance between the roles of IBTEs and SBTEs has been upset, with more responsibilities falling to practicing teachers, yet it is questionable as to whether they have more status within ITE. The shift in balance threatens the involvement of HEIs in teacher education which, in turn, could lead to fragmentation and undermine the sustainability of ITE. The risk is that schools and universities could end up competing against each other rather than collaborating. However, within this current context there are spaces where effective partnerships can develop to enrich the preparation teachers.

The increased responsibility for aspects of ITE that are new to SBTEs has produced a need for professional development in the knowledge and skills of teacher education, and integration into a professional community of teacher educators, in order to develop an identity as a teacher educator and to benefit from the rich specialized knowledge within this community (White, 2013). Where IBTEs and SBTEs can work collaboratively to plan academic aspects of the programme, there are recognized benefits for all participants. These collaborative partnerships provide a space for the professional learning and development of the teacher educators involved and increases the competency and confidence of those carrying out this role.

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ACCOUNTABILITY AND THE ACHIEVEMENT GAP

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ABSTRACT

The challenge of encouraging and enabling the skills of a not-very-diverse teaching force to become advocates for an increasingly diverse pre K-12 student population has been discussed often and is an issue of paramount importance.

ACCOUNTABILITY AND THE ACHIEVEMENT GAP

The challenge of encouraging and enabling the skills of a not-very-diverse teaching force to become advocates for an increasingly diverse pre K-12 student population has been discussed often and is an issue of paramount importance. Achievement gaps economically, racially and ethnically are well documented at all levels of education. In addition, AP and honors courses are traditionally under-represented by a diverse student population.

One secondary teacher's passion changed the process her high school followed in identifying students for advanced placement and honors classes. With administrative support, she was allowed access to data to support her plan, given permission to educate teachers about student demographics and descriptors of appropriate identification.

That was six years ago, and this study follows the changes that have become permanent in the school culture.

For many years, educational research has been focused on the achievement gap between Caucasian students and students of color. In a recent study published by the Center for American Progress, Boser, Baffour and Vela (2016) report that achievement gaps remain large among students of color as reported in the 2015 National Assessment of Educational Progress, NAEP test, known as the nation's report card. Every two years, NAEP exams in math and reading are given to a random sample of schools and students in each state and more than 20 urban districts.

While NAEP assesses student progress at the national and state level, the Trial Urban District Assessment, TUDA, is used to report the performance of large urban districts. The TUDA test was first administered in 2002 and served as a way to "focus attention on urban education" by providing district-level NAEP exams. In 2002, there were only six participating urban districts; that number has since increased to 21 districts.

"Using data from TUDA and NAEP, this report estimates the absolute number of students at or above proficient for each disaggregated group. We started with the overall percentages of students scoring proficient or above or scoring advanced or above on each NAEP exam in 2015. We then compared these data with estimates of the total school-age population for each group. To our knowledge, this is the first time that such an analysis has been done (Boser, Baffour & Vela (2016). This data highlights the second issue of the education crisis: the persistent low achievement of students of color and students from low-income backgrounds. States and districts have largely ignored the needs of such students, and many students of color and students in poverty have attended schools with far fewer opportunities. Graduation rates for students of color are also lower than those of white students. During the 2013–2014 school year, 87 percent of white students graduated from high school on time; whereas only 73 percent of black students and 76 percent of Hispanic students earned a high school diploma.

In the 9th annual AP Report by the College Board, states have made great strides in recent years in closing equity gaps for underserved minority and low-income students, but these students remain underrepresented in AP classrooms. Blacks and Latinos make up 37 percent of the nation's high school students but only 27 percent of those enrolled in an AP course. It is imperative that we increase diversity and performance at the same time, and ensure that the demographics of both AP participation and success align with the demographics of the overall student population.

The national data was mirrored at Wichita High School East as well, when in 2008 the racial makeup of ninth graders in advanced classes was 43 percent Caucasian and by junior year, 53 percent, while the overall percentage of students of color in the school was 68 percent. Clearly, there was an achievement gap. In her sixth year of teaching, the researcher had seen the problem clearly year after year, and was ready to take on the challenge to address the inequity.

The initial action needed was to disseminate this information to the teachers and make them aware of the school's current standings. Graphs and charts of the data were given to the social studies department teachers, and they were given time to reflect and discuss. The goal was to improve the situation merely through increased awareness, as sometimes just spotlighting a problem illuminates a solution. That did not happen. The next step was to analyze the students' records who did not receive an Honors or AP recommendation even after the teachers were made aware of the situation.

The next phase of the project was to look at each non-recommended category and separate out the cause. For example, if a student did not get a recommendation because of academic ability, questions were asked: What could be done to change that? What abilities were lacking? Was it testing ability, writing skills, reading, or organizational skills? What could teachers do to reach these academically challenged students?

The initiative to tackle these questions came with full district backing, the most effective being Vertical Teams. The social studies department committed to aligning vertically in weekly Professional Learning Community teams to assist in this initiative and set up a sixth to twelfth grade AP social studies vertical team that consisted of teachers from all seven grade levels and all middle schools feeding the majority of their students into East High. From Junior AP teachers to sixth grade world civilization teachers, the curricula and skills needed were outlined. Based on the discussions of what high school Honors classes are about and what skills they require, the middle school teachers submitted their student recommendations for freshmen Honors. Those lists were collected, and just like the high school data was studied, the search for students with like data was searched. This also gave the high school a baseline for looking at Honors recruits who might not be coming from the three middle schools from which the majority of entering freshmen come. Making the middle schools aware of the situation and involved in the solution had a major impact. The collaboration needed to address this kind of disposition change involved communication at every level, teacher to teacher, teacher to data coordinator, department to counseling staff and department to administration.

Although by the end of the action research project, minority enrollment in advanced classes had increased only in single digit rates. But to date, the upward trend continues.

One of the serendipitous unanticipated results of this ongoing six-year research project has been the change in culture among the faculty. To assess said change, the researchers interviewed administered a sample of teachers to quantify perceptions of culture change. Selected responses:

In addition to set pathways and data, we do a good job of using teacher input as a component of placement. There have been times when the data doesn't necessarily show a student's ability, but a teacher has advocated for the student to have the opportunity to be up-drafted.

Our building is a special place with an uncommon combination of collaborative leadership with high intention and true respect for teachers, an extremely dedicated group of department chairs and energy from teachers that ends up creating an overall learning environment that is greater than the sum of its parts.

One aspect of our faculty's cohesion is a result of them feeling their input is heard and valued. Teachers know that their colleagues, administrators, and support staff will listen to and ask for information about a student on a variety of levels—academic, personal, health, etc. When teachers feel their voices matter, it changes the way they view leadership, meaning it makes them more likely to want to take on leadership roles and become involved in activities beyond their classroom doors.

Our building is a special place with an uncommon combination of collaborative (dare I say humble?) leadership with high intention and true respect for teachers, an extremely dedicated group of department chairs, and energy from teachers that ends up creating an overall learning environment that is greater than the sum of its parts.

I love to watch the students entering Honors Physics classes. They are all shades of skin pigment and as wide a cross-section of East High cultures as we have anywhere. The students sitting in his classroom look just like the students walking through the hall. I'm not sure that's true across the board for other content areas/school. I think this is because we say to students, "You have the skills; this is where you belong".

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