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Meeting the Needs of the New Generation



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JOURNAL OF THE INTERNATIONAL SOCIETY FOR TEACHER EDUCATION

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ABOUT THIS EDITION

Welcome to the 18th volume, first issue of the Journal of the International Society for Teacher Education. This issue marks the fifth edition of us being the editors of this journal. We are proud to present these 13 articles representing 11 different areas of the world. Each of these articles was presented in paper groups at the 33rd seminar of ISfTE which met at Hong Kong Baptist University in Hong Kong, China. Although each article has its local perspective, teachers and teacher educators can learn from each of these perspectives to enhance their own practices in other parts of the world.

The four articles which center on various aspects of teacher education come from four different geographical areas: Hong Kong, United States, Bhutan, and Brazil. The first article by Atara Sivan and Dennis Chan from Hong Kong was an action research project on teachers' understanding of their interpersonal behaviours and how those behaviours affect the classroom environment and student learning. The next article, authored by Penée Stewart and Kristin Hadley from the US, sampled pre-service elementary teachers to investigate how visual imagery, metacognition, and mathematics pedagogical content knowledge are related. The third article in the category is from Karma Galey of Bhutan. He discussed how the use of virtual learning environments has not yet been optimized for the training of student teachers. The last article, by Vera Lucia Felicetti and Marilia Costa Morosini, focuses on the importance of international cooperation to produce more rounded graduate students in teacher education in Brazil.

Three of the articles focus on culture and cultural values from three very different viewpoints. The first article from Hong Kong brings attention to the perspectives, values, and beliefs of parents whose children are on the autism spectrum. The authors are Kathleen Tait (a visiting professor in Hong Kong but has now returned to Australia), Lawrence Mundia from Brunei, and Francis Fung and Chun Ho Wong, research assistants in Hong Kong. In the second article Emmanuel Sunday Osiyemi argues that the teaching of traditional Nigerian cultural

values within schools is vital to maintaining national identity. The last article in this category is from Shannon Butler from the United States who negotiated cultural dissonance when she brought her "Western" teaching style to her graduate students learning English at Peking University in China.

Education in the kindergarten to grade 12 setting is spotlighted in four articles; a fifth article bridges the k-12/college setting. Olufolake Sophia Orekoya, currently from Hong Kong, suggests that social studies instruction has the need to be improved throughout the world. She offers several solutions. In an article from Singapore, Tay Pei Lyn Grace and Tee Kai Thomas Lee argue for mobile technology use in primary schools that is interdisciplinary and develops necessary skills through authentic learning. Focusing on secondary education in Nigeria, specifically chemistry, Modupe Osokoya and Raphael Yewande, conducted a study to show how human constructivism-based cooperation learning affected students' construction of chemical equilibrium and their chemistry self-efficacy. Taking a more global rather than content-specific approach, Renu Yadav of India, suggests that the capability approach first espoused by Amartya Sen would provide a solid foundation for quality education. The last article in this section is by Theodosia Prodromou of Australia. Her research was about using GeoGebra, an open-source software package, in an introductory college statistics course. Although her research took place at a university, she suggests that this software package could be used to teach algebra, geometry, and calculus in secondary schools.

The last article explains the artistic path Subhashbhai Makwana and Jignesh Patel took in designing a symbol to represent teachers. Their simple yet elegant symbol was presented to Forrest Crawford, Secretary-General of ISfTE, at the seminar in Hong Kong. It is a fitting symbol to unite teachers around the world.

Karen Bjerg Petersen and Peggy J. Saunders, Editors

ENHANCING TEACHERS' UNDERSTANDING OF THEIR INTERPERSONAL BEHAVIOUR IN THE CLASSROOM: AN ACTION LEARNING PROJECT

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Abstract: *Interpersonal teacher behaviour is as an important aspect of classroom environment which is conducive to student learning. This paper reports on a project aiming at enhancing teachers' interpersonal behaviour in the classroom by arousing their awareness of their interaction with students. Twenty-one Hong Kong secondary school teachers and their students participated in two cycles of action learning involving the completion of Questionnaire on Teacher Interaction (QTI) and teachers' reflection on the data with the investigators serving as 'critical friend'. Results indicated that teachers were perceived as exhibiting more leadership, friendliness and understanding than uncertain, dissatisfied and admonishing behaviour. Some changes in teachers' interpersonal behaviour were identified between the two cycles, with teachers' consciously making changes in their interactions with their students. Teachers' feedback on the project showed its contribution to their understanding of interpersonal teacher behaviour and awareness of its possible impact on student learning.*

Key Words: interpersonal teacher behaviour, student-teachers, action learning, Hong Kong

Introduction

Interpersonal teacher behaviour has been acknowledged as an important aspect of classroom environment which is conducive to student learning. Numerous studies have indicated that interpersonal teacher behaviour is associated with students' cognitive and affective learning outcomes (den Brok, Brekelmans, & Wubbels, 2004; Fraser, 2002; Wubbels & Brekelmans, 2005). The measurement of interpersonal teacher behaviour is based on Leary's (1957) classic examination of dialogues and group discussion in clinical situations which led to the identification and mapping of different types of interpersonal behaviour. Leary's concept was then adapted to the context of education, resulting in a Model for Interpersonal Teacher Behaviour (MITB) measured by the Questionnaire on Teacher Interaction (QTI) (Wubbels, Creton, Levy, & Hooymayers, 1993). The MITB maps the behaviour of teachers on two dimensions: Proximity and Influence.

While the former refers to cooperation-opposition practices, the latter deals with dominance-submission relationships. Within these two dimensions there is a division of eight sectors which describes different types of teacher behaviour: Leadership, Helpful/Friendly, Understanding, Student Responsibility/Freedom, Uncertain, Dissatisfied, Admonishing, and Strict.

The QTI has been widely used in different contexts among students and teachers and shown to be valid and reliable (Wubbels & Brekelmans, 2005). In our previous study on interpersonal teacher behaviour in Hong Kong, we have collected evidence supporting the validity and reliability of the instrument and found that it was positively associated with students' cognitive, affective, and moral learning outcomes at secondary schools (Sivan & Chan, 2013). In view of its significant association with student learning and in order to promote teachers' role as facilitators of learning, we decided to

extend our previous investigation by using the QTI as a feedback tool for teachers' professional development. The present paper reports on an action learning project which aimed at enhancing teachers' understanding of their interpersonal behaviour by using the QTI.

Action learning assumes that learning results from active experience and improvements to existing situations can be brought about through involvement in a cyclical process of critical reflection and action (Kember, 2000; Zuber-Skerrit, 2011). In this study, action learning was adopted with the view to fostering teachers' professional development by enhancing their learning and active development through reflection on their own practices (Zuber-Skerrit, 2011). With this background, the objectives of this project were (a) to arouse teachers' awareness of their interpersonal behaviour in the classroom, (b) to facilitate their reflection on their interpersonal behaviour, and (c) to enhance their interpersonal behaviour so as to strengthen their role as facilitators of learning.

Methodology

An action learning approach (Kember, 2000) with two cycles of data collection was adopted in this project. There were four phases in each cycle, namely planning, action, observation, and reflection.

Participants were volunteer year-one student-teachers enrolling in the Postgraduate Diploma of Education (PgDE) in the Department of Education Studies of the Hong Kong Baptist University and their junior secondary school students. The PgDE is a two-year part-time programme for in-service secondary school teachers. The student-teachers enrolling on this programme normally hold a bachelor's degree in a specialising subject but do not have the

qualification in professional teacher training. All participants completed the QTI once in each cycle.

The QTI is a 48-item questionnaire with eight scales depicting different types of interpersonal teacher behaviour. Each scale consists of six items on a 5-point Likert scale, ranging from 0 (never) to 4 (always). Some sample items for illustration are: "This teacher is willing to explain again if we don't understand" (understanding), "This teacher gets angry quickly" (admonishing), and "This teacher is friendly" (helpful/friendly). A total score for each scale can be calculated by summing the scores of its six items. Below is a description of the four phases in each cycle.

Cycle One

Planning. An initial briefing session was held with the student-teachers to familiarize them with the objectives of the project, the procedures in data collection, and the eight types of interpersonal teacher behaviour. With the help of the investigators, the student-teachers made preparations for conducting fieldwork at the beginning of the semester like seeking permission from their principals to collect data in the school, choosing a class of students to participate in the project, and administering the QTI twice to the same class of students.

Action. Student-teachers ($n = 21$) and their respective students ($n = 505$) completed the QTI in their own classroom setting. Follow-up interviews were held with the each of the student-teachers and a group of their students (4 to 8) after their completion of the QTI.

Observation. Data obtained from the QTI and the follow-up interviews were coded, analyzed, and used for facilitating student-teachers' discussion and reflection. Based on the QTI data, two patterns of individual

interpersonal behaviour were constructed for each student-teacher: one from the student-teacher's perspective and the other from his/her students' perspective.

Reflection. Results of the two individual QTI patterns were highlighted and presented to each of the student-teachers in a sharing-reflection session in which the eight types of interpersonal behaviour were compared from the two perspectives. All student-teachers were informed of the differences in perceptions between the two perspectives. This was followed by student-teachers' discussion and reflection of their own interpersonal behaviour with reference to their role as facilitators of learning. Throughout this session, the investigators served as 'critical friends' giving student-teachers feedback and helping them to have a better understanding of their interpersonal behaviour for improving classroom teaching. The role of critical friend in action learning is perceived as an agent for teacher development and unlike an adviser or consultant, the person who serves in this role sees himself/herself as a friend (Kember et al., 1997; Stenhouse, 1975). The critical friend is also regarded as a partner who works together with the teachers in the action learning process and gives them advice. While the teachers are planning to initiate changes in their teaching, the critical friend serves as a facilitator who plays a proactive role in promoting their learning through engagement in reflective inquiry (Elliot, 1985). The group sharing, together with the investigators' feedback, served as the basis for reflection in Cycle Two.

Cycle Two

The second cycle involved the same four phases, repeating the same procedures in Cycle Two. The same class of students of each student-teacher was contacted again

near the end of the semester for their second completion of the QTI (n = 405). Similarly, the same group of student-teachers (n = 19) was invited again to fill in the QTI. Based on their responses, two patterns of interpersonal teacher behaviour were again constructed for each student-teacher for comparison and reflection in Cycle Two. In the fourth phase, student-teachers' feedback on the project was also solicited through a brief questionnaire with 10 close-ended and some open-ended questions. Qualitative and quantitative data were analyzed using the QSR N5 (Richards, 2000) and the SPSS 16.0 for Windows (2007) respectively.

Results

Figure 1 provides an example of a student-teacher's two patterns of interpersonal teacher behaviour in one cycle, one from the students' view and the other from the student-teacher's perspective. The patterns are presented in a circumplex model representing the MITB (Wubbels et al., 1993). The shaded areas in the figure show the mean scores of the student-teacher's or his/her students' responses to the questions of the eight QTI scales. In this example, we can identify some differences between the student-teacher's self-perceptions and the students' perceptions. In comparison with the students' perceptions, the teacher tended to perceive himself/herself as exhibiting more leadership, being more helpful/friendly, displaying more understanding, and allowing more student responsibility and freedom, but regarded himself/herself as displaying less admonishing and dissatisfied behaviour. In addition to the two above-mentioned models for each student-teacher, the scores of self-rating and the mean scores of his/her students' ratings regarding the eight types of interpersonal behaviour were calculated for discussion, sharing, and reflection.

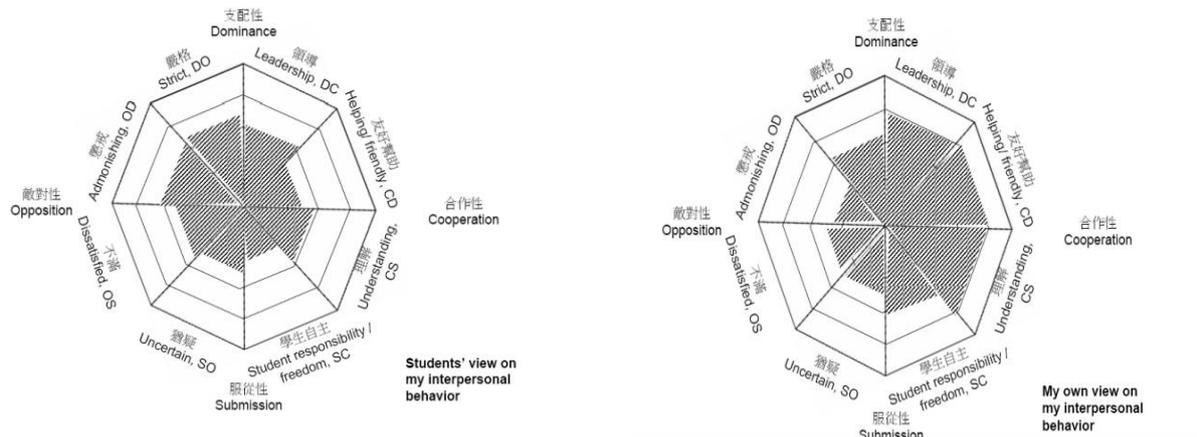


Figure 1. A Student-teacher’s and Students’ Mean Scores in Perceptions of Interpersonal Teacher Behaviour

In general, in both cycles, students as a group tended to perceive their teachers as showing more leadership, friendliness, and understanding than uncertain, dissatisfied, and admonishing behaviour. In comparing the data collected in the two cycles, some positive changes were identified in students’ perceptions and teachers’ self-perceptions in Cycle Two. For example, while the students perceived their teachers as giving them more student responsibility/freedom, the teachers tended to see themselves as being more helpful/friendly.

Follow-up interviews with student-teachers in Cycle Two indicated that some of them had consciously attempted to make changes in their interactions with students: being more helpful/friendly, providing more responsibility/freedom, feeling less uncertain and dissatisfied in class, and being less admonishing and

strict. In addition, some student-teachers remarked that they were more in control of their own emotions and paid more attention to their inattentive and misbehaving students.

Feedback solicited in Cycle Two showed that student-teachers’ evaluation of the project was very positive (Sivan & Chan, in press). In Table 1, it can be seen that the mean scores of all the ten close-ended question items were well above average (a score of 3), ranging from 3.76 (The project has enhanced my professional knowledge as a teacher) to 4.53 (The project is relevant to my teaching career). These findings strongly suggested that the project had made an impact on the student-teachers by arousing their awareness of their interpersonal teacher behaviour and by facilitating their reflection on teacher-student interactions.

Table 1
Student-teachers' Feedback on the Project in Cycle Two (n = 17)

Question Item*	Mean	SD
1 The project is relevant to my teaching career.	4.53	.62
2 The project has made me think more about my classroom interactions with my students.	4.47	.62
3 The project has made me aware of the strengths in my interpersonal classroom behaviour.	4.47	.51
4 The project has contributed to my understanding of my interpersonal classroom behaviour from the students' perspective.	4.41	.62
5 The project has made me aware of the areas for improvement in my interpersonal classroom behaviour.	4.35	.70
6 My overall evaluation of the project is positive.	4.24	.56
7 The project has made me think more about the impact of my interpersonal classroom behaviour on my students.	4.18	.64
8 The project has achieved its objectives.	4.06	.43
9 I have benefited a lot from the feedback sessions of the project.	4.06	.75
10 The project has enhanced my professional knowledge as a teacher.	3.76	.83

*Question items are on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Qualitative data on student-teachers' responses to the open-ended questions in the feedback questionnaire showed that the project was perceived as inspiring and helpful to them in making improvement in their teaching and interpersonal behaviour. In addition, some student-teachers commented that the project had provided them with a valuable opportunity for understanding classroom interactions from their own perspective and from that of their students. Some student-teachers even suggested having more action learning cycles in the project in order to allow more opportunities for learning and reflection.

The following quotations from student-teachers are illustrative of the impact of the project on their professional development and teaching.

Through this project I can assess my interactions with students systematically. Being aware of my strengths and weaknesses in this regard is helpful to making changes in my interpersonal behaviour and consequently in my teaching. (ST1)

At the beginning of Cycle One, I did not know much about interpersonal teacher behaviour, but after learning the eight types of teacher behaviour in this project, I consciously began to take note of my interpersonal behaviour. I was often told by senior teachers and the Principal in my school that more content should be covered in the curriculum and more interesting material should be included in my daily teaching. But I was never told to pay more attention to my interactions with students. In this project, I begin to see the importance of giving more attention to students, understanding their perceptions of their teacher, and making necessary adjustments in my teaching. (ST2)

According to my [QTI] report, there are some differences between students' perceptions and my perceptions. For example, my students thought that I did not

explain things clearly, but I felt that I had already tried my best to do so. Now I begin to take note of my interpersonal behaviour. When I finish teaching something, I will ask students immediately whether they have got it or not. I will observe their facial expressions. I did not do this in the past, but now I do it more often... I think understanding interpersonal teacher behaviour from students' perspective is helpful to my teaching. (ST3)

I see something from my own perspective and my students may see it differently. It is important for me to understand my students' perceptions of me and to reflect on their views. As a result of my reflection, for example, I will try to change if they think that I am unfriendly... and will keep on doing those things that they think are positive. (ST4)

Discussion

The action learning project reported in this paper aimed at enhancing student-teachers' understanding of interpersonal teacher behaviour by arousing their awareness of classroom communication, facilitating their reflection on their behaviour from their own perspective and from that of their students, and helping them to bring about appropriate positive changes in their interactions with students.

The patterns of interpersonal behaviour constructed specifically for student-teachers were found to be useful for their reflection on their own performance, particularly in relation to their interactions with their students. Student-teachers' comprehensive understanding of these patterns depicting the eight types of interpersonal teacher behaviour is important because the latter were found to

be associated with students' cognitive, affective, and moral learning outcomes (e.g. den Brok, Brekelmans & Wubbels, 2004; Goh & Fraser, 2000; Sivan & Chan, 2013).

Engaging student-teachers in the reflection session, guided by the investigators of the project serving as critical friends, provided a forum for them to actively play the role of reflective practitioner which has been advocated as a significant part of teacher development for enhancing of teaching and learning (Schön, 1987). In addition to student-teachers' reflecting on the two patterns of interpersonal behaviour as perceived by their students and by themselves, the reflection session also rendered an opportunity for them to identify and discuss the discrepancy or congruence between these patterns with their fellow-teachers, to think about the potential impact of these patterns on teaching and learning in their classrooms, and to work together in formulating a plan for enhancing their interpersonal relationships with their students. Both quantitative and qualitative data collected from student-teachers lent support to the achievement of the stated objectives of the project.

According to Wubbels, Brekelmans, den Brok, and van Tartwijk (2006), soliciting students' and teachers' perceptions of interpersonal teacher behaviour by using the QTI are important for both research purposes and for teachers' professional development. While many studies on the QTI indicated that it is useful as a research tool, "research on the QTI as a feedback instrument for teachers is insufficient to prove its usefulness" (Wubbels et al., 2006, p. 1188). With a focus on applying the QTI to improving practice, the present project has filled this knowledge void by trying out the QTI as feedback tool for teachers' professional development. Our student-teachers found that it is important to know how their students perceived them

and used that feedback for enhancing professional development purposes and for improving their teaching.

Though the QTI was useful in arousing student-teachers' awareness, and consequently facilitating enhancement of their interactions with students, it is important to note that different teaching situations require their own specific interpersonal modes. To be effective, teachers must be able to display appropriate behaviour in different kinds of teaching situations, whether they are delivering lectures, facilitating group work, or leading discussions. There is no one pattern of interpersonal teacher behaviour that fits all teaching situations. In other words, an effective teacher must possess an interactional repertoire which is broad, consisting of many interpersonal modes, and at the same time flexible, permitting smooth switch from one interpersonal mode to another (Wubbels, Creton, & Hermans, 1993). In addition, it is also important to note that interpersonal teacher behaviour varies with factors like teachers' developmental stages in their professional career, their teaching experiences, the characteristics of their students, the specific subjects they are teaching, just to mention a few of these factors (e.g., Wubbels et al., 2006).

There are two limitations in this project. First, it is concerned with the requisite number of classes from which QTI data are collected for each student-teacher. On the one hand, there are arguments suggesting that in order to obtain reliable data, the QTI needs to be administered to at least two classes of students for each teacher (Wubbels et al., 2006). On the other hand, it has also been argued that the QTI scores collected from two different classes do not generally vary much, because the teacher's patterns of behaviour is relatively stable (Wubbels et al., 1993). For example, studies have indicated

differences between classes taught by the same teacher were smaller than those between the same classes taught by different teachers (Levy et al., 1993). In view of this, it may not be necessary to obtain data from two classes of students. In this project, due to the time constraint and difficulty in obtaining permission from schools, the QTI was administered to only one class of students for each teacher. Because the data collected might not be highly reliable in fully depicting the teachers' patterns of interpersonal behaviour, the project also utilized qualitative data from interviews to solicit student-teachers' and their students' perceptions. It is noteworthy that the use of qualitative data in addition to the quantitative data gathered through the QTI was highly recommended for enhancing teachers' professional development (Wubbels & Brekelmans, 2005).

Second, the time interval between the first and second administration of the QTI to the same class of students was relatively short, with the two administrations occurring within one semester. As a result of this relatively short interval between the two administrations, it is possible that student-teachers might not have enough time to make appropriate adjustments in their interpersonal teacher behaviour in response to students' feedback, and students might not be able to detect whether changes in their teachers' behaviour have taken place or not.

Based on the findings of this project, it is recommended that more studies using the QTI as a feedback instrument should be conducted in teacher education programs so as to enhance student-teachers' interpersonal behaviour in the classroom and promote their role as a reflective practitioner.

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THE IMPACT OF TRADITIONAL CHINESE BELIEFS, STIGMA AND LOCAL SCHOOL SERVICE PROVISION ON THE COPING STRATEGIES OF PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS IN HONG KONG

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Abstract: *In Confucian philosophy, filial piety (FP) is a virtue of respect for one's parents and ancestors. Fulfilling one's FP responsibilities means that an individual should be good to their parents; should be capable of supporting and taking care of their parents and ancestors in their old age. As a result, it is generally recognized that in Chinese society, parents attach a very high value to the academic achievement of their children. A Chinese child's 'job' is to do well academically, in order to become gainfully employed, so that they can fulfil their FP duties. If a child is unable to observe FP towards their parents and ancestors, for example due to limited academic achievement, this might be perceived by their family as straining and violating their cultural obligations. Consequently there are several culturally specific impacts that must be faced by Chinese parents who find themselves raising a child with a significant disability, such as autism spectrum disorders (ASD). Despite the acknowledged importance of the family, relatively little is known about the functioning of Chinese families with children with ASD (CwASD) in Hong Kong (HK). Data were gathered from 100 x HK/Chinese parents of CwASD to try to understand how traditional Chinese beliefs, community values, and the day-to-day experience of raising a child with ASD impacted on Chinese parents' perception of current local school provision in HK, and the resulting coping strategies employed by these parents. It is hoped that the results of this study will raise awareness for the need of further teacher awareness, and educational services for families who are currently trying to adjust their parenting skills to cater for a family member with ASD.*

Key words: autism spectrum disorder (ASD), filial piety, Hong Kong, traditional Chinese beliefs

Introduction

Autism Spectrum Disorder is a life-long condition that is often diagnosed at 2 years of age. According to the DSM-5 (American Psychiatric Association [APA], 2013), the new criteria for the diagnostic features of Autism have moved to using a single diagnosis of ASD. ASD is a severe disruption of the normal development process and is viewed as a spectrum or a continuum of disorders with varying degrees of severity and levels of

functioning. There is no doubt that children with a moderate to severe intellectual disability, such as ASD will face greater obstacles in the fulfillment of family expectations related to academic achievement than will their peers with less significant disabilities. Nonetheless, many CwASD are capable of being fully included in regular education classrooms with their standard curriculum and instructional methods providing a well-developed, inclusive education program is offered.

Research conducted by Holroyd (2003) and more recently by Tait, Mundia, and Fung (2014) about Chinese parents of children who have significant disabilities do consider that their children are thought to represent disruptions to the flow of filial piety (FP) exchanges, in that giving good things to children who have a disability might not make life meaningful in the usual cultural sense understood by a Chinese parent. Thus, the “natural” progression of patterns of reciprocity that flow into ancestry and birth is neither immediate in the form of gratitude, nor generalized in the form of delayed care with debts never able to be reclaimed. As a result, the long term care of CwASD by their parents and its effect on families is something that teachers and educational service providers in Hong Kong (HK) are beginning to strive to quantify.

While education is considered vital to help all students to reach their potential and is a child’s major right of passage into their culture and community, it would appear that a recent study (Tait et al., 2014) has uncovered a growing lack of faith in the current HK local school education system. Indeed, many Chinese parents of CwASD living in HK believe that implementing inclusive education in local government schools for children with significant developmental disabilities is going to require major changes to current values, systems, and inclusive education practices.

The measurement of the meaning that raising a family member with ASD holds for HK/Chinese parents, their view of their family life, and their perception of the level of support offered in the current local school environment in HK, (including teacher attitude towards inclusive education) for children with special education needs (SENs), was the central interest of this study. The objective of this study was to investigate the subjective interpretation of HK/Chinese parents’

regarding the consequences for caregivers when raising a child with ASD.

Context

Over the past several years, a truly dramatic increase in the number of children diagnosed with ASD has been reported world-wide (Tait & Mundia, 2012). Sturmey and Fitzer (2007) estimate that ASD occurs in approximately 1 in every 150 school-aged children, and that it is four times more common in boys than in girls. According to World Report on Disability (World Health Organization [WHO], 2012), there are 1,100,000 cases of ASD in China, and 5.49 children in every 10,000 are diagnosed with the disorder in HK.

However, part of the difficulty in providing support services to these families is that a significant number of Asian families with children who have a significant disability choose to remain hidden (Tait & Mundia, 2012) resulting in information on the incidence and prevalence of CwASD in countries like HK being inconsistent and difficult to come by. In view of the increasing prevalence or identification of ASD in the world and the importance of caregivers’ mental health in the treatment process, a need for closer examination of the consequences of raising a child with ASD in HK is called for, in order to obtain a better understanding about HK/Chinese parental needs.

There are limited qualitative studies undertaken in Hong Kong that have explored the issues of information needs and service provision from the perspective of Chinese parents or primary caregivers of children with developmental disabilities. The current paper is part of a larger mixed-methods study on parental perceptions of vulnerability and resilience in Chinese communities of living with child/children with ASD. The parenting

stress caused by raising a child with ASD in HK focusing on families who are currently trying to adjust their parenting skills to cater for a family member with ASD and the coping strategies to deal with that stress has been reported elsewhere (Tait et al., 2014). The aim of the present paper is to focus on issues around how traditional Chinese beliefs, community values, and the day to day experience of raising a child with ASD impacted on Chinese parents' perception on current local school provision in HK.

Method

Participants

The total sample for this study consisted of 100 parents from HK/Chinese families who were rearing at least one family member who had been diagnosed with ASD between the ages of 3-18 years. This age group was chosen as it relates specifically to the school age years and thus should highlight a range of information, educational, and support needs by families.

Data Collection

Three different kinds of data were obtained. Firstly, general demographic data were collected about the child (e.g., gender, birth order of the child, etc.). Secondly, data were collected on the parents' perception of the impact of their child's disability on family behaviour via the use of the *Impact on Family Scale* (IFS) survey (Stein & Reissman, 2004). Finally, parents were invited to be involved in a face-to-face, semistructured interview in order to add their personal accounts to this investigation.

The Survey Instrument

According to Williams, Piamariyakul, Williams, Bruggeman, and Cabanela (2006), the IFS is a reliable and valid

measure of a family member's perception of the effect of a child's disability that can be used across diagnostic groups and it can be useful in clinical and health service research. The results of the IFS are presented under four subscale scores (i.e., financial impact, disruption of social relations, general impact, coping) and a total impact score is in the results section of this paper. In order to invite as many families as possible, participants were recruited in two ways.

The first recruitment strategy was to approach participants directly at local non-government organizations' (NGO) (free entry) parent information seminars on ASD that are held annually during 'Autism Awareness Week'. This strategy resulted in a total of 70 completed surveys. The second strategy was to recruit parents indirectly via three NGO special schools for CwASD. Teachers nominated the children who were diagnosed with ASD for inclusion in this project. Thirty completed surveys were returned using this strategy. In total, 100 completed surveys were returned which was an overall response rate of 32%.

Tri-lingual language considerations. The most frequently spoken language in HK is Cantonese, and the written script is known as Traditional Chinese (TC). Not all local HK/Chinese people speak English, and when they do, proficiency in written and spoken English can vary considerably. In addition, some families relocate from The People's Republic of China (PRC) to live permanently in HK. Putonghua is the language spoken by PRC, and the written script used there is Simplified Chinese (SC). All documents used in this study were offered in English, TC, and SC.

Fidelity of the translation of materials.

All written materials were originally designed in English, and later translated by two Chinese research assistants (RAs): one from HK and one from PRC into TC and

SC. Both Chinese translations were then checked by two Chinese senior academic research staff from the Department of Education Studies, Hong Kong Baptist University (HKBU). The translations were also checked by a Head of Department in the Language Centre of HKBU who has more than 20 years of experience teaching Asian languages in HK. All documents were piloted with six Chinese parents of CwASD. No change to the survey materials was requested in the pilot phase.

The Interview

Thirty percent of the respondents took up the offer to have a face-to-face individual interview to discuss their family's individual story. Fifteen (15) interviews were randomly selected, transcribed, translated, member checked, analyzed, back checked, and used in an effort to further explain the findings of the IFS data. All of these parents spoke TC. The interview was designed to obtain general information on issues such as needs of, access to, and use of information, education, and therapy services, and general topics on family adjustment to living with a CwASD in HK.

The interviews were conducted by two RAs who had recently graduated with a Master of Education degree. Both RAs could speak English, and TC fluently. The interviewer contacted each family by telephone and arranged a mutually convenient time to visit. The interview questions on the demographic items varied little in their format. Some questions required only simple yes or no responses such as Are you _____'s [target child's name] biological mother? The interviewer recorded this information manually on prepared data collection sheets. Other questions were asked using a semi-structured set of questions. All interviews took place in 2013.

Data Analysis

Information obtained from the parent interview and the IFS was organized, classified, and synthesized. Initially, demographic child and parent characteristics were summarized to identify the family context in which the members were functioning. The data have been standardized with a mean value of 50 and a standard deviation value of 10. This means that the data were comparable and that it was possible to rank the data using Skewness values. All data analyses were done using the SPSS version 12. An ethnographic approach was used to analyze the interview data.

Results

General Description of the Families and CwASD

In the sample (n=100), 31% were within the pre-school age range (i.e., 3-5 years olds); 59% were within the primary school age range (i.e., 6 – 12 year olds), 10% were of secondary school age (i.e., 13 – 18 years). 75% were male children and 25% were female children with a mean age of 7.9 years. In this group of children, 25% were considered to be below average intelligence and 20% of children were considered to be of average intelligence, while the majority (55%) of parents indicated that they just did not know. Consequently, it cannot be said that the heterogeneity of the ASD population is illustrated in this group. The birth order of the children varied; however, in the majority of cases (73%), there was only the one child.

Family Functioning Measures

The main findings from the IFS are summarized in Table 1. In order to interpret this table, one needs to understand that, the larger the positive skewness value, the bigger the impact on

the families in this study. Consequently, it would appear that the General Impact variable for this group of parents was the most severe. Alternatively, the Coping variable was very strong. Brief explanations of these two variables will be

followed by a summary of the findings of this study.

Table 1
Descriptive statistics on the five scales of the Impact on Family Scale (n = 100)

Scale	Mean	Median	S.D.	Skewness
1 Financial Impact	50.00	48.76	10.00	0.014
2 Disruption of Social Relationships	50.00	48.00	10.00	0.134
3 General Impact	50.00	48.47	10.00	0.237
4 Coping	50.00	50.06	10.00	-0.208
5 Total Impact	50.00	50.05	10.00	0.026

General Impact

The General Impact (GI) score is a personal strain factor that measures subjective feelings of a family’s stress. Figure 1 is a visual representation of a negative general impact. Because the coefficient of skewness is positive (Skew = 0.134), this implies that the majority of the scores in the data set with high frequencies were low and concentrated in the bottom part of the distribution.

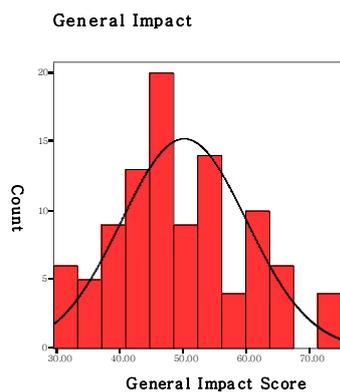


Figure 1. Mean, 50; Standard Deviation=10; Skewness, 0.237

government funded education services for their children with ASD. Participants’ use of community support services (NGOs) and private fee paying services for CwASD in HK has been reported in a separate publication (refer Tait, Mudia & Fung, 2014). In all cases, interviewed parents chose to send their child to a private special school or NGO run education service. Many parents in this study spoke about their fears for the difficulties that their child would face, if they attended a local public school in HK.

I can’t imagine how normal kids would treat my boy. What is the situation like if my child is in a normal school? The kids outside are smart, and once they know you are weak and can be a target for bullying, they will do it (Interviewee #3).

Other parents commented on the high teacher-child ratio at EDB run local schools and their fears that their CwASD would not be given the quality of care that he/she required.

I have to send him to private schools. It is a better student – teacher ratio, which is better for him. (Interviewee #7).

Parents’ Views on Inclusive Education Services Offered by Local HK Government Schools

The focus of the following discussion is on participants’ perceptions and use of local

Coping

The Coping score addresses the change in a parent's sense of mastery over the management of his/her child with a disability. Despite the negative impacts depicted in Figure 1, the coping scores of families of CwASD in this study appear to indicate that these parents have developed salient coping strategies to help them to withstand the pressure, tension, anxiety, and stress associated with the task of caring for a child with high support needs. The negative skewness (Skew = 0.237) suggests that the scores with high frequencies were mainly located in the upper tail of the graph as is graphically indicated by Figure 2. The distribution of scores for the coping variable is left negatively skewed.

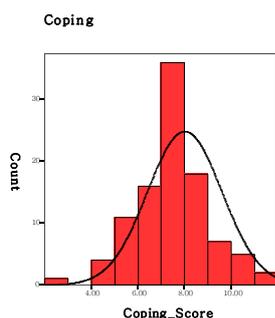


Figure 2. Note: Mean, 7.99; Standard Deviation=1.60

However, based on the existing literature with Chinese families with children with developmental disabilities such as ASD, denial and avoidance appear to be the two most dominant coping strategies employed (Lam and Mackenzie, 2002). Shek and Tsang (1993) also reported that approximately half of the families in their sample (N=381) never sought assistance from friends, relatives, parents, or in-laws, and about a third of this group had never sought support from professionals (e.g., teachers, therapists, etc.).

In the present study, there were similar reports of parents not attending parent

training sessions. For some, it was the cost of these services, but for many, denial that their child even had a disability was the main method by which participants chose to cope with raising their CwASD in HK. One parent commented:

To look at her, you would not know that she had a disability. (Interviewee #1).

Avoidance seemed to be the other strategy most used for coping with raising a child with ASD in this research group, particularly when the child was very young. Many parents told of how they attempted to hide the disability from others, including close family members, to maintain face. Sample parent comments were:

Our neighbours? No, they don't know about the situation. (Interviewee #4).

I live with my wife and my mother and they are positive about treating my child. But for the family of my wife, actually they do not know about the situation that my child have because my wife didn't want them to know about that. We can keep this secret, we only met a few times every year and they still don't know about him, the problem of my child. So yeah, that's the situation of my family. (Interviewee #6).

In HK, parent participation within the classroom is not a tradition. Education has been historically perceived as the responsibility of the schools, and parent intervention or volunteering to assist in class is viewed as interference with what trained professionals are supposed to do. Many parents believed that their participation in a school lesson would not help the teachers perform their jobs; as a result, parents separated themselves from the education process even when parent information sessions were offered. In addition, it is frequently the case in HK that both parents work full time, and work

commitments was another reason stated by many of the participants in this study for their non-involvement in school activities. One parent explained:

The day care centre does offer some parent lessons on child development but I have never been, either I am at work, or if I am at home, I have to care for my child. (Interviewee #15).

It was only parents of older children who admitted to attending parent training and only then, from trusted community support services. Even so, maintaining a level of secrecy or denial to their families and friends of the true nature of those services still remained one of the most frequently employed coping strategies for these HK/Chinese families. Sample comments were:

My family does not know [that my child has ASD]. My family asks me "Why do you have to go to these classes? So that was quite conflicting within myself, listening to all of these comments from my family. But at the same time, I know there are problems with my son and he needs to learn and that will only happen if I attend the parent training workshops. (Interviewee #10).

The only support we've received is from the therapist at his private after school program. I tell my family that my child is attending extra English classes and they do not ask me questions. (Interviewee #8).

Typically the husband was the only one who knew the truth about the child's disability. In one case, the child's mother would attend the therapy training sessions, and then train the child's father at home in the techniques that she had learned at the NGO. This parent explained:

I go to the (NGO) trainings with my son, so that I've actually learnt more about home training, and his Dad sees....he knows that I've been

laborious, as I've been with him (the child) and going after him all of these years, so he has offered himself to help...and he (the husband) asked me to teach him how to do the training with our child. (Interviewee #10).

As a result, most of these HK/Chinese parents' support systems were extremely limited.

Discussion

The Impact of Stigma and Limited Support Services

According to McCubbin & Patterson (1983) and Mak and Kwok (2010) parenting stress is influenced by a myriad of factors including: child characteristics, family's perception of the child, the caretaking activities, social resources, cultural impacts, discrimination, and stigma. The two main issues of concern raised by the parents interviewed in this study were (a) the lack of free educational options and (b) the lack of understanding by others. Several parents' in this study commented on the shame and the frustration that they felt when fielding questions and comments by others.

It's always difficult to explain to others. To explain to my family, to explain to my child's class mate's families, who might come and ask you "What happens to your son?" It's stressful to deal with when people keep asking you "What "happened" to him?" (Interviewee #4).

For adults, they would be like...."Don't go near that kid, it could be dangerous!"....it happens...but it is hard to deal with that, when they mean my kid! (Interviewee #10).

Many parents were also concerned for the future care of their child due to the lack of

free or HK government subsidized post school services.

Another issue repeatedly raised by parents in this study was that attitude to inclusion is very poor among HK mainstream teachers. Parents were worried that if they sent their child to a local school, their child would be neglected or mistreated. This fear seems well founded, as in 2006, the Special Education Society of HK (SESHK) and the HK Primary Education Research Association (HKPERA) conducted a survey among teaching staff of local inclusive schools. Findings showed an overall negative view toward students with special needs.

Adcock & Cuvo (2009) raised the point that at least for some academic subjects, children with disabilities might not fully profit from the standard curriculum and instructional techniques offered at local HK schools. This point was also addressed by one participant in the current study when she discussed family participation at extra curricula events.

We can't join in many school activities as others do. It is difficult for my child to take part in a class play, or to have fun at the school athletics carnival. (Interviewee #7).

Discrimination such as exclusion from social activities, humiliation and neglect by teachers and the public are themes identified by other studies of the HK community (Ling, Mak, & Cheng, 2008). Many parents in this study spoke about their choice to pay the high price of international school fees because they felt that their child would be treated better in private education than if he/she attended a local HK school:

That's why I send my child to an international school to study. Not a local school. The local school always thinking about who can get the better marks. But in an international school, they are more open about how to

support him, not how to get rid of him. (Interviewee #6).

There are services here, as long as you can afford it. If you cannot afford it? Oh I don't know what happens to those kids. (Interviewee #8).

In reality, it is extremely difficult to obtain access to HK families who have no means to fund their child's attendance at suitable inclusive education or community support services. It is impossible to know just how many families in HK are raising their CwASD behind closed doors, unsupported and too ashamed to tell anyone of their situation.

The Significance of this Research to Teacher Education in Hong Kong

Disability is a powerful social construct within most contemporary societies because the community is presented with conflicting images of it. For some time now, individuals with disabilities in HK have been placed into the role of the "deviant outsider" whose lives and experiences are hidden from the 'normal' majority (Clarke & Cochrane, 1998). It is likely that these damaging views have permeated into the field of education in HK and influenced how the HK Education Bureau (EDB) has defined the conditions of, and reacted to, CwASD.

When their children turn school age, an additional cause of stress to HK/Chinese parents is having to deal with the shame of imposed societal barriers to their child's mainstream education. Exclusion from local schools solely on the basis of their child's disability and the assumption that because their child has special education needs (SEN), he/she can never achieve academically negates the child from ever fulfilling the FP duties. Currently, the HK local school system operates on a belief that children with SEN should be helped to achieve provided they 'can be taught' in

the first place. As a result of this study, it is clear that many HK/Chinese parents of school aged CwASD overwhelmingly believe that current policy and practice in local schools do not meet the needs and requirements of their children.

The local school always thinking about who can get the better marks. Local teachers always thinking how to get rid of him. (Interviewee #6).

We don't want him to go to local schools because we don't want such a weak child to be bullied. (Interviewee #5).

For inclusive education (IE) to be successful, parents of CwASD need to feel confident in the quality of care that will be received by their child and that IE practice will be offered to their child. Parents know that many teachers working in local HK schools have to struggle with classes of around 40 students at a time. Even without the extra responsibilities that come with IE practices, HK teachers have to contend with many non-teaching duties that impinge upon their lessons. This

makes it difficult to predict the reaction towards inclusive practices by post service teachers. That said, the results of a study of a cross-segment of pre-service teachers at one HK university are known to be apathetic to the needs of children with even mild SENs (Tait & Mundia, 2014). Consequently, it is highly likely that they would react in the same manner towards children with significant learning needs, if total inclusion became compulsory in HK.

The management of parents' stress and enhancement of their mental health should be an extremely important issue for local school provision in HK. More research on the consequences of impact on HK/Chinese families with a child who has ASD is essential, particularly in the lower SES groups, in order to raise the HKSAR Government's awareness of the need to provide a range of IE services, to provide more IE training to local teachers, and to offer campaigns to increase public sensitivity to these marginalized families and their children.

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INVESTIGATING THE RELATIONSHIP BETWEEN VISUAL IMAGERY, METACOGNITION AND MATHEMATICS PEDAGOGICAL CONTENT KNOWLEDGE

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Abstract: *In an era of international change in mathematics instruction, it is important to investigate elements essential to the effective learning and teaching of mathematics. Research has shown that metacognition and visualization are both important cognitive skills for teaching mathematics. This study investigated the relationship between metacognition, visualization ability, and mathematics pedagogical content knowledge in pre-service elementary teachers. Thirty-two elementary pre-service teachers completed the Metacognitive Awareness Inventory, the Vividness of Visual Imagery questionnaire, and the Learning Mathematics for Teaching assessment to evaluate mathematics pedagogical content knowledge. An additional 39 pre-service elementary teachers completed the Metacognitive Awareness Inventory and the Learning Mathematics for Teaching assessment. Metacognitive awareness, visualization, and mathematics pedagogical content knowledge were not related in the first sample. In the second sample, metacognitive knowledge was related to mathematics pedagogical content knowledge of number, concepts, and operations. Overall, participants were fairly high in metacognitive awareness and visualization so relationships were difficult to ascertain. More sensitive instruments and a larger sample size may have provided more significant results.*

Key words: Metacognition, mathematics pedagogical content knowledge, visualization

Introduction

Preparing quality teachers is a common goal worldwide (Darling-Hammond & Lieberman, 2012). One characteristic of quality teachers is accurate pedagogical content knowledge. Many teacher preparation programs attempt to develop pedagogical content knowledge as part of the teacher preparation program; characteristics of pre-service teachers may influence their ability to acquire this pedagogical content knowledge. This study will examine whether two pre-service teacher characteristics, vividness of visual imagery and metacognitive awareness, have a relationship with the level of mathematics pedagogical content knowledge attained by pre-service teachers.

Visual Imagery

Paivio (1986) proposed the dual coding theory to explain how people represent knowledge in their minds. His theory identified the two most common forms of knowledge used by the mind as language and mental images. Language is an external representation of thought, captured in words on a page or sounds in a conversation. Mental images on the other hand, are private and cannot be seen by other people, but that does not dismiss their importance in knowledge construction.

Mental images are often also referred to as visual images. The ability to visualize is sometimes likened to seeing mental pictures or seeing in the mind's eye. Educational psychology textbooks recommend using visual imagery as an effective way to encode and retrieve

information from long-term memory (Ormrod, 2012; Woolfolk, 2012). Visual imagery is also an instructional strategy used across a variety of academic disciplines (Drake, 1996). In particular, its use is recommended in the content areas of reading and mathematics. Visualization is a frequently suggested reading comprehension strategy (Miller, 2013; Pressley, 2000). The teacher manuals for most basal readers regularly suggest the use of visual imagery to increase reading comprehension.

In 2000, the National Council of Teachers of Mathematics (NCTM) included visualization as part of the geometry standard. Specifically, students should “use visualization, spatial reasoning, and geometric modeling to solve problems” (p. 43). Visualization can provide students with a way to develop meaning of abstract mathematical concepts (Moyer-Packenham, Ulmer, & Anderson, 2012). Van Garderen (2006) reported that students who were able to visualize also were more successful solving mathematics problems. For example, chunking visual images has improved the geometry performance of students with mathematics disabilities (Zhang, Ding, Stegall, & Mo, 2012). However, several researchers suggest visual imagery can at times cause difficulty in solving mathematics problems, particularly if the visual image generated by the student is an incorrect inaccurate representation of the idea (Aspinwall, Shaw, & Presmeg, 1997; Presmeg, 1992).

Although visual imagery as an effective strategy is almost universally recommended, the ability to visualize is not universally possessed. The ability to create visual images seems to span the spectrum from those whose visual images are as vivid as real life, to those who cannot create visual images at all (Marks, 1973; Taktek, Salmoni, & Rigal, 2004). This has important implications for

teachers (Martinez, 2010) and those who train teachers.

Metacognition

Metacognition, or “thinking about thinking” was first proposed as a construct in 1976 by Flavell. Metacognition’s central importance to all learning has been increasingly recognized and studied (Hacker, Dunlosky, & Graesser, 2009). “Metacognition is especially important because it affects acquisition, comprehension, retention and application of what is learned, in addition to affecting learning efficiency, critical thinking, and problem solving” (Hartman, 2001, p. xi).

A more formal definition of metacognition is “knowledge and beliefs about one’s own cognitive processes, as well as conscious attempts to engage in behaviors and thought processes that increase learning and memory” (Ormrod, 2012, p. 100). This definition highlights the two key components of metacognition, knowledge and regulation. Metacognitive knowledge is knowledge about oneself as a learner and the factors which influence learning. Metacognitive regulation is the ability to control one’s thinking and includes the subskills of planning, monitoring and evaluating. Planning is the ability to think about and select appropriate strategies for the learning task. Monitoring is awareness of one’s understanding and progress in learning. Evaluation is appraising the end results and efficiency of one’s learning. Schraw and Dennison (1994) created the Metacognitive Awareness Inventory, a survey that has been used to measure adult metacognitive knowledge and regulation (Moulding, Stewart, & Cooper, 2010; Young & Fry, 2008).

Metacognitive knowledge and regulation contribute to how well students learn mathematics and their attitudes about mathematics (Cardelle-Elawar, 1995). By kindergarten, metacognitive knowledge

predicts achievement on mathematics word problems more than general ability (Mevarech, 1995). Conceptual change in mathematics and the development and appropriate use of strategies are all dependent upon metacognition. Metacognitive knowledge and regulation, when combined with conceptual and procedural mathematics content knowledge, contributes to higher student achievement (Pressley et al. 1987). Carr (2010) recommended a renewed research focus on metacognition and the reflective process inherent in metacognition.

Metacognition is not only important for students who are learning mathematics, but also for the teachers who are teaching mathematics. Mathematics teaching is itself a problem solving experience and thus, metacognition is an important skill needed by teachers as well as students (Artzt & Armour-Thomas, 2001). Recent research suggests that when students are in a classroom in which the teacher consistently uses metacognitively rich language, the students exhibit greater levels of content-based problem solving strategies (Grammer, Coffman, & Ornstein, 2013). Unfortunately many teachers lack a deep appreciation for the importance of metacognition in the classroom and even those that recognize its value often have not mastered strategies to integrate metacognition into the classroom (Veenman, Van Hout-Wolters, & Afflerbach, 2006).

Mathematics Pedagogical Content Knowledge

Effective mathematics teachers must not only think about their own thinking but they must also think about their students' thinking. In 1986, Shulman introduced the concept of pedagogical content knowledge (PCK). PCK is "an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different

ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons" (Shulman, 1986, p. 9). Effective teachers of mathematics must possess pedagogical content knowledge for mathematics. In recent years, researchers have investigated pedagogical elements for effective mathematics instruction (Ball, Hill, & Bass, 2005; Hill, Ball, & Schilling, 2008). Hill et al. (2008) discussed knowledge of content and students (KCS) as elements of pedagogical content knowledge. They define KCS "as content knowledge intertwined with knowledge of how students think about, know, or learn this particular content" (p. 375).

Teachers develop the ability to think about student mathematical thinking (Cohen, 1989) which is an extension of metacognition. Skilled teachers are able to combine what they know about the mathematical content and student thinking about the content. This can be even more complex when the content involves mathematics embedded in real world contexts and using in-depth problem solving skills.

Summary

Through instruction in pre-service programs, many pre-service teachers gain pedagogical content knowledge for mathematics while some pre-service teachers struggle to understand how students think about mathematics and how to address student mathematics difficulties. It may be that some pre-service teachers struggle with these concepts because of their underlying metacognition and visualization abilities. This study will examine whether two pre-service teacher characteristics, visual imagery and metacognition, have a relationship with the level of mathematics pedagogical content knowledge attained by pre-service teachers.

Method

A correlational study was conducted to evaluate relationships between pre-service elementary teacher mathematics pedagogical content knowledge, metacognitive awareness, and vividness of visualization.

Participants

Participants were students in an elementary teacher preparation program. Data were collected at the end of the students' final semester prior to student teaching. In the first sample, there were 32 female participants ranging in age from 20 to 38. In the second sample taken the following semester, there were 39 participants, of which 37 were female and 2 were male. They ranged in age from 20 to 45. Although this sample is predominantly female, it is representative of the population of primary teachers internationally. In many countries around the world the percentage of female elementary teachers ranges from 80% to 85% (O'Neill & Stephenson, 2012).

Instruments

To evaluate the constructs, students in the first sample completed three assessments on the final day of class of the semester. The students completed the assessments in a computer laboratory adjacent to their regular classroom. To evaluate metacognitive awareness, students completed the Metacognitive Awareness Inventory (MAI) by Shraw and Denison (1994). This questionnaire evaluates students' awareness and evaluation of their own metacognitive processes. The inventory consisted of 52 true/false items which are separated into two factors: metacognitive knowledge (17 items) and metacognitive regulation (35 items). For scoring of the scale, false responses were recorded as 0 and true responses were recorded as 1, then each student's mean

score was calculated for a result between 0 and 1. For this administration, the reliability of the measure as calculated by Cronbach's alpha was .793.

To evaluate students' visualization abilities, students completed the Vividness of Visual Imagery questionnaire (Marks, 1973). The questionnaire consisted of 16 items to evaluate the students' ability to see images in their mind. Students responded using a 5-point Likert scale ranging from "perfectly clear and as vivid as normal vision" to "no image at all." Student mean scores were calculated for a result between 1 and 5. The reliability for this administration was $\alpha=.936$.

The Learning Mathematics for Teaching assessment (2009) evaluates mathematics pedagogical content knowledge (MPCK). The three elementary content subtests evaluated students' knowledge about elementary mathematics content and how to teach the content. Three subtests were used: number, computation, and operations; geometry; and patterns, functions, and algebra. The assessment was computer adaptive and scores were reported as an item response theory (IRT) standardized score with a mean of 0 and a standard deviation of 1.

Difficulties in the data collection process necessitated a second sampling. These participants completed two assessments: the Metacognitive Awareness Inventory (MAI) by Shraw and Denison (1994) with corrected answer choices rather than true/false. The students could respond with (1) not at all true of me, (2) seldom true of me, (3) occasionally true of me, (4) somewhat true of me, and (5) very true of me. The reliability for this administration was $\alpha=.952$. These students also completed the Learning Mathematics for Teaching assessment but did not complete the visualization assessment.

Results: Sample One

Student results were analyzed using SPSS. Descriptive statistics of the variables are found in Table 1. Overall the students were fairly high in metacognitive awareness and were higher in metacognitive knowledge than regulation. Students were also quite vivid visualizers with the lowest student scoring 3.5 which was between “moderately clear and vivid”

and “clear and reasonably vivid.” Scores for mathematics pedagogical content knowledge were slightly above the IRT mean of 0 for the number, operations, and computation (NCOP) and the patterns, functions, and algebra (PFA) subtests and slightly below the mean for the geometry subtest. Scores for the geometry (GEOM) subtest were slightly below the IRT mean.

Table 1
Student Metacognitive Awareness, Visualization Ability, and Mathematical Pedagogical Content Knowledge

	Mean	S.D.	Minimum	Maximum
Metacognitive Awareness				
Knowledge	.85	.15	.41	1.0
Regulation	.75	.16	.43	.97
Vividness of Visualization	4.30	.46	3.50	5.00
Mathematics Pedagogical Content Knowledge				
Number, Computation, and Operations	.33	.63	-1.14	1.16
Geometry	-.01	.76	-1.52	1.55
Patterns, Functions, and Algebra	.20	.68	-1.10	1.63

N=32

The relationships among the variables were investigated using a Pearson product moment correlation coefficient. Correlations are found in Table 2. All statistically significant correlations were within category; for example metacognitive knowledge was related to metacognitive regulation. Also, within the category of mathematics pedagogical content knowledge, the geometry subtest was related to both the number,

computation, and operations subtest and the patterns, functions, and algebra subtest. The geometry subtest also showed some interesting trends. Geometry and metacognitive knowledge were related at $r=.320$ and geometry and visualization were related at $r=.252$. While these relationships were not statistically significant, with a larger sample size, this level of correlation may be significant.

Table 2
Relationships Among Metacognition, Visualization, and Mathematics Pedagogical Content Knowledge

	Knowledge	Regulation	Visualization	NCOP	PFA	Geom
Metacognitive Awareness						
Knowledge		.459**	-.001	.038	.010	.320
Regulation	.459**		.146	-.053	-.047	.048
Visualization	-.001	.146		.169	.018	.252
MPCK						
NCOP	.038	-.053	.169		.279	.469**
PFA	.010	-.047	.018	.279		.580**
Geom	.320	.048	.252	.469**	.580**	

**p<.01, N=32

Results: Sample Two

To correct errors in the MAI answer selections, the assessments were given to a different group of students. Again, the students were fairly high in metacognitive awareness and were higher in metacognitive knowledge than regulation.

Scores for mathematics pedagogical content knowledge were slightly above the IRT mean of 0 for the number, operations, and computation (NCOP) subtest and slightly below the mean for the patterns, functions, and algebra (PFA) and geometry subtests (see Table 3).

Table 3
Student Metacognitive Awareness and Mathematical Pedagogical Content Knowledge

	Mean	S.D.	Minimum	Maximum
Metacognitive Awareness				
Knowledge	4.31	.41	3.47	4.82
Regulation	4.10	.51	2.89	4.94
Mathematics Pedagogical Content Knowledge				
Number, Computation, and Operations	.24	.63	-1.32	1.37
Geometry	-.36	.75	-2.68	1.32
Patterns, Functions, and Algebra	-.17	.65	-1.43	.88

N=39

The relationships among the variables were again investigated. In this sample there were again significant correlations within categories with metacognitive

knowledge related to metacognitive regulation and the patterns, functions, and algebra subtest related to both the geometry and the number, computation, and operations subtests. In this sample

there was also a statistically significant correlation between metacognitive

knowledge and the numbers, concepts, and operations subtest (see Table 4).

Table 4
Relationships Among Metacognition and Mathematics Pedagogical Content Knowledge

	Knowledge	Regulation	NCOP	PFA	Geom
Metacognitive Awareness					
Knowledge		.693**	.335*	.148	.093
Regulation	.693**		.169	.053	-.038
MPCCK					
NCOP	.335*	.169		.529**	.308
PFA	.148	.053	.529**		.601**
Geom	.093	-.038	.308	.601**	

*p<.05, **p<.01, N=39

Discussion

As a group, the students in both samples were fairly high in metacognitive awareness. The students in the first sample were also high in vividness of visualization. The lack of spread and small sample size made identifying relationships in the first sample challenging. As expected, relationships existed within constructs of the metacognitive awareness scale and within the mathematics scales. With the improved scales of the MAI for the second sample, relationships were seen between metacognitive knowledge and students' mathematical pedagogical content knowledge in the area of number, concepts, and operations.

While many may have considered visualization as important for mathematical understanding, this research indicates that students' mathematics pedagogical content knowledge is not impacted by visualization, at least for students who are moderate to high visualizers. Although the NCTM recommended (2000) the use of

visualization to teach and understand mathematics, vivid visualization abilities may not be related to PCK in mathematics. It is unclear from these findings if the lack of visualization impacts a student's mathematics pedagogical content knowledge.

However, an interesting trend was found with the geometry subtest. Geometry is the area where visualization is most encouraged. Students are encouraged to visualize two- and three-dimensional shapes as well as patterns and graphs (NCTM, 2000). These data showed an emerging trend toward higher geometry PCK and more vivid visualization for students in the first sample.

One difficulty with the data from the first sample was the insensitivity of scale used to measure metacognitive awareness (Schraw & Dennison, 1994). The version readily available had responses of True/False while the original scale used a 1 to 5 Likert scale ranging from 'not at all true of me' to 'always true of me.' This problem was corrected in the second sample which enabled a more sensitive

assessment of students' metacognitive awareness.

Vividness of visualization is also difficult to measure because it is an introspective process and not overt, so most visual imagery measurements rely on individuals' self-report of their ability. Some non-visualizers are unaware that others are able to see pictures in their mind, thinking the term is just a figure of speech such as "I have butterflies in my stomach"(P. Stewart, personal communication, May 16, 2013). This may result in some students indicating on the survey that they can form visual images because they really do not understand what the survey is asking. This difficulty caused the researchers to

eliminate this instrument for the second sample.

More useful visualization measures are being sought. Preliminary work with undergraduate and graduate students suggests Mark's VVIQ (1973) may not reliably identify people who cannot form visual images. Students who cannot form visual images at times respond on the VVIQ indicating they can form visual images but during personal interviews acknowledge they cannot. Several versions of a simpler, but hopefully more reliable instruments, are currently being developed. With larger numbers of participants and more sensitive scales, more relationships may be uncovered.

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SOCIAL STUDIES CURRICULUM: IT'S TIME TO ACT!

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Abstract: *This paper addresses probable ways of developing a learning environment and pedagogy that is intellectually and developmentally appropriate for students through an integrated social studies curriculum. The inadequacy of social textbooks; lack of integrated sequence in topics that build concepts, skills and generalizations from one level to another, culminate some concerns about the existing social studies curriculum in international, and national schools. Taking the lead from personal teaching experiences and educators' assertions, the author focuses on the need for other materials and resources to be used as supplements for the existing texts such as: the use of interdisciplinary method of teaching, and the development of a multicultural time line for diversity in the study of history across the globe. Emphasis on the need for social studies curriculum review, and the identification of concepts geared toward empowering young citizens to face daily life's challenges are among some of the operational goals discussed.*

Key words: social studies, curriculum, teachers, students

Problem

Social studies, especially in the primary grades, suffers a slight decline in students' interest due to poor instructional teaching methods. According to research, the social studies curriculum at the elementary level is blurred by a lack of consensus about what is to be taught (Birnbaum, 2010; Goodlad, 1984; Dube, 2009) and teachers who tend to lean on designing social studies lessons solely around textbook-based, teacher-directed instruction. Consequently, students are often deprived the true understanding and significance of the events they are studying, resulting in characterizing social studies as difficult and boring.

Research findings also indicate that most social studies textbooks lack integrated sequence of topics that build concepts, skills, and generalizations from one level to another (Elliot, Nagel, & Woodward, 1985). Social studies as a subject is considered to be an inherently dynamic subject capable of engaging and motivating students in learning about their environment and the world at large.

Hence, the need for a constant review of the social studies curriculums and texts in order to implement systematic development of programs capable of empowering young citizens to face the challenges (social-economic, ethical, and personal). In a world where the daily demands of independent and cooperative problem solving skills are inevitable, a dynamic social studies curriculum is necessary. However, it is cautioned that while reviewing the social studies curriculum, it should be the educators' responsibility to keep important historic information intact; to avoid undermining the accuracy of history which could render the curriculum ineffective globally (Birnbaum, 2010).

Literature Input

This paper ventures into a body of literature that exposes the inadequacy of social studies curriculum in different regions around the world and efforts geared toward resolving the problem. A mind-boggling question that some teachers ask, according to Perricelli (2008) is, 'why do many students across the world view

social studies as boring or irrelevant in spite of the fact that some motivated teachers have tried to enhance the interest of social studies' in the classroom?' Frazee and Ayers (2003) indicated that expanding environments is the basic curriculum that most states, textbook companies, and curriculum leaders use to organize elementary (K-6) social studies. This, they argued, has dominated elementary school social studies for nearly 75 years. While this approach appears to provide an organized curricular sequence, they contend that it lacks substantial content, especially in the early elementary grades, and children tend to find its narrow focus deeply uninteresting.

Reiterating the lack of depth in elementary social studies, an analysis of a series of social studies reports by Elliot, Nagel, and Woodward (1985) revealed that virtually all of the typical social studies programs for primary and intermediate grades have been reduced to a series of teachers' guides, textbooks, workbooks, and optional filmstrips. Thereby narrowing the social studies to "a facile and shallow treatment of numerous topics" (p. 23). Another study shows that about 50% of the American students in the study perceived other countries and their ideologies as threatening to the United States (Goodlad, 1984). Goodlad attributed this development to the prevailing inattention to international topics and in-depth cultural comparisons. He concluded that many elementary teachers have not identified the curricular components necessary for understanding the United States in a global context.

It is cautioned that there is a need for a careful examination of the underlying assumptions of the textbook publishers (Shearer & Shearer, 1994). These authors noticed a pattern of modern preoccupation with self, cultural diversity, and political correctness that permeates social studies texts. A program of cultural and historical

study which emanates with self and moves gradually outward (e.g. family, community, state, country, world) seems sensible, but portrays the "me generation." "It teaches children that they are the center of the universe that everything revolves around them and it teaches them that things are important only to the extent that they touch their personal world" (Shearer & Shearer, 1994, p. 2).

Some of the topics addressed by social studies textbooks suffer the sequence of topics that build concepts and do not address diversity, and, are not supported with details that will enhance higher order of thinking skills in elementary students. As Wiggins and McTighe (2005) recognize, "we may have gone far, geographically or figuratively—through lots of textbook pages—but that doesn't mean we have derived great meaning or insight from our travels" (p. 106). It is obviously time for a change.

Solutions

The first solution demands that social studies curriculum be reviewed and evaluated in the light of the social studies standards. A curriculum that is geared around concepts from history and the social sciences will enhance the ability of children to understand, evaluate, and make decisions in daily endeavors. A growing body of literature supports the need for further review of social studies curriculum in various places. Boikhutso (2013), in the study of how well the Botswana's social studies curriculum, articulates gender issues: called for the further review of the gender social studies curriculum in order to address the issue of equality and foster better understanding of citizenship in Botswana.

Social studies ought to help children understand, evaluate, and make decisions in contemporary settings. It is with this insight that the establishment of the Hong

Kong Curriculum Development Council gave teachers from both public and private schools the leverage to be involved in curriculum decisions together with other professionals through the years, and social studies as a subject has undergone changes appropriately with the socioeconomic evolution of society (Morris, McClland, & Wong, 1997, 1998). The need was stressed for the implementation of strategies to be employed in introducing new curricula in West Africa. Maduewesi (2001), one of the West African regional seminar participants, emphasized the need for a constant curriculum review, revision, and adaptation of the social studies curriculum in order to meet the ongoing changes in learners' interests. In a related situation Eshun (2013) from Ghana made a recommendation for the review of the colleges' of education social studies program to incorporate areas of need such as attitudes and values cultivation and skills development in accordance with the junior highs' social studies curriculum.

Echoing the need for a broader approach to social studies, Zongyi, Gopinathan, and Lee Kim-Eng (2013) in a preview of the new book entitled *Globalization and the Singapore Curriculum*, indicates the relation of globalization with curriculum development. It highlights a set of curriculum issues, problems, and challenges that matter to policymakers, educators, and reformers in Singapore, Asia Pacific, and in other countries around the world. The need for diversity of function and structure of knowledge with the social studies curriculum should be the motivating factor for presenting contemporary perspectives on some of the most enduring problems that confronts social studies educators (Ross, 2006). Notably, the need for developing a learning environment and pedagogy that are intellectually and developmentally appropriate for social studies cannot be overemphasized.

The second solution offered in this paper recognizes teachers' need to employ a variety of literature as supplements to the available texts and use appropriate developmental instructional plans that provide for meaningful learning of social studies especially for the elementary and intermediate students. Educational research shows that children who encounter historical data in the form of biography and historical fiction, "exhibited interest in and enthusiasm for history and for further investigation in more traditional sources" (Ten-Dyke, 2003, p. 6). This solution is rated as outstanding because it provides a fundamental approach for the teaching and learning of social studies for life-long learners.

Teachers need to make time in their instructional plan to provide reflection time for students as a priority. "You can either have your learners' attention, or they can be making meaning, but never both at the same time" (Jensen, 1998, p. 46). By allowing time for reflection, students are given the chance to create their own links and patterns in their learning. The use of other materials has been the desire of many people. Shearer and Shearer (1994) encourages the introduction of the ancient Western civilizations to American elementary social studies and encourages the use "living books" such as biographies alongside with textbooks in order to foster student interest in the study of the ancient Greeks and Romans. Obed (2009), in an appraisal of the controversial issues posed by the lack of adequate knowledge content of social studies in teacher education, suggested that teachers should harness the opportunities to practice integration of contemporary issues into the curriculum. Restating the need for "Teaching social studies authentically," McKenzie (2007) suggested challenging the imagination of students by providing and promoting learning that increases students' productivity, motivation, and engagement. The examples given in meeting the

challenges included: (a) organizing work place site-visits to interview adult workers or other places related to the topics or units being learned and (b) exposing students to producing documentaries and media presentations. McKenzie further suggested simulations and role-playing as promising strategies for history classes, which could help to engage students in thinking as actors in historical situations.

Education Scotland (2012) in its recent report on the importance of a vibrant social studies curriculum, emphasized interdisciplinary learning that draws experiences and results side by side with social studies and other areas of the entire curriculum. It was reported that this idea will help keep special focus on the need for primary learners to have the “breath” of social studies learning before the youngsters move on to the secondary phase of specialization. The National Council for the Social Studies’ (NCSS, n.d.) position statement on its homepage affirms the qualities of impactful and authentic social studies teaching and learning as being “meaningful, integrative, value-based, challenging, and active.” This serves as a powerful reminder of the inevitable influence of social studies teachers on the society.

The third but uninteresting solution hinges on arbitrarily keeping to the textbook tradition in the classroom for teaching social studies. Teachers may cling to the ‘tradition’ and strictly adhere to and depend solely on the available textbooks for instructional planning and teaching. Apparently, most social studies textbooks have been in use for a long time, thus, it is easier for consistent learning plans. Some textbooks offer extra teaching planners on the web. However, Lampe & Rooze (1996) advise that elementary teachers should teach social studies history using cooperative learning strategies as opposed to the traditional teacher-directed textbook approach.

Many teachers have found that designing social studies lessons solely around textbook-based, teacher-directed instruction often results in students’ lack of true understanding of the significance of the events they were studying. Quoting Wiggins and McTighe (2005), “we may have gone far, geographically or figuratively—through lots of textbook pages—but that doesn't mean we have derived great meaning or insight from our travels” (p. 106). It is obvious that this solution will not meet the learning needs of students. Hence, this solution is rated as impossible.

Conclusion

Despite the understanding of the importance of social studies in developing children toward the sense of efficacy as participating citizens of their world, one question that resounds around the globe but has yet to have a clear answer is, ‘what is the definitive scope of social studies?’ Until this question can be clearly answered by educators (curriculum specialists and teachers), the important and significant role of social studies will always be in the limbo. It is time to act on reviewing social studies curriculums in our respective countries for the benefit of the fast growing young learners in our changing global society.

Using authentic, practical means of teaching social studies will not only boost the seemingly downgraded subject but also help stimulate young learners’ interest. By seeing the museums come alive through “living books” (biographies) and creative role-play in our classrooms and outdoor activities, students will be able to connect their learning experiences with daily life aspirations. While the forgoing solutions one and two seem reliable to enhance meaningful teaching and learning experiences in and outside of the classrooms, the third solution of teaching solely from the texts will not suffice in

solving the current problem described in this paper.

Some of the suggested operational goals for making the social studies come alive include: (a) the formation of a social studies curriculum committee in schools to identify aspects of the social studies curriculum that should be developed by teachers and curriculum specialists; (b) teachers and curriculum specialists advising education decision-makers of the

growing need for a vibrant social studies curriculum; (c) teachers using the interdisciplinary method of teaching by teaching social studies alongside with other subjects for a wider range of learning experiences; and (d) teachers in international schools and other national schools developing a multicultural timeline for diversity in the study of history revealing accounts of historical events that occurred at the same time in different parts of the world.

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DESIGNING OF AUTHENTIC LEARNING MEDIATED BY MOBILE TECHNOLOGY FOR PRIMARY SCHOOL LEARNERS

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Abstract: *Authentic learning motivates students through solving of real-world problems and has been considered one of the most effective ways to learn. However, it is not always easy to implement this. This paper describes the synergistic integration of ICT in authentic learning tasks for primary school pupils and its effects on the pupils. The use of a customised iPad application “Trail Shuttle” enabled pupils’ participation in a shopping trail in a Singapore supermarket. The multi-modal learning trail incorporated problem-solving scenarios, audio cues such as songs, as well as visual cues such as maps. It is also interdisciplinary integrating the learning of topics in the English language, mathematics, social studies, and health education. Activity theory and authentic design elements form the backbone of the trail design. The affordances of ICT led to the development of a myriad of 21st century skills which include collaborative learning, self-directed learning, ICT skills, creative and critical thinking, and so on. A total of 270 pupils and 9 teachers participated in the learning trail. Results in the form of content analysis of pupils’ reflections, observations from teachers, and quantitative data from survey were collected and analysed. Results suggest that the pupils were engaged and motivated by the trail due to the multimodal approach. A high percentage of pupils also reported self-efficacy and belief in the benefits of collaborative learning. Some elements of self-directed learning were reported by pupils.*

Key words: mobile technology, authentic learning, activity theory

Introduction

One of the goals of education is for pupils to be able to apply skills, concepts, knowledge, and strategies learnt in the classroom into relevant contexts in their lives. However, decontextualized information, abstract concepts, and academic-driven subjects taught in silos of its origins and purpose has resulted in a generation of unmotivated learners who study for study’s sake. These learners are removed from reality, often regurgitating what has been imparted to them in examinations for the sole purpose of exceling academically. In recent years, there has been increased interest by educators about how to surmount this problem. Many have turned to technology

as the solution, whilst others have argued the importance of providing contexts in instruction through situated learning and authentic learning models. This paper examines the implementation of a blended model of learning which incorporates mobile technology and authentic learning through the lens of Activity Theory in a Singapore primary school.

Literature Review

Defining Authentic & Situated Learning

Authentic learning and situated learning postulates that learning should be more than the transmission of abstract and decontextualised knowledge from one individual to another. Both tout learning as

a social process whereby knowledge is co-constructed and where learning must begin with solving problems. Knowledge is constructed as people explore real life situations for answers. Lave and Wenger (1991) suggest that situated learning is situated in a specific context and embedded within a particular social and physical environment. Similarly, authentic learning must include tasks which have real world relevance and utility, which can integrate across the formal curriculum that provides appropriate levels of complexity in the process allowing students to select appropriate levels of difficulty or involvement (Jonassen, 1991). Authentic learning has its roots in Dewey's (1938) 'learning by doing' theory which posited the value of action while learning. Models of situated learning include making greenhouses, gardens into classrooms, apprenticeship, field trips, sports practice; whereas, authentic learning has greatly influenced the design of online learning environment to simulate actual learning scenarios. Both believe in real-world, direct and purposeful contexts and connections with actual situations and people.

Role of Mobile Technology in Authentic Learning

Researchers have also suggested the use of technology to provide contextual learning, in particular, the use of mobile devices. The use of mobile devices is widespread among the 21st century learners. These devices enable learners to have access to educational content anytime, anywhere (Cochrane, 2010; Frohberg, 2007; Shih & Mills, 2007; Traxler, 2010). Mobile devices allow learners to be embedded in realistic contexts (Walker, 2006). This is supported by the affordances of mobile technology which include GPS tagging, built-in cameras, connectivity, mobility, geolocation, social networking, personal podcasting, and vodcasting (Cochrane, 2010; Cochrane & Bateman, 2010).

Mobile devices have often been used in outdoor and field-based learning providing learners with control over their learning through instant feedback and prompts. These affordances promote a pedagogical shift from didactic teacher-centred to participatory student-centred learning (Facer et al., 2004). As such, mobile devices can work seamlessly to support authentic learning in the situated context of the task.

Why Authentic Learning

Authentic learning has been suggested to be an effective way of motivating learners. Learners feel engaged and can become self-determined when learning authentically. Self-determination theory emphasizes three basic needs of humans: autonomy where the learners experience control over their learning; feeling of competence where they feel that they are contributing with their knowledge and skills; and relationship where there is feeling of connectedness to some other people (Deci & Ryan, 2000). Authentic learning contributes to autonomy because learners are in control of their learning. It also strengthens their feeling of competence (self-efficacy) because learners are involved in contributing to meaningful tasks. Finally, authenticity contributes to relationship because authentic learning believes in co-construction of knowledge between learners and relating with actual people in real-world scenarios.

Research Design and Method

The aim of the study is to present educators with practical insights into designing a lesson package which integrates authentic learning and mobile technology into the school curriculum and explore the possible effects of the implementation on primary school learners. The questions include

1. How can authentic learning and mobile technology be integrated into curriculum?
2. What are the effects of authentic learning and mobile technology on the primary school learners?

We hypothesize that the integration of authentic learning and mobile technology will allow pupils to experience feelings of competency, relationship, and autonomy.

The population of this study comprises of 270 eight-year-olds (Primary Two) pupils. Ninety pupils were randomly sampled out of the population for the qualitative component as well as the 9 teachers who were involved in the implementation of the package. The respondents provide a reasonable representation of the population as it is one-third of the population.

Phase 1 of the study involves designing of the lesson package. Phase 2 describes the step-by-step implementation of the package and pupils' evaluation and reflection of the lesson package. A single study mixed methods research design was adopted in this study to ensure triangulation of the data (Creswell & Plano Clark, 2007). Quantitative data in the form of pupils' after programme evaluation survey was first collected from all the Primary Two pupils. Qualitative data in the form of pupils' written reflection and teachers' observations were then collected. The lesson package took a period of 6 weeks to implement. Data were collected at the end of the 6 weeks.

Pupils were asked to complete a survey as part of the post-programme evaluation to explore pupils' feelings of competence, relationship, and autonomy. The survey was analysed using simple descriptive statistics. Subsequently, the pupils recorded their feelings and lessons learnt in a reflection sheet. Simple content analysis was carried out on pupils' written reflection to identify themes. Content

analysis is a method of analysing written, verbal or visual communication messages (Creswell, 2008). During content analysis, the inductive method was adopted where the reflection forms were analysed through open coding for recurring themes which is a string of words conveying meaning. Teachers shared their observations and reflection during a professional learning community (PLC) session. This was recorded by the principal investigator. Analysis of the data was carried out by one of the teachers who was also a principal investigator of the research.

Phase 1: Lesson Package Design

In previous years, pupils' learning of the mathematic topic of money included the usage of play money and completing mathematical problems in their workbooks. In other words, the learning of money was an abstract and academic-driven exercise. In order to increase the authenticity of the learning of money, teachers decided to design a learning package to incorporate authentic learning and mobile technology. The package incorporated 10 design elements of authentic learning (Reeves, Herrington & Oliver, 2002). Table 1 delineates how the elements were incorporated into lesson design. It also made use of iPad (2nd generation) equipped with features such as 3G network access, camera, text input, trail shuttle application, etc. In addition, the lesson design also provided opportunities for the development of a myriad of 21st century skills such as oral and written communication, critical thinking and problem-solving, accessing and analyzing information, initiative and innovation, collaboration, ICT skills, curiosity, and adaptability (Dede, 2009).

Table 1
Elements of authentic learning which were incorporated into lesson design

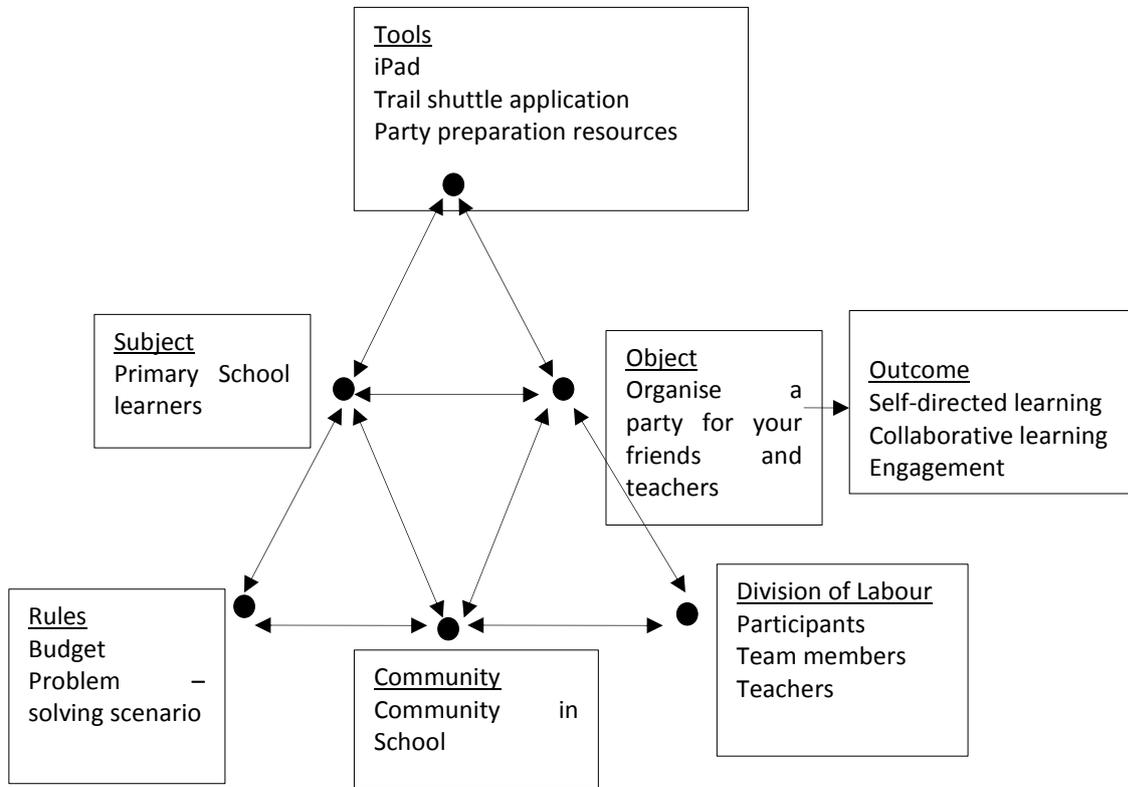
Authentic Design Elements	Lesson design
Real world relevance	Pupils organize and prepare their own party. This includes recipe-writing, invitation, shopping for their food online and at the supermarket, actual food preparation, decoration of the party venue.
Ill-defined activities	Pupils are required to define their tasks, decide who to invite, what recipe to use, what food to buy at the supermarket with the budget they have as well as the division of labour among the team members. Problem-solving scenarios were also posed to pupils to simulate possible problems countered in reality, compelling them to think on their feet e.g. Food being sold out, etc.
Sustained investigation	Pupils completed the activities over a period of 6 weeks spending 4 hours per week on research, discussion and preparation.
Multiple sources and perspectives	Pupils used resources from government websites, food websites and supermarket online sites to make decisions and conduct research.
Collaboration	Pupils work in their teams of 6 to organize the party. During the supermarket trip, the teams had to work together to solve problems and complete tasks posed by the Trail shuttle application.
Reflection	Pupils participated in a 3 tiered reflection exercise: class, group, and self-reflection. This occurred at different points of the preparation process. As a class, pupils reflected on what comprises “Halal” food and why is it necessary to prepare food that is ‘Halal’. As a group, team members discussed the difficulties encountered during the process. As an individual, the pupils reflected on their learning points through a self-reported survey and reflection sheet.
Interdisciplinary	The lesson package integrated subjects such as English, math, social studies and health education to ensure a holistic perspective.
Integrated assessment	The package includes formative assessment of pupils. Pupils were involved in the listing of items and costs in their budget planning trip. Their ability to name the highest and lowest priced item, add up total cost of budget and calculate change received at the supermarket as well as ensuring that it is all within the budget were assessed.
Polished product	The different steps and activities led to the launch of the party where pupils get to enjoy socialising.
Multiple interpretation and outcomes	Different teams chose different recipes for their party food. They also used different ways to send out their invites e.g. email or invitation card or e-invite. They had the autonomy to select who they would like to invite as well.

To ensure effective integration of technology into learning, teachers made use of a conceptual framework to ensure that technology is not integrated merely for technology sake but as a tool to mediate learning. Activity theory is one such theoretically-based conceptual framework for studying human behavior (Engeström, 1987; Leont'ev, 1978) and a lens to study how tools such as mobile technology interact with classroom systems to mediate pupils' learning. It has successfully been applied to aspects of technology-supported learning (Joyes, 2006). In the third generation of Activity Theory, Engeström (1987) introduced his systemic model to explain collective activities and cooperative work with emphasis on the mediational role of the community and that of social structures. It comprised the subject of the activity (the learners) working towards the object (purpose) leading to desired or undesired outcomes. In the process, studying the tensions and mediating effects of the community it is carried out in, the tools or artefacts used to achieve the object and in the contexts of the rules and regulations it is subjected to.

(Column left intentionally blank due to figure on the next page.)

Figure 1 is a proposed representation of the complementary relationship between authentic learning mediated by mobile technology analysed through the lens of activity theory. The primary school learners who are the subject of the lessons are working towards organising a party (object) using tools such as the iPad (hardware), Trail Shuttle iPad application (software), and the Internet through collaboration with their teammates, teachers, and participants of the party. They have to abide by a set of rules stipulated by their teachers such as a budget by which to conform and problem-solving scenarios embedded in the Trail Shuttle application. The desired outcomes include inculcating in learners self-direction, collaboration and engagement in learning.

Figure 1. Graphic representation of authentic learning mediated by mobile technology



Phase 2: Implementation of the Lesson

Stage 1: Background knowledge. Pupils were given links to various sites to research on and explore the term “Halal” using the Safari application in the iPad. Subsequently, they engaged in group and class discussions on the definition of the term.

Stage 2: Invitation. In their group of 6, pupils then decided who they would like to invite to their group party such as Muslim and non-Muslim teachers, principals, heads of department, parents. They learnt how to use the email and how to write an invitation during English and ICT lessons. They then emailed their invitation to the teachers. Some pupils chose to make their invitation cards.

Stage 3: Preparation for the party. Subsequently, they learnt recipe-writing and wrote their recipes. They then went online shopping to search for the cost and availability of the ingredients needed in their recipes to ensure that they are within the budget. A formative assessment for money where they were assessed based on their ability to add up the amount, ability to keep within the budget was carried out concurrently.

Stage 4: Shopping trail. Finally on the day of the party, the students were brought to a supermarket in the vicinity of the school where they were to use the iPad and Trail shuttle application to complete a trail around the supermarket before purchasing the items they require. The trail comprised five stations which included quizzes/songs/maps which are clues that will lead them to different sections to perform tasks such as photo-taking of the items purchased, answer related questions. The trail also included some problem solving scenarios.

Stage 5: Launch of the party and reflections. After purchasing the items,

pupils went back to school for the party preparation and finally the launch of the party. They then reflected on the shopping trip, party preparation, and the party using a reflection sheet, and they completed the survey.

Results and Discussion

In this section, the results of the analysis of pupils reflections, teachers observations, and survey are presented in mixed data sets due to the nature of the mixed methodology used in the research design. Discussion of the results for the various emerging themes will also be carried out.

From the content analysis of pupils reflections in Appendix 1, four emerging themes were identified . They are namely: engagement, relationship, autonomy, and challenge. These correspond and support the findings from the survey. However, a new category emerged from the content analysis which was not captured by the survey. The category relates to the problem-solving scenarios pupils were given in the mobile trail. Pupils narrated their feelings of confusion and frustration which is often related to solving novel and non-routine problems. They were forced to think on their feet. They felt challenged to conjure up another solution.

The survey findings are reported in descriptives as no pre-test or post-test was administered, and there was no comparison and control group. Pupils answered questions on a 4-point Likert scale. The results were then merged into 2 categories of “agree” and “disagree”.

Theme 1: Engagement

Survey Questions	SA/A	SD/D
I enjoyed the experience of preparing for a party.	94%	6%
I felt motivated to learn more about preparing for a party.	93%	7%

Findings suggest that majority of the pupils were engaged in the lesson package. 94% of pupils enjoyed the experience and 93% were motivated to learn more. This is supported by findings from the content analysis which provided insight that the use of the mobile trail which included quizzes and songs was the cause for their engagement. Some pupils also commented that they enjoyed the experience of preparing for the party without assistance from their parents. The most common phrase used was “It was fun.”

Teachers’ observations confirmed this finding. During the online shopping, teachers observed that pupils were on-task and were asking relevant questions which revealed that they were thinking and engaged in the task. One teacher commented on her observation of her pupils, “They decided to purchase grapes for their party. To their surprise, the cost of the grapes was measured by weight. They were at a loss as they were not taught this. They brought this problem to me, and we engaged in fruitful discussion. I was able to provide just-in-time instruction for them, and they really learnt something new that day.”

Theme 2: Relatedness

Survey Questions	SA/A	SD/D
We were able to solve problems encountered by working as a group.	95%	4%
I worked well with my group members.	91%	6%

Findings from the survey and the content analysis suggest that pupils were able to get a sense of relationship while working on their tasks. They acknowledged the importance of collaboration to solve problems. They mentioned “groupwork”/“teamwork”/“working together” enabled them “to solve problems better.” They also reflected on the difficulties of working together and “no quarrelling”

will result in problems being solved faster.

One teacher commented, “I was afraid that they would fight over the use of 1 iPad and to my surprise, they assigned the roles on their own. Two boys in the team were assigned the role of holding the shopping basket because they were thought to be stronger. One was appointed the leader because she is careful and good at typing. Another with similar perceived talent was appointed as the assistant. The last two members were the “spotters”, they will spot the items needed and take it from the shelves and also because they were taller than the rest.” Incidentally, the teacher also reflected that this team was one of the most successful teams in her class. Upon seeing their success, the other teams who had disagreements started to emulate their concept of division of labour. The pupils demonstrated the simplest form of ability-driven division of labour among the pupils.

Theme 3: Autonomy

Survey Questions	SA/A	SD/D
I spent time outside class finding out more about preparing for a party by discussing with people or reading books or searching on the Internet.	58%	32%

Findings revealed that close to half of those surveyed took initiative to learn independently outside of the classroom context. Teachers reported that some pupils went to the supermarkets on their own accord prior to the class shopping trip to conduct a research on food which is “Halal” and with the healthier choice label. Some pupils took responsibility for their learning by engaging their parents in discussion over the recipes to select and why. These pupils returned to class and shared their findings with their classmates and teachers. From the content analysis, comments from students inadvertently linked SDL to the use of iPad. The

technology was their tool in getting around and accomplishing their task independently. The use of technology had provided them with the control and autonomy over their learning. There was no mention of adults in all the reflections analysed. As a result, many exhibited self-determination to learn on their own.

Theme 4: Competence

Survey Questions	SA/A	SD/D
I am able to use a shopping list.	99%	1%
I was able to read the nutritional information on the food items to make a wiser choice.	95%	5%
I am able to prepare another mini-party with little help.	87%	13%

Self-efficacy is a person’s belief in his or her ability to succeed in a particular situation in other words, their sense of competence. Bandura (1994) described these beliefs as determinants of how people think, behave, and feel. Most pupils reported a belief in their ability to transfer the learning from this lesson package to a similar situation and also the life skill of reading labels to make wise purchases. The problem scenarios weaved into the shopping trip also provided opportunities to make them think on their feet. The pupils encountered problems like busting the budget, not being able to buy the original items planned, constraints like food being Halal, lowest cost, manufacturing place, healthier choice, etc. Their ability to surmount challenges faced could have contributed to their feelings of competence.

The above qualitative and quantitative results suggest that our hypothesis is correct. Most pupils experienced a sense of relatedness, competence, and autonomy. The relatedness they experienced was borne out of collaborative problem-solving. They were confident of their ability to prepare another party or to engage in shopping in a supermarket, and they were engaged in

learning and problem-solving. On the other hand, autonomy had the lowest percentage among the four themes which could be due to the fact that rules and teachers' control is still present to a large extent. This could be possibly due to their age (8-year-olds) and also teachers tend to take a more directive stance. This could be a possible area for further research. Pupils narrated their autonomy experience in relation to the iPad. The affordance of the mobile device allowed it to play a mediating role in helping pupils to extend their learning.

Conclusion

Authentic learning mediated by mobile technology leads to feelings of relatedness, autonomy, and competence and thus contributing to learners' self-determination. The collaborative problem-solving orientation of the authentic learning package has led to feelings of competence and relatedness among the learners. The affordance of mobile technology provided pupils with opportunities to experience control and autonomy over their learning. Our study has demonstrated a possible link between authentic learning and self-determination and the synergy between mobile technology to authentic learning. This has significant implications for educators looking into ways to increase pupils’ self-determination. Firstly, authenticity of their curriculum can be increased through the use of technology. Technology plays an integral role by increasing opportunities for the pupils to experience and have a voice in their learning and many times providing the context for learning. Secondly, the curriculum designed should be of suitable difficulty level for pupils to encounter problem-solving opportunities and yet still be able to experience feelings of competence upon solving it. Moreover, the process of collaborative problem-solving allows pupils to increase feelings of relatedness

that they are not working on the task in silos. Technology can also bridge the gap where pupils experience difficulties to learn in context due to geographical distances. Online chats with international subject experts or GPS to view volcanos are some examples. This study is subjected to possible reliability and validity issues since it is conducted on a single primary school in Singapore. Nonetheless, it has provided practitioners with a workable model and valuable

insights into the integration of authentic learning and ICT into formal curriculum.

For future research, empirical studies on correlation between pupils' self-determination and authentic learning and technology could be carried out for different contexts such as different age groups, gender differences and so on. Researchers may also investigate the various strategies and methods to increase pupils' feelings of autonomy.

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GEOGEBRA IN TEACHING INTRODUCTORY STATISTICS

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Abstract: *This article discusses the special opportunities for teaching statistics that technology offers teachers who aim to provide rich learning experiences for their students. These opportunities involve automation of many activities such as quickly organising data, computing measures, and generating graphs. By automating the tasks of computing statistics or generating data, technology facilitates students' ability to visualise abstract concepts, affording an opportunity to focus on conceptual understandings and data analysis. This article also examines how GeoGebra can be integrated into the curriculum and learning process of introductory statistics to engage college students in cycles of investigation including (a) managing data, (b) developing students' knowledge for understanding specific statistical concepts, (c) performing data analysis and inference, and (d) exploring probability models. Recommendations are included for ways mathematics educators can engage college learners in developing their knowledge for exploring data concepts and doing statistics with GeoGebra.*

Key words: GeoGebra, mathematics, statistics, technology use in mathematics

Introduction

Statistics is becoming increasingly important to all levels of citizenship; it facilitates an abundance of data to inform decision-making. The biggest leaps forward in the next several decades – in business, and society at large – will come from insights gained through understanding data. The Australian Curriculum and Reporting Authority K-10 (ACARA, 2010) advocates the increasing importance of student competence in using, analysing, and interpreting data with or without the use of technology. Available technologies (e.g., Web 2.0) afford opportunities for communicating with students in ways meaningful to them (Ridgway, Nicholson, & McCusker, 2011) and for helping students visualise main characteristics of data in order to make sense of, analyse, and interpret data.

The use of technology can provide strong support in implementing novel and different approaches in teaching statistics.

Technologies for doing and teaching statistics, such as graphing calculators, spreadsheets, and statistical packages such as SPSS, SAS, S, and S-PLUS, and more recently R or Minitab, have become commonplace in many tertiary and some secondary contexts.

This article discusses (a) the special opportunities for teaching statistics that technology offers teachers who aim to provide rich learning experiences for their students, and (b) how GeoGebra, which has tools designed for engaging college students in managing data, performing data analysis and inference, and exploring probability models, can be integrated into the curriculum and learning process of introductory statistics. GeoGebra is of particular interest to educators with a limited budget because it is an open-source software package, available free on the Internet, and it can be an effective tool to teach geometry, calculus, algebra, and statistics.

What Does Technology Offer Teachers of Statistics?

Pratt, Davies, & Connor (2011) examine the affordances of technology in teaching statistics. They consider five affordances that technological advances offer to teachers of statistics as follows: (1) Using representations as dynamic tools for analysis, (2) expressing personal models, (3) exploring modelling, (4) storing and processing real data, and (5) sharing and communicating. In this paper, a sixth affordance is added, which is (6) the visualization approach.

Using representations is the first affordance. Traditionally, graphs are used to report data, often through graphical displays and representations. Statistical software can provide graphical representations of data that are easily generated. Technology, therefore, enables representations to be used as analytical tools at the end of the investigation. Pratt et al. (2011) argue that, “when graphs are used to try to make sense of data during analysis, the representations need to appeal to an intuitive sense of position, spread and outlying values” (p. 98). For example, the hat plot in *TinkerPlots* (www.keypress.com/x5715.xml) was designed to appeal to students’ intuitive notion of modal clump (Konold, & Pollatsek, 2002).

Pratt et al. (2011) consider as a second important affordance for teaching statistics, the creation and use of models that capture the inherent structure in a situation. Teachers of statistics might therefore engage their students in an activity using computational tools to express personal models that better fit data arising from the random phenomenon in question. Computational tools empower the students’ levels of expressiveness needed to create their own informal models for the data by looking for patterns in the data, a process often termed as

expressive modelling (Doer & Pratt, 2008).

Additionally, teachers could use statistical software to build models that the students can then explore by taking samples or using other statistical procedures. According to Pratt et al. (2011) exploring models is the third important affordance for teaching statistics. The process of engaging in exploratory modelling (Doer & Pratt, 2008) and experimenting with statistical distributions (Garfield, & Ben-Zvi, 2008) might provide opportunities for students to appreciate the use of key statistical concepts in particular contexts. When students are engaged in activities of expressive modelling, there is no guarantee that they are also engaged in constructing any key statistical concepts. Simulations have been used to help students draw connections between ambiguous statistical concepts such as epistemological perspectives for probability (Abrahamson & Wilensky, 2007), unexplained and explained variation (Engel, Sedlmeier, & Worn, 2008), experimental and theoretical distribution (Prodromou, 2008, 2012a), experimental and theoretical probability (Prodromou, 2012b), or deterministic and stochastic causality (Prodromou, & Pratt, 2006, 2013).

Storing and processing real data is the fourth important affordance for teaching statistics (Pratt et al., 2011). Digital technology facilitates the storage and easy retrieval of large data sets. Use of large data sets enables the analysis of data drawn from real situations that are meaningful for students. Real data sets present issues that are usually not present in carefully prepared situations. These issues are difficult numbers, errors in data, and missing values. Such issues need to be confronted because they raise important points about the limitations and reliability of statistical inferences.

Sharing and communicating is the fifth fundamental affordance for teaching statistics with technology (Pratt et al., 2011). Several researchers argued that new technologies enhance the sharing and communication of information about statistics. For example, Ben-Zvi (2007) has researched several types of wiki activities for the creation of resources that could be beneficial to teacher trainees of statistics and their future students. Amongst these activities, are collaborative writing, glossaries, discussion and reviews, statistical projects, self-reflective journals, and assessment. Nolan and Temple Lang (2007) investigated how a very large data set consisting of 9000 email messages that contained 30 variables each was used to introduce teacher trainees to a dynamic document environment that included a live worksheet that in turn allowed students to interact with the data, adjusting inputs, altering computations and exploring a variety of different statistical analyses. A live worksheet with data allows users to reflect on what statisticians might do in order to perform a statistical investigation. Interactive environments reinforce reflection, which supports teachers in more effectively teaching statistics and students in drawing better connections between problems-solving activities in statistics and real life situations.

The sixth affordance, a focus on visualisation, is an approach to statistics where the goal is to uncover some aspects of the data or other important statistical processes that might not be perceived, or appreciated by other means. Concepts important for statistics can be mastered with a “wholly visual approach” that will, “attempt to minimize the conceptual distances between the concrete realities, including precursor practical experiences, and the dynamic imagery envisaged” (Wild, Pfannkuch, Regan, & Horton, 2011, p. 252). This approach encourages an inferential step to be performed without having “students taking their eyes off their

graphs” (p. 252) so that students can easily draw connections between question and data, and answer as quickly as possible. This new approach places working with data and making and validating visual inferences on the fly, at the core of instruction, and constitutes a shift towards more holistic, process/problem-oriented approaches to learning statistics. The emphasis is on situations/data that unfold in time.

These six affordances that focus on using representations as dynamic tools for analysis, to express models, including personal models, to store and process real data, to share and communicate will be used to guide our analysis of GeoGebra. We might expect that technology affordances as described above have changed the way teachers teach statistics and students learn statistics. Technology in general and GeoGebra in particular can help with amplifying users’ abilities to solve problems or reorganise the way people think about problems in statistics and search for their solutions (Ben-Zvi, 2000; Pea, 1987).

We will reflect on a lecturer’s use of GeoGebra (Hohenwarter, 2001) in teaching and learning Introductory Statistics. This reflection will help teachers to take advantage of some of the opportunities GeoGebra offers teachers while remaining alert to the issues surrounding their use.

GeoGebra

GeoGebra is a dynamic and interactive geometry, algebra, and calculus application, intended for teachers and students. Most parts of GeoGebra are free software and as of 2014 March, there were more than 150 GeoGebra Institutes (IGI) around the world. GeoGebra Institutes are non-profit organizations at schools and universities who share free educational materials, support teachers and students in

using GeoGebra, and work on projects related to GeoGebra. GeoGebra, as its name suggests, was initially designed to teach geometry and algebra. Teachers and students can use GeoGebra to make conjectures and to understand how to prove geometric theorems because they conceptualise the mathematical formulae in relation to their geometrical constructions. Many features of GeoGebra are designed to this end, and thus are not of immediate relevance to statistics education.

GeoGebra has very recently offered some tools that can be used for teaching statistics. We will reflect on how GeoGebra could be integrated into the curriculum and learning process of introductory statistics.

Teaching Introductory Statistics with GeoGebra

We will consider two distinct ways GeoGebra can be used when teaching introductory statistics courses:

- (1) Applets created with GeoGebra are integrated into lectures to demonstrate specific concepts.
- (2) Students use GeoGebra as a software tool to perform data analysis and inference and to explore probability models.

In the case of applets created by teachers for classroom use, such applets can be used during lectures and tutorials to demonstrate specific fundamental concepts that are commonly difficult to conceptualise in relation to a bivariate distribution. These applets facilitate students' capability to visualise abstract statistical concepts with which teachers expect students to engage with. For example, the least Squares line demonstration affords students with two affordances of using technology: exploring models (third affordance) and visualisation

of abstract concepts (fourth affordance). In this least Squares line demonstration applet, automation in GeoGebra facilitates students' capability to visualise how the overall minimizes the sum of squared residuals and visualise how the overall minimizes the sum of the squares of the errors made in the results of every single equation (Figure 1). This visualisation is not possible without technology that can scaffold students to reorganise their conceptions of bivariate distributions. Students are also provided with learning opportunities to interact with the main characteristics of the "least squares" by dragging the scatter points in a graph window or the two points on the fit line, or overlaying the graph with statistical measures (e.g., residuals, squared residuals, means, a least square line) and observing the augmentations of the graph. Through features of making augmentations to the existing representation of the least Squares line, GeoGebra can be used by teachers in ways that extend what students may be able to do without technology to help reorganise and change students' statistical concepts. For example, teachers can promote exploring of the applet (third affordance) by encouraging students to make augmentations least squared line (a) altering representations, (b) overlaying other characteristics other than statistical measures and additional information in the representation (e.g., a residual plot to show a graph of residuals) overlaying measures on graphs. Such augmentations can help change the way teachers and students conceptualise the relevant measures in relation to a bivariate distribution, particularly since the statistical measures update automatically as data is changes by dragging data points in the graph.

Another applet created with GeoGebra is the student's t-distribution vs. Z demonstration. The applet provides two important affordances for teaching how the t-distribution approximates the normal distribution (with mean 0 and variance 1)

as the number of degrees of freedom increases. These two affordances are the first affordance, using representations as dynamic tools, and the sixth, visualisation of abstract concepts. In this applet, the student's t-distribution that has the following probability density function, $f(t) = \frac{\Gamma(\frac{\nu+1}{2})}{\sqrt{\nu\pi} \Gamma(\frac{\nu}{2})} \left(1 + \frac{t^2}{\nu}\right)^{-\frac{\nu+1}{2}}$, where ν is the number of degrees of freedom and Γ is the gamma distribution, is used as a

dynamic tool. Controlling parameters of the student's t-distribution, such as the degrees of freedom, generates the displayed distribution in real time and provides students the ability to observe the altered graphical representations that show how the t-distribution becomes closer to the normal distribution (with mean 0 and variance 1) as the number of degrees of freedom increases.

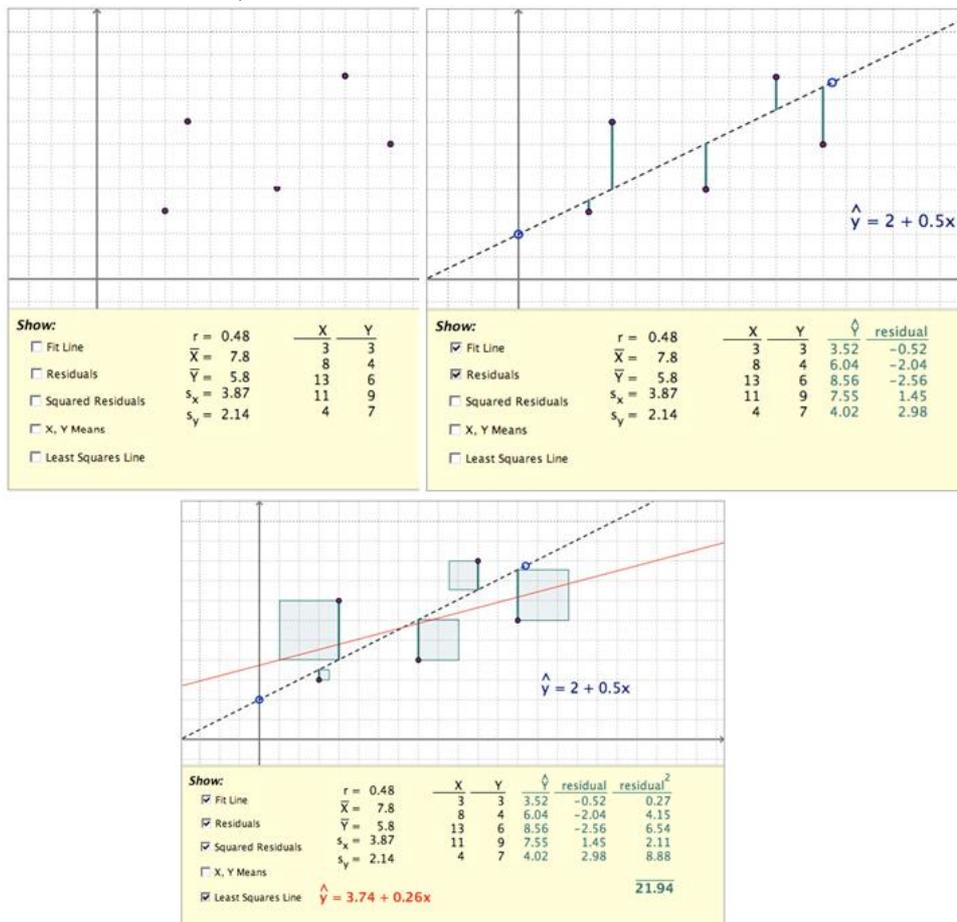


Figure 1. The applet of least Squared line demonstration

The representations (see Figure 2) show the density of the t-distribution (red line) for increasing values of ν . The normal distribution is shown as a blue line for comparison. Figure 2 also illustrates how to create dynamic links among the t-distributions and the Normal Distribution. A dynamic link, in contrast to a static link, “occurs when a purposeful action is done

to one representation that causes a reactive and coordinated action in another representation” (Lee, Kersaint, Harper, Driskell, & Leatharm, 2012). A static link within dynamic software occurs when there is an indication of coordinating complementary information in two or more representations (Ainsworth, 1999) that does not involve any direct

technological interaction with a representation.

Ultimately, GeoGebra applets like those shown above provide affordances of dynamic statistical software such as abilities to relate the two representations, connecting them dynamically, and obtaining simultaneously graphical

augmentations of the density of the t-distribution (red) for 1, 5, 10 and 20 degrees of freedom. Taking advantage of these affordances users could actively be engaged in statistical problem solving activities that may lead to further investigation or additional insight.

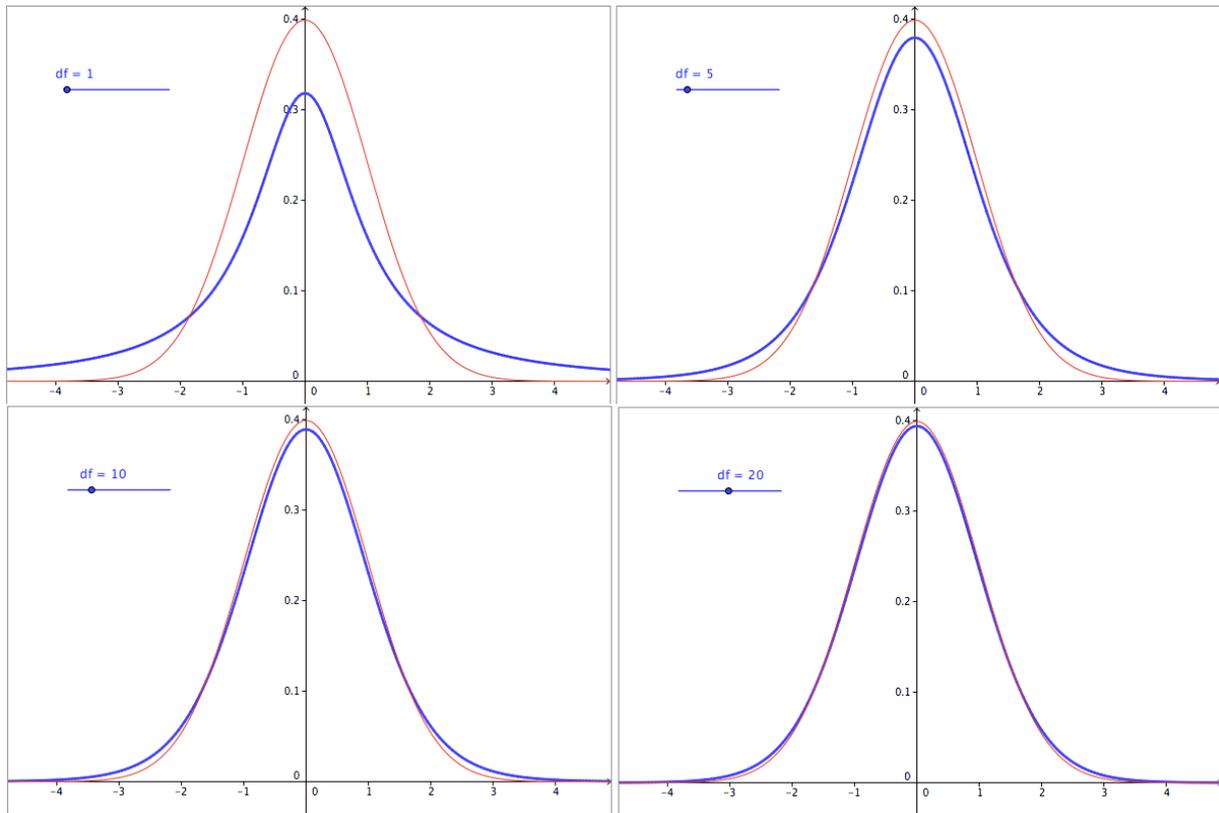


Figure 2. Density of the t-distribution (red) for 1, 5, 10 and 20 degrees of freedom compared to the standard normal distribution (blue).

In this study we were also interested in how teachers can take advantages of the features in GeoGebra that allow some of the affordances described by Pratt et al. (2011) in their teaching of introductory statistics to engage college students in (a) managing data, (b) performing data analysis and inference, and (c) exploring probability models. A description of (a) to (c) follows.

Using GeoGebra as a Statistics Software Package

GeoGebra can be used as a statistics software tool to help students perform data analysis and inference and explore probability models. Features of the software relate to the following affordances of Pratt et al. (2011): using representations as dynamic tools for analysis (first affordance), storing and processing real data (fourth affordance),

sharing and communicating (fifth affordance), and the visualization approach (sixth affordance). Students can work with a specially configured version of

GeoGebra designed for a statistics-learning environment (Figure 3).

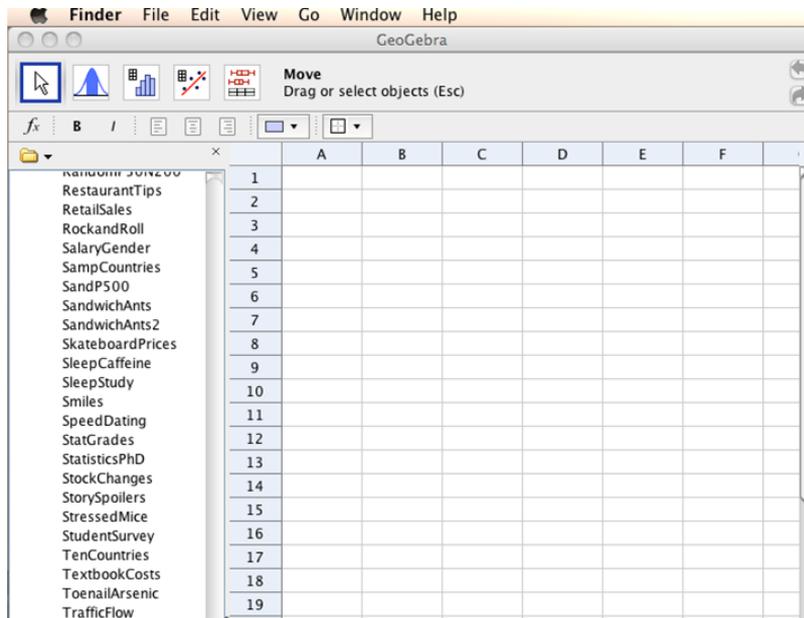


Figure 3. The statistics-learning environment version of GeoGebra

In this example, the students do not use the input bar or graphics window. All work is done from the spreadsheet and data analysis dialogs. This action of using data sets of data points from a spreadsheet and data analysis dialogs is the primary building tool of GeoGebra when creating the representation of data analysis tools to establish a link between the data analysis graphs or summary tables to the data that is stored in the spreadsheet table. The users of GeoGebra view a spreadsheet table of data points and visualise a graphical representation separately. This capability of storing and processing of (real) data reflects the fourth affordance described by Pratt et al. (2011) because GeoGebra facilitates the use of large data sets through its capacity for data storage, easy retrieval, and availability. The affordance of data visualisation is also involved when using GeoGebra as a software package to help with revealing

some aspects of the data that might not be perceived or appreciated by other means.

Other affordances described by Pratt et al. (2011) are exhibited such as sharing and communicating (fifth affordance). Teachers can use new technologies such as discussion forums, Wikis, and interactive white boards to promote teachers' collaboration and involvement. While these tools can be used in course management, they can also encourage students' collaboration and involvement in sharing data (for example, using Google docs spreadsheets at docs.google.com), analysing data individually or in groups, and discussing the analysis of data. The visualisation approach affordances involved when students may link the information from the data points in the spreadsheet table with the information in each plot. This visualisation is not possible without technology that can provide a way to coordinate this kind of information. This

way of coordinating information is done by establishing a static link between the data points of one variable and the information in each plot or summary table. The structure of the GeoGebra environment does not allow representation of data to be linked as they are created as other dynamic environments do (e.g., Fathom or *TinkerPlots*). In Fathom (www.keypress.com/x5656.xml) or *TinkerPlots* (www.keypress.com/x5715.xml) when creating a graphical representation or a summary table, one can drag an attribute name (variable) from the data card or data table onto a plot window or an axis in a graph window or a row or column in a summary table.

Managing data. GeoGebra offers students these affordances of Pratt et al. (2011): (4) storing and processing real data and (5) sharing and communicating. GeoGebra facilitates the use of different sizes of data sets. In general, technology facilitates the use of large messy data gathered from surveys, or censuses. This data can also be assessable through the Internet. Notwithstanding, teachers should develop an ethical disposition about the use of data sets taken from the internet, citing resources and being aware of data sets that have been transformed into usable data by others who have particular agendas to use it to bring different cultural ideas to the fore.

Data sets are re-entered and manipulated as columns in GeoGebra's spreadsheet. Data can be imported into the spreadsheet with cut and paste techniques or by opening data files from a local drive or external web site.

Accessing data files is greatly simplified with GeoGebra's data browser, which displays a catalog of locally stored data files or a catalogue of files stored on a web page. With one click on a file title the spreadsheet is cleared and the data file

imported. In this example, the data browser is set by default to list the data files for the course textbook examples and homework problems.

This optional sidebar panel provides students with the capability to quickly open and explore data files spontaneously in response to homework questions. Storing and processing data as well as analysing and displaying data affordances as described by Pratt et al. (2011). GeoGebra also facilitates the use of large data sets of interest to students that are collected and accessed through the internet. Knowing how to collect real data from the internet and how to transform it into usable data using a particular piece of software (e.g., GeoGebra) or downloading and manipulating it in a graphic calculator is a useful skill to statistics education, since teachers should be cautious of data sets that has been transformed by others (teachers or not) who might wanted to use the data to bring different statistical ideas to the forefront.

The use of discussion forums, Wikis, interactive whiteboards, and self-assessment software can promote collaboration and students' involvement, supporting a focus on collaborative tools for data collection, analysis, and data visualisation. Collaborative tools to collect data can promote a community approach to generating and analysing data that can foster sharing of information and collaborative investigations of data and discussion to consider the statistical problems. This reinforcement of sharing and communicating constitutes the fifth affordance (Pratt et al., 2011).

Creating graphs and performing inference. GeoGebra provides students with Pratt et al.'s (2011) first affordance of creating and using representations as dynamic tools for analysis or performing inference with GeoGebra. To perform inference with GeoGebra, a student capitalizes on the sixth affordance offered

by the technology that focuses on the visualisation approach. This approach encourages an inferential step to be performed without having “students taking their eyes off their graphs” (Wild et al., 2011, p. 252) so that students can easily draw connections between question and data, and answer as quickly as possible. When students use GeoGebra, they select data from spreadsheet columns and by pressing a toolbar button, launch a data analysis dialog window. The dialog opens with a simple graphical representation of the data and provides options to display statistical measures and sub-dialogs for calculating confidence intervals and hypothesis tests (Figure 4).

There are three data analysis options: one variable analysis, regression analysis, and multi-variable analysis. The one variable analysis button is used for single variable data: both quantitative and categorical. It generates bar charts, histograms, boxplots, stem and leaf plots, dot plots, or normal quantile plots. The regression analysis button is used for quantitative bivariate data and generates scatterplots or residual plots with a variety of regression models. The multi-variable analysis button generates stacked boxplots and one-way ANOVA tables.

For some dialogs there is a data-selection panel for setting data values. This option can provide opportunities to consider a view of a distribution of a group of data values and juxtaposed this view to an aggregate view of a distribution. For example, the students might use graphical representations to consider the impact of particular data values in a distribution of aggregate values or to examine the impact on a measure of center if an outlier is removed from a data set. GeoGebra also allows students to focus on an interesting subset of data by allowing them to segment a distribution’s range into several parts, and group data visually within a

range in order to examine special features in subregions of a distribution.

Probability and statistical inference calculator. GeoGebra provides students with its Probability Calculator (Figure 4). Students can use this feature to explore data, calculate probability models, and make claims and decisions about basic statistical inferences from data. The software tools in this dialog are equivalent to or surpass those found in a typical graphing calculator.

The observation of the graphs selected in the Probability Calculator model provides the following affordances: exploring modelling (second affordance) and the use of visualisation (sixth affordance). Engagement with the GeoGebra’s modelling tools provides students with opportunities to visualise the probability distribution of data and explore the relationships of the different probability distributions and their corresponding statistical measures (mean, variation, hypothesis testing). The automation in GeoGebra allows instant generation of the probability distribution and computation of the relevant statistics. Students usually made static links toward the end of making concluding claims and decisions about basic statistical inferences from data, as they reflected on their interactions with the tools of the probability and statistical inference calculator.

The probability calculator within GeoGebra has two tabbed panels, probability and statistics. The probability tab panel allows students to view a variety of common probability models. In particular, it displays a graph for a selected model and has a panel with a simple, button-driven interface for computing interval probabilities (Figure 4a).

The graph gives visual feedback for computed probability intervals and allows for dynamic changes by dragging interval

endpoints. This dynamic dragging of interval endpoints allows students to establish a dynamic link coordinating a single graphical representation of a distribution with statistics like mean, variance, and standard error, as well as tools for different hypothesis tests. Students are able to use dynamic linking to look at basic probability models and make inferences from data by performing hypothesis testing and observing every time how the values of mean, variance, and standard error are modified (Figure 4b). Students often compare the impact of

modifying a certain model to a statistic and using such comparisons they can make statements about relationships.

The probability tab panel in the probability calculator could help users to view several graphical representations of different probability models, offering students a range of affordances that could scaffold their learning of statistics, ensuring that students could link statistical thinking to probabilistic thinking.

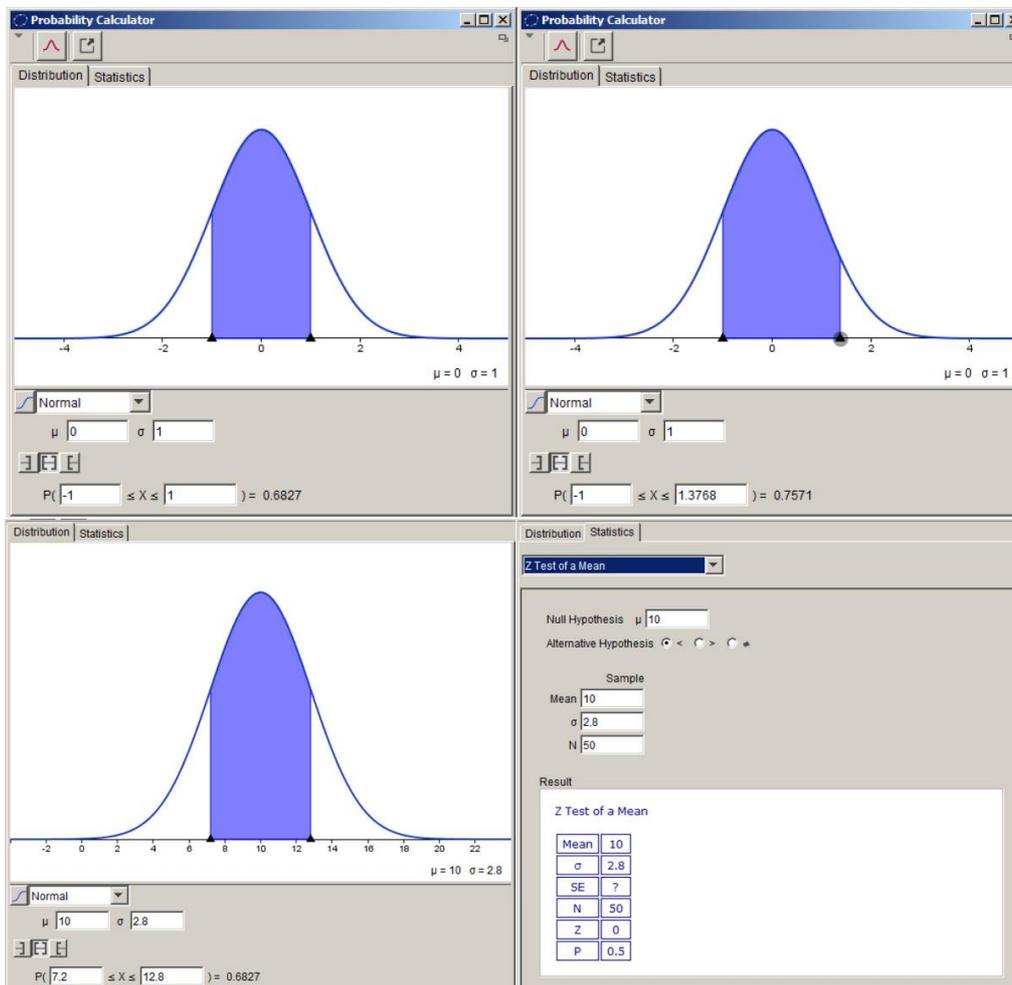


Figure 4a. Two graphs on top

Figure 4b. Graphs and statistic at the bottom

Students establish dynamic links when coordinating information about graphs of a selected model and computed probability intervals, which allows for dynamic changes by dragging interval endpoints.

The statistics tab panel is a dialog for computing common confidence intervals and hypothesis tests from summary statistics. These software calculator tools replace table lookups and hand-held

calculators. The majority of the college students already own a hand calculator that can do statistical work, but such calculators don't allow the features that GeoGebra has, and thus do not provide affordances such as the visualisation approach (sixth affordance), hence GeoGebra provides an advantage over such calculators.

Challenges for Teacher Education

It has been argued that technology provides a range of affordances that could revolutionise statistics education; however this transformation can only happen if statistics is taught differently (Marriott, Davis, & Gibson, 2009), and this change can only occur if teachers' education changes. There is an increasing focus on the use of technology included in teacher preparation programmes (Powers & Blubaugh, 2005). Moreover, studies have researched and reported on the difficulties teachers have when using technological tools to teach (Reston & Bersales, 2008) because of their own limited knowledge of the best use of technology to positively impact students' learning of statistics. Immersion in the use of technology on teaching statistics may uncover teachers' weak conceptual understanding of statistical concepts. Teacher education programmes might deal with such weaknesses when they are exposed, by engaging teachers in statistical thinking. To engage teachers in statistical thinking, teachers should be active learners who conduct statistical investigations, collect data to examine situations, and make decisions using appropriate statistical language. Teachers should then be able to engage in a process of collecting measures, creating meaningful graphical representations, computing statistical measures, and translating their interpretations integrating the content.

The use of technology should be implemented in teachers' courses. To help

teachers develop teaching materials in statistics education during their teaching training, teachers should be engaged in statistical thinking while performing statistics with different technological tools and reflect on their personal learning in order to consider possible pedagogical issues. The aim of such engagement with technological tools would be to enhance teacher's learning of how (a) their students think and reason about statistics with and without the use of technology, and (b) the special features of technological tools that might be integrated into teaching to support learning of certain statistical concepts.

Discussion

The development of technologies, including GeoGebra, will of course continue as will the analysis of how their design and implementation impact teaching and learning. However, the way forward is to place emphasis on teacher education, so the affordances of technology, as discussed in this paper, can be understood by teachers and the challenges for teacher education can be met. Research is needed to examine and evaluate developments in teacher education, and to help understand and measure the effects of different educational technologies.

GeoGebra provides the affordances that Pratt et al. (2011) suggest that technological advances offer to users. In GeoGebra, representations of data are used as dynamic tools for analysis at the end of each investigation when solving statistical tasks. The representations that are available in GeoGebra, however, are lacking three important structures of dynamic environments.

First, GeoGebra does not yet provide tools that could have an appeal to students' intuitive sense of some statistical concepts; however, such tools could be integrated

into GeoGebra in the future. It would be better for middle school students and younger users of the software to have access to individual data values so they could interact directly with them. For instance, dragging a data point within a dot plot could contribute to instantly separating data values into groups for the same variables and generating common graphical displays of those variables. Students could also actively construct different representations by dragging the name of the representation on to a selected representation. Second, in GeoGebra when highlighting a data point in one representation, it does not create a highlighted display of that data point within all other representations. GeoGebra does not yet include built-in connections among all representations created from a data set.

GeoGebra facilitates real data storage and processing of real data drawn from situations that are meaningful for the students (Pratt's fourth affordance). It can be used by students to process data in a faster way, calculate sophisticated statistics, analyse data, and draw appropriate inferences. The way that GeoGebra supports users to explore probability models places emphasis on the third affordance of modelling as well as on data analysis as discussed above. GeoGebra also supports Pratt's fifth affordance of sharing and communicating statistical results through discussion forums, Wikis, interactive whiteboards, and self-assessment software to promote collaboration and students' involvement.

As shown, GeoGebra offers the range of affordances described by Pratt et al. (2011) as being available in technological advances. Continued developments of mathematical software, like GeoGebra, need to be examined and evaluated to help mathematicians and software designers to better understand the consequent impact that results from learners' interaction with the software, and the way that teachers integrate the special characteristics of such software into teaching to support students' learning of statistical ideas.

The availability of GeoGebra for doing and teaching statistics extends to what teachers may be able to do without technology to help reorganize and change a student's statistical conceptions. Teachers can better teach many difficult statistical concepts with GeoGebra because automation in GeoGebra facilitates visualisation of abstract concepts and such a visualisation approach is not possible without the use of technology. Teachers who learn to use GeoGebra can develop further tools – applets or simulation tools – that suit their students' learning needs. Integrating simulation tools into teaching can have positive benefits by allowing students to experiment with statistical distributions and data (Garfield & Ben-Zvi, 2008) or abstract concepts (Chance, Ben-Zvi, Garfield, & Medina, 2007). Teachers who use technology in their own statistical investigations will have first-hand knowledge of the power of using simulations as pedagogical tools.

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RETHINKING CONCEPTUAL CHANGE: IMPACT OF HUMAN CONSTRUCTIVISM INSTRUCTION ON STUDENTS' CONSTRUCTION OF CHEMICAL EQUILIBRIUM TASKS AND CHEMISTRY SELF-EFFICACY

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Abstract: *This study provided an empirical basis for rethinking conceptual change model showing effect of human constructivism-based cooperative learning strategy on senior secondary school II students' construction of chemical equilibrium tasks and their chemistry self-efficacy. The conceptual change model was grounded in the perspectives of chemists who track students' changes from their preexisting conceptions and the intervention with human constructivism based group discussion learning instruction to observe multiple ways to observe multiple pathways. Data were collected from 244 students through open-ended conceptual test items. Two research questions were raised and two hypotheses generated. Quantitative and qualitative data collection methods and analyses were used. Results indicated students' views of chemical equilibrium tasks fell short of scientific conception before treatment. Four conceptual pathways ranging from notion to construction were observed. T-test revealed significant effects of treatment on students' construction of chemical equilibrium tasks and chemistry self-efficacy. The study provided valuable information for instructional practices.*

Key words: conceptual change, chemical equilibrium, human constructivism, chemistry self-efficacy, group discussion

Introduction

Conceptual change is a term synonymous with the fundamental restructuring of concepts after exposure to well-conceived and executed learning strategies leading to the acquisition of scientific concepts. Jonassen (2006) stated that conceptual change is the mechanism underlying meaningful learning. In an exposition of meaningful learning, Okebukola (2012) notes that meaningful learning is best described by contrasting it with its diverse – rote learning. This is because the arrangement of both rote and meaningful learning takes different turns in our cognitive structure. Meaningful learning occurs when concepts can be linked to a similar concept, when it can be correlated, when it can be applied, and when it can generate new ideas; while rote learning is

anchored on knowledge that are isolated which are not relatable, which cannot be spontaneously constructed when given a similar task and is very prone to forgetfulness.

One of the most versatile and robust conceptual change models in science education students' epistemologies is Hewson (1996). In this model, accommodation of new conception occurs when a learner is dissatisfied with his/her prior conception and an available replacement conception is intelligible, plausible and fruitful. According to Hewson (1996), an intelligible conception is sensible if it is non-contradictory, and it is understood by the students. Plausible implies that in addition to the students knowing what the conception means, they find the conception believable, and the

conception is fruitful if it helps the learners solve other problems or suggests new research directions.

Mintzes and Wandersee (2005) observed that many misconceptions are robust with respect to age, gender abilities, and cultural boundaries, which transcend many disciplines. These misconceptions emanate from diverse set of personal experiences encompassing direct observation of natural objects and events. These can be as a result of interaction with peers, everyday language, and in some cases, the teachers themselves.

Some studies (Sheppard, 2006; Tsarpalis and Papaphoris, 2009) situated in constructivist settings have shown difficulties in changing misconceptions as well as indicating strategies that can be effectively employed in helping students change their misconceptions. Tsarpalis and Papaphoris (2009) using mixed-method design employed active and cooperative forms of learning which are consistent with social-cultural constructivism. Sheppard (2006) used Predict-Observe-Explain situated in a constructivist setting to probe into students' understanding of acid-base titration and found that students' conceptual change improved with the use of the learning technique.

Conceptual change model has come under some heavy criticisms (Fensham, 2001; Limon, 2001). One of the most outstanding criticisms is that most conceptual change approaches do not consider affective measures. Human constructivism propounded by Novak (1993) provides a veritable approach for rethinking conceptual change. It has three main themes, and the first one asserts that human beings are meaning makers. The second theme states that the goal of education is the construction of shared meanings while the third one states that the construction of shared meanings is facilitated by the active intervention of

well-prepared teachers. It also stresses the importance of cognitive processes in the facilitation of conceptual change as well as respect the essential aspects of a supportive social environment in which reality can be personally constructed as well as socially discovered. This, therefore, makes the use of learning strategy that is supportive of social processes necessary in this study.

In order to achieve the objectives of learning, classroom environment should incorporate students' interactions with the teacher, the learning material, and with one another. It is believed that interactions among students' foster exchange of ideas in a non-authoritative manner in a peaceful atmosphere, which gives freedom on the part of students to ask questions, express opinion, and seek clarification and justification from one another in a group setting. Group discussion may take a variety of forms such as small group, devil's advocate, round table, panel discussion, opposing panel, and debate (Adewuya, 2003). Discussion as a process of giving and talking, speaking and listening, describing and witnessing helps expand horizons and foster mutual understanding. It is observed that teaching strategies that incorporate group activities such as group discussion used in the classroom can and do make the difference to students' self-efficacy (Fend & Scheel, 2005). Group discussion makes possible a supportive social environment which is in agreement with human constructivist position, it was thus considered in this study as the experimental treatment.

Human constructivism is thought to be better promoted by including an affective factor which is socio-cognitive in nature and self-efficacy provides a unique combination as evidenced from literature (Crippen & Earl, 2007; Duit & Treagust, 2003; Koballa & Glynn, 2007; Lawson, Banks, & Logvin, 2007). Self-efficacy is a self-belief construct that deals with the

perception that one is capable of doing what is necessary to reach one's goals in terms of knowing what to do and being emotionally able to do it (Pajares & Schunk, 2001). Self-efficacy influences how students approach a task such as problem-solving, the amount of effort they exert, and their levels of persistence all of which influences students' performance (Crippen & Earl, 2007).

Zusho, Pintrich, and Coppolla (2003) noted that even after controlling for prior achievement, students' chemistry self-efficacy was the best predictor of their grades in an introductory college chemistry course. Self-efficacy is hinged on social-cognitive theory (Bandura, 1986, 2001). The theory emphasizes how cognitive, behavioural, and environmental factors interact to determine motivation and behaviours (Crothers, Hughes, & Morine, 2008). The basic principle behind self-efficacy theory is that individuals are more likely to engage in activities for which they have high self-efficacy and less likely to engage in those they do not (Van der Bijl & Shortridge-Baggett, 2002).

Chemical equilibrium has been regarded as a concept that poses learning difficulties for chemistry students as evidenced by the fact that they do experience misconceptions (Justi, 2002; van Driel, 2002). It is a concept that integrates many terms that appear abstract. It is also effectively linked to other concepts in chemistry such as rate of chemical reaction and chemical thermodynamics which are considered difficult (Cakmakci, Leach, & Donnely, 2006; Goedhart & Kaper, 2002; Sozbilir, 2003; van Driel, 2002). Based on these facts, chemical equilibrium was chosen as the topic to be experimented.

The Problem

Human constructivism based instruction may be a conceptual change intervention. It is a strategy that is capable of

simplifying perceived difficult concepts as well as facilitating the construction of meaning from students' conceptions to scientific concepts. Chemical equilibrium concept seems not to be properly understood probably because the relatedness among the three representations of chemistry namely – microscopic, macroscopic, and symbolic – seems to be elusive to the students thus limiting their understanding and preventing conceptual change. Consequently, students are unable to apply knowledge in novel ways as well as construct scientific meanings of concepts thus leading to misconceptions which cannot be easily corrected using strategies that are not constructivist in nature. It is against this background that the study investigated students' knowledge restructuring in chemical equilibrium tasks and the various multiple pathways to the understanding of chemical equilibrium.

Research Questions

1. What are the various misconceptions observed in students before and after exposure to treatment in chemical equilibrium tasks?
2. What are the conceptual pathways observed among the students after exposure to treatment?

Hypothesis

1. There will be no significant main effect of treatment on (a) students' conceptual change in chemical equilibrium and (b) students' chemistry self-efficacy.

Methodology

The study adopted a mixed method design. Quantitative design was first employed using pretest-posttest quasi-experimental design while the qualitative design used case study. The population for the study was all the senior secondary schools (SSS) II students in Ibadan, Nigeria. Random

sampling technique was used in selecting four schools. Schools were randomly assigned to treatment and control groups; two experimental schools and two control schools were used. A total of 244 students participated in the study for the quantitative part. Twenty-four students were purposively selected to participate in the qualitative aspect of the study which was an individual interview with both the control and experimental groups. Based on their performances on the chemistry test, twelve high achievers and twelve low achievers were selected. The questions selected for the interview were based on that which had been assessed in the test in which students demonstrated high level of misconception.

Two instruments were used for this study. The first instrument was Chemical Equilibrium Conceptual Change Test (CECCT). The test consists of four conceptual open ended test items derived from concepts in chemical equilibrium. The instrument was content validated and the reliability determination was ascertained using test-retest measurement over a period of two weeks, and it gave a value of 0.824. Inter-scorer reliability was estimated using Pearson correlation moment coefficient, and it indicated a value of 0.894. Varying paths observed during the process of students' development in the restructuring of knowledge from existing conceptions to scientific conception in conceptual change research is termed conceptual pathways. This can vary from two to seven pathways depending on specific features being sought out (Adadan, Trundle & Irving 2010; Duit & Treagust, 2003). The assessment for chemical equilibrium tasks used to determine conceptual pathways was based on adapted format of Claesgens (2007) criterion referenced format of 15-point scale. However, this was a 25-point scale in which 1-5 marks represent notion, 6-10 marks represent recognition, 11-15 marks represent formulation, 16-20 marks

represent construction, and 21-25 marks represent generation. The second instrument was Chemistry Self-Efficacy Scale (CSES). It is an instrument which indicates confidence of self-adjustment of students in problem solving tasks and achieving excellence in chemistry. This was developed by the researchers; the construct was established using factor analysis, and it consists of twelve items on chemistry self-efficacy. There are four response formats in CSES. It was validated using Cronbach alpha, and it gave a value of 0.893. (See Appendix).

Data were analyzed quantitatively and qualitatively. Quantitative data were analyzed using frequency count, percentages, t-test, and Cohen's d to estimate the effect size. Categorization of respondents for each of the questions was ensured by using their register number to identify them. Thereafter, similar responses were grouped into categories and given a name. The total number of students in each category was such that * represented few participants comprising 1-3 people, ** represented some participants comprising 4-6 people while *** represented many participants comprising above 6 people.

Group discussion technique of small group with the essential features of human constructivism was used. It is a group activity carried out by participating individuals based on exchange of ideas on chemical equilibrium. The facilitator, who is the teacher, provided the objectives of the discussion. One of the members acts as moderator. Prior knowledge is activated; individuals in the group give their contribution; students reason together to build theories and arrive at shared understanding of the topic. Students were assigned into groups of four. Teachers were trained in the use of human constructivism based group discussion intervention. Lesson plans were written

and used during the training. The procedures employed are stated as follows:

- Pretest was given to ascertain students' prior knowledge of chemical equilibrium tasks in order to establish existence of misconceptions.
- Misconceptions in the pretest were made explicit to the students before the intervention.
- Subsumption represents the initial stage in the conceptual change intervention strategy. This is an attempt by the chemistry teacher to create cognitive dissonance between an existing conception and the scientific conception. The scientific conception provided to the student was such that it was fruitful, plausible and intelligible. When the new learning is accommodated under an existing cognitive structure, the pre-conception does not need a serious fundamental restructuring.
- Super-ordinate learning is the next cognitive process brought about by instructional strategy in which the preconception has undergone serious and radical fundamental restructuring such that the new learning has completely displaced or subsume the original conception in the cognitive schema. This cognitive process occurs only when fundamental and radical restructuring has taken place in the learner.
- Progressive differentiation is a follow-up on subsumption and super-ordinate learning. It seeks for elaboration and clarification of concept meanings in

chemical equilibrium. Application of the new knowledge on the part of the students could be assessed at this level.

- Integrative reconciliation is the last cognitive process which attempts to delineate similarities and/or differences between concept structures. Application of the new knowledge is still emphasized as well as encouraging students to reflect on the new learning. Reflection on new learning entails evaluating what they have learnt as well as thinking of novel ways to which the new knowledge could be put to.
- Post-test was then administered to the students based on the same tasks on chemical equilibrium.

Students' role in the intervention group was such that they reacted to the facilitator's (teacher) attempt at eliciting their prior knowledge. They also executed the strategies given to them, applied the new knowledge and embarked on thoughtful reflection on what they had been taught. The intervention lasted for four weeks. Students in the control group were not exposed to any special intervention package. They were treated to the conventional classroom practices existing in the schools.

Results and Discussion

Research Question 1

What are the various alternative conceptions observed in students before and after exposure to treatment in chemical equilibrium tasks?

Table 1
Frequency Counts and Percentages of Alternative Conceptions Before and After Treatment

Test Item No.	Experimental (N=124) Frequency (%)	Control (N=120) Frequency (%)	Total (N=244) Frequency (%)
Before			
1(i)	76 (61.3%)	65 (54.2%)	141 (57.8%)
1(ii)	64 (51.6%)	66 (55.0%)	130 (53.3%)
2	41 (33.1%)	56 (46.7%)	97 (39.8%)
3	62 (50.0%)	60 (50.0%)	122 (50.0%)
4	46 (37.1%)	31 (25.8%)	77(31.6%)
After			
1(i)	12 (9.7%)	50 (41.7%)	
1(ii)	9 (7.3%)	44 (36.7%)	
2	5 (4.0%)	32 (26.7%)	
3	11 (8.9%)	49 (40.8%)	
4	10 (8.1%)	28 (23.3%)	

Note: Misconception is exhibited for a particular item when above 40.0% of the number of students did not exhibit scientific conception.

Table 1 shows percentage of students who exhibited misconceptions in item 1(i&ii) as well as question 3. The students were unable to correctly apply Le Chatelier's principle to constraints of temperature and pressure. Before the intervention, 57.8% of the students were unable to give scientific conception to the application of Le Chatelier's principle to chemical systems under the constraint of temperature. Similarly, 53.3% were unable to give scientific conception to the application of Le Chatelier's principle under the constraint of pressure. In the same vein, 50.0% of the students were unable to explain whether hydrolysis (test item 3) will occur in chemical systems. Table 1 also shows that human constructivism based group discussion learning strategy was effective in reducing the number of alternative conceptions in the experimental group. There was also a reduction in the number of misconceptions in the control

group, but the percentage of misconceptions in the experimental group was below 10.0% ranging between 4.0% and 9.7% in all the questions after treatment. This shows the efficacy of human constructivism based group discussion learning strategy. Nevertheless, it was still not possible to record no alternative conception in at least one of the conceptual test items, and this confirms the resistant nature of alternative conceptions which are sometimes very difficult to get rid of (Mintzes & Wandersee, 2005). This is because the students' worldviews of that task might have been engrained in their memory even when they seem to have accepted it; some still go back to their former way of thinking. In order to show the categories of misconceptions, interviews were carried out in the experimental and control groups to know their exact views on the tasks given to them, and this is captured in Table 2

Table 2
Qualitative Analyses of Categories of Responses After Treatment

Test item number	Concept	Category	Exp. (N=12)	Control (N=12)
1 (i)	Application of Le Chatelier's Principle for temperature	(i) No attempt (A1)	Nil	*
		(ii) Equilibrium position shifts to the right (A2)	***	**
		(iii) Equilibrium position shifts to the left (A3)	*	**
		(iv) Equilibrium position is neutral (A4)	Nil	*
Misconception status			*	***
1 (ii)	Application of Le Chatelier's Principle for pressure	(i) No attempt (B1)	Nil	*
		(ii) Equilibrium position shifts to the right (B2)	***	**
		(iii) Equilibrium position shifts to the left (B3)	*	***
		(iv) Equilibrium position is neutral (B4)	Nil	Nil
Misconception status			*	***
2	Applying hydrolysis to chemical systems	(i) No attempt	Nil	Nil
		(ii) Hydrolysis occurs and the solution is neutral	***	**
		(iii) Hydrolysis occurs and the solution is acidic	*	*
		(iv) Hydrolysis occurs and the solution is alkaline	*	*
		(v) Hydrolysis does not occur	Nil	*
Misconception status			*	**

Key: (*) FP, few participants (1-3 people)
 (***) SP, some participants (4-6 people)
 (***) MP, many participants (more than 6 people)

With regard to item 1(i) and 1(ii) as shown on Table 2, few participants demonstrated misconceptions when they were asked individually in interview in the experimental group while many participants demonstrated alternative conceptions when they were asked individually in control group. With regard to item no. 3, few participants demonstrated alternative conceptions in the experimental group while some participants demonstrated this in the control group.

It clearly shows that concepts in chemical equilibrium are not well understood by the students and it is a confirmation of findings in research literature of chemical equilibrium which has been regarded as a

concept that poses learning difficulties for students (Justi, 2002; van Driel, 2002). Experiences in this study also reveal that when alphabets are used to represent chemical substances, students find it hard to make connections with the real chemical substances that they are familiar with and as such it is evident that conceptual understanding is lacking. Thus, meaningful learning is inhibited. In exposition of meaningful learning, Okebukola (2012) noted that meaningful learning is best described by contrasting it with its diverse-rote learning. This is because the arrangement of both rote and meaningful learning takes different turns in humans' cognitive structure. Meaningful learning occurs when concepts can be linked to a similar concept, when it

can be correlated, when it can be applied and when it can generate new ideas. On the other hand, rote learning is anchored on knowledge that are isolated which are not relatable, which cannot be spontaneously constructed when given a similar task and is very prone to forgetfulness. Thus, it is difficult for such

knowledge to be integrated into students' cognitive structure

Research Question 2

What are the conceptual pathways observed among the students after exposure to treatment?

Table 3

Frequency Counts and Percentages of Conceptual Pathways After Treatment

S/N	Conceptual Pathways	Group Discussion Frequency (%) (N = 124)	Control (N=120) Frequency (%) (N = 120)	Total Frequency (%) (N = 244)
1	Notion	0 (0.0%)	0 (0.0%)	0 (0.0%)
2	Recognition	18 (14.5%)	86 (71.7%)	104 (46.6%)
3	Formulation	70 (56.5%)	34 (28.3%)	104 (46.6%)
4	Construction	36 (29.0%)	0 (0.0%)	36 (14.8%)
5	Generation	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total		124	120	244

Percentage is in parentheses

Table 3 shows that there were no students in the notion group for both experimental group and the control group. There were more students in the recognition pathway in the control group than in the group discussion. A total of 104 students were in the recognition pathway out of which 82.7% were in the control group. There were more students in the formulation pathway in the experimental group (group discussion) than in the control group. In the same vein, 104 students were in the formulation pathway out of which 67.3% were in the experimental group. There were no students in the construction group for the control group with all the 36 students from the experimental group. This implies that human constructivism group discussion learning strategy was effective in bringing about reconstruction of knowledge and facilitating conceptual change by ensuring that students were

found in the higher conceptual pathway. Using this form of assessment procedure though on a 15-point scale, Claesgens (2007) was able to show that it enabled tracking of conceptual change pathways over time. In addition, high school students were found to be moving from a "notions" perspective based on macroscopic view of matter and real-world knowledge rather than a particulate view – toward simple normative models of chemistry that describe and explain matter at a particulate level.

Hypotheses

There will be no significant main effect of treatment on (a) students' conceptual change in chemical equilibrium asks in chemistry, and (b) students' chemistry self-efficacy

Table 4

T-test Table of Conceptual Change and Chemistry Self-Efficacy in Experimental and Control Groups (Before and After Treatment)

	Treatment	N	Mean		Mean		Mean Gain	df	t	Sig.	Cohen's d
			Pre-test	SD	Post-test	SD					
Conceptual Change Scores	Group Discussion	124	8.13	2.32	15.89	2.71	7.76	242	14.32	0.00	2.26
	Control	120	8.64	2.64	10.38	2.16	1.74				
Chemistry Self-efficacy Scores	Group Discussion	124	36.57	5.34	41.67	2.85	5.10	242	11.40	0.00	1.46
	Control	120	36.64	5.00	37.88	2.61	1.24				

Table 4 shows that there was a significant main effect of treatment on students' conceptual change ($t=14.32$, $df: 242$, $p=.00$, $d=2.26$). Cohen's d was used to determine the effect size of the treatment and was found to be of great effect. An effect is small when it is less than 0.5, it is moderate when it is between 0.5 and 0.8, and it is considered great when it exceeds 0.8 (Cohen, Menion, & Morrison, 1997). Similarly, Table 4 also shows that there was a significant main effect of treatment on chemistry self-efficacy of students ($t=11.40$, $df: 142$, $p=.00$, $d=1.46$). Cohen's d value also indicates that the effect size of the treatment was great.

The study has shown the potency of human constructivism based group discussion learning strategy on students' conceptual change in chemistry. The strategy of human constructivism using group discussion was achievable based on a number of factors. First, it was based on well conceive cognitive processes incorporating four elements of constructivist studies as well as four cognitive processes situated in human constructivist model (Baviskar, Hartle, & Whitney, 2009; Novak, 1993). Second, it does not put undue pressure on sudden insight into the process of knowledge restructuring as it contest that it could either be sudden or gradual as opposed to sudden insight of radical constructivism (Von Glaserfield, 1992). In the same vein,

it can be seen that the effect of the treatment is also great on another socio-cognitive variable called self-efficacy. The finding of this study corroborates the assertion of Fend and Scheel (2005) who observed that strategies which are conceived in groups has a dual advantage of improving the academic performance of students as well as boosting their self-efficacy.

Conclusion and Implication

The study sought to rethink the conceptual change model using human constructivism based group discussion learning strategy that combines well-conceived cognitive processes as well as social interactions to foster conceptual change in chemical equilibrium tasks. Alternative conceptions were found in aspects that applied the use of Le Chatelier's principle in explaining what happens to a chemical system in equilibrium. Human constructivism based group discussion learning strategy had more students in the higher knowledge restructuring pathway of formulation and construction as compared to the control group that had more students in the not well ordered knowledge restructuring of chemical equilibrium concepts.

Also, treatment was significant for students' conceptual change in chemistry as well as their chemistry self-efficacy. Group discussion learning strategy based

on human constructivism proved greatly effective in fostering conceptual change as well as boosting the chemistry self-efficacy of the students. The information in this study is highly valuable for instructional practices in the teaching of concepts in chemical equilibrium in specific as well as chemistry in general and provides a basis for rethinking the conceptual change model from the

monistic view (one-sided view) to views that combines a cognitive and affective factor. Though this conceptual change model may be a bit time consuming, it ensures that meaningful learning is fostered as it is capable of bringing about worthwhile knowledge restructuring and conceptual understanding.

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APPENDIX

Chemistry Self Efficacy Scale (CSES)

The aim of this study is to ascertain students' chemistry self-efficacy. Kindly fill this questionnaire with utmost sincerity and honesty. The information supplied shall be treated as confidential.

SECTION A

Please indicate in the appropriate column for your personal information

Name of School: _____ No in the class register-----

Sex: Male () Female ()

SECTION B

Please tick () in the appropriate column for each of the following statements to indicate your choice towards the statement.

VGE = To a Very Great Extent

GE = To a Great Extent

ME = To a Moderate Extent

LE = To a Little Extent

S/N	STATEMENT OF ITEMS	VGE	GE	ME	LE
1	When faced with a challenge in practical chemistry, I am confident that I can adjust and re-manipulate the apparatus more effectively.				
2	Motivating myself in choosing a career in chemistry is a thing I am confident I can achieve				
3	When I have a difficulty in solving a chemistry problem, I am very sure that I can refocus and solve it painstakingly				
4	When some of the skills require to learn practical chemistry are inadequate, I am confident that I can re-learn it effectively				
5	If I experience a laboratory accident, I am certain that I can always motivate myself to overcome such experience to achieve excellence				
6	If I am not contributing much to a group work in chemistry, I am very sure of myself that I can refocus and contribute more meaningfully.				
7	When my performance in chemistry is low, I am confident that I can re-plan to boost my morale leading to an improved performance				
8	I am confident that I can solve most of my assignment questions in chemistry without being assisted				
9	Becoming an effective problem solver in chemistry is a thing I am sure that I can orientate myself towards.				
10	When solutions to a problem in chemistry seems hard to come by, I am sure that I can put in a better effort to bring about appropriate solution				
11	Ways of improving upon the quantitative aspects of chemistry is a thing I am very certain I can achieve.				
12	Application of chemistry concepts to real life situations is a thing I am confident of doing.				

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USE OF VIRTUAL LEARNING ENVIRONMENTS AT PARO COLLEGE OF EDUCATION (BHUTAN)

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Abstract: *Virtual Learning Environment (VLE) has brought some positive changes in the 21st century classroom practices. Today many educational institutions use VLE to provide rich and positive experiences to both learners and teachers. With an aim to provide quality instruction and rich learning experiences to the student teachers, Paro College of Education in Bhutan instituted the VLE system in 2007. Lecturers and system administrators were trained through a series of workshops, and student teachers were familiarized by the IT lecturers to use the system. Despite these measures, the VLE has not been optimally used to supplement classroom teaching and learning. Therefore, this paper examines a variety of determinants that influence implementation of VLE at the Paro College of Education.*

Key words: virtual learning environment (VLE), pre-service teachers, distance teaching

Introduction

Paro College of Education is a teacher training college in Bhutan. Its primary focus is training primary teachers. The college installed a Virtual Learning Environment (VLE) in 2007 with support from STEP (Secondary Teacher Education Project) and MoE (Ministry of Education) to assist teacher training programs.

VLE is an online education platform facilitating both teachers and students to have easy and flexible online communication in teaching and learning. The VLE that the college uses has useful features such as chat, discussion forum, grades, blog, quiz, questionnaire, sharable content object reference model (SCORM) activities, survey, feedback, upload files, and tracing performance of students.

Lecturers were given hands-on workshops at the initial stage of the implementation of VLE, and student teachers were oriented through a functional information technology module which is compulsory across the programs. Although, VLE system was instituted in 2007, it has not made substantial impact on the teaching learning processes. The statistics and log

of VLE reveal that only 29 modules were active out of 62 modules offered in the spring semester of 2013, which is only 46.8%. The modules on the VLE are at various levels. Some modules are well structured and many with minimum information. Thus, the author is interested to study the cause of ineffective use of VLE at Paro College of Education.

VLE is new to the Royal University of Bhutan (RUB), and there is limited study done on it. This paper focuses on the moodle from the open source as platform for the VLE. This paper will hopefully provide basis for further study in the use of VLE at the colleges of RUB.

Literature Review

In the 21st century, education should prepare learners to be global citizens and for this, they need life and career skills, learning and innovation skills, and information, media and technology skills (Kennedy, 2010). Students need more active and independent learning. To address this type of learning, teachers need to give more guidance than teaching by telling. Teachers must cultivate the 21st century learning environment. The North

American Council for Online Learning (NACOL) and the Partnership for 21st Century Skills (2006) proposed that virtual learning has the potential to be the 21st century learning environment. This structure creates better environment for the learners where their creativity and innovation is enhanced. However, one thing teachers must be aware of, is that no technology used in teaching and learning has intrinsic educational value in itself. It all depends on how courses and activities are designed and delivered which can add value and increase effectiveness (O’Leary, n.d.).

Kennedy (2010) rightly pointed out that “classes with online learning (whether taught completely or blended) on average produce strong student learning outcomes than do classes with solely face-to-face instruction” (p. 5). VLE can offer more structured independent learning and flexibility of time and space. These features of VLE are particularly beneficial to students as they can study at their own pace. Further in teacher education, this allows the student teachers to personalize learning by revisiting the materials used by their lecturers in the classrooms and study upcoming materials.

VLE can also improve the collaboration and make easy access to the audio, video, and text materials. Learners who are not able to attend the classes can access resources uploaded by the lecturers on the VLE. Additional features such as assessment, tracking functionalities, web-links, synchronous and asynchronous discussion make VLE a legitimate tool for the 21st century learning. However, teachers on the other hand, find it difficult to use this technology to their advantage.

Some teachers have a notion that using computer and projector to project lesson in

the classroom is integration of technology, which is not true. According to Pisapia (1994), the use of learning technology to introduce, reinforce, supplement, and extend the skills of the learners is considered as integration of technology in teaching and learning. Dias (1999) further supports that use of technology seemingly as part of the daily learning process is known as integration of technology. This calls for an educator to have profound understanding on how to use technology in education and how it might affect the complex learning process within and outside the classroom (Chee & Wong, 2003). Learning with technology has greater impact on the achievement level of the students.

Kulik (as cited in Schacter, 1999) stated that, “students like their classes more and develop more positive attitudes when their classes include computer-based instruction” (p. 4). Sivin-Kachala (cited in Scacter, 1999) further stated that “students in technology rich environment experience positive achievement in all major subject areas. Students’ attitudes towards learning and their own self-concept improved consistently when computers were used for instruction.”(p. 5). This finding holds true as the student will get an opportunity to understand the concept and situation better with the help of technology. Thus, technology is deemed necessary in teaching and learning paradigm to improve the accessibility to instructions and materials providing quality education. However, one should not perceive that technology has all the advantages. It is worth mentioning the perceived advantages and disadvantages of VLE as proposed by O’Leary (n.d.) in Table 1.

Table 1
Advantages and Disadvantages of VLE System in Education

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easy online delivery of materials. • Easy to use for both students and lecturers. • Widens student access on and off campus to learning materials and resources. • Offers flexible support for educators who do not need to be in a fixed time or place to support and communicate with students. • Has the potential for new ways of learning and teaching such as active and independent learning which make use of online communication, online assessment and collaborative learning 	<ul style="list-style-type: none"> • Can become a ‘dumping ground’ for materials not designed to be delivered online. • Copyright of materials need to be considered. • Off campus access to hardware and networks can be problematic for both students and educators and raises issues of equality. • Need to plan online support carefully to avoid overload. • Such independent learning still needs to be guided and supported. Appropriate training and ongoing support is still needed for both students and educators.

Research Questions

The status of VLE at Paro College of Education is not very encouraging in terms of usage. Almost all the modules are offered focusing more on face-to-face mode and little is done with the integration of VLE in teaching and learning. The intent of this paper is to study the implementation of VLE at the Paro College of Education with special reference to the following areas:

1. How do lecturers perceive VLE in teaching and learning?
2. What obstructs the lecturers in integrating VLE in their teaching and learning?
3. How competent are the lecturers in technical and pedagogical aspect of using VLE in teaching and learning?
4. What can the college do to make effective use of VLE?

Study Approach

The study used mixed method with sequential research design because of the nature of study which requires both qualitative and quantitative data. The author used this approach as the “overall strength of study is greater than either qualitative or quantitative” mode of research (Creswell, 2009). The participants’ consent was sought via letter.

The purpose of the study and maintaining the anonymity of the participants were also intimidated through letter. The author has presented the data in its true form without manipulation.

Survey questionnaire and semi-structured interviews were the tools used to collect data. The survey questionnaire was piloted and redesigned as per the feedback before the actual implementation. The survey was conducted with 170 (90 female and 80 male) student teachers from year one through four and 44 (12 female and 32 male) lecturers for quantitative data. Semi-structured interviews were conducted randomly with student teachers and lecturers for qualitative data. The VLE log and statistics of semester I, 2013, were also examined to strengthen the findings.

The findings of this paper may not be generalized on a broader scale as the data sample is small for such a claim. However, certain issues can be taken for future studies.

Findings and Discussion

Lecturers’ Perception on Use of VLE

It is encouraging to note that 72.7% (see Table 2) of the lecturers have a positive thought on the use of VLE in teaching and

learning, and 65.9% (see Table 2) are using for pre-service student teachers. This is a clear indication that there is positive attitude amongst majority of the lecturers in using technology to support teaching and learning. The college should bank on this positive note and take appropriate measures to use VLE system effectively before it is too late. Once this enthusiasm dies off, it will be very difficult to revive. There are also some lecturers (25%, see Table 2) who do not use VLE at all. When I asked this group of lecturers, they said “VLE is good for teaching and learning but due to our poor IT skills, we are not very confident in delivering our subjects through VLE.” For the effective implementation of the VLE, the college needs to raise the level of ICT skills of the lecturers.

Obstacles in VLE Integration

The ICT facility is one of the barriers for the effective use of VLE at Paro College

of Education. The slow internet connectivity and old computers are often a source of problems which are internationally identified barriers to ICT integration (Pelgrum, 2001). Lecturers said that the Internet connectivity is slow (52.3%, see Table 2), and they found it time consuming and at times frustrating to upload materials for their student teachers. One-fourth of the student teacher interviewees said, “Internet is slow and sometimes we go to lecturers to get the materials with our thumb drive.” Some student teachers expressed that limited number of working computers in the labs and poor Internet connection in the hostels are some impeding factors to use VLE. However, in an effort to enhance the use of VLE, the college management has provided new laptop each to all the lecturers and Internet connectivity was increased from 3mbps to 10mbps. This is one of the measures taken by college management to enhance the use of VLE.

Table 2
Responses by Lecturers to Questions Posed

	Strongly agree	Agree	No Comment	Disagree	Strongly disagree
I feel VLE is useful in supporting teaching and learning.	29.5%	43.2%	9.1%	6.8%	6.8%
I use VLE for my pre-service teachers.	40.9%	25.0%	9.1%	6.8%	18.2%
Internet speed is good enough to use VLE.	4.6%	15.9%	27.3%	31.8%	20.4%
I find it difficult to use VLE in my teaching.	11.3%	27.3%	20.5%	25.0%	15.9%
I need some training in the technical areas of VLE.	33.3%	30.3%	19.3%	13.8%	3.3%
I get required support from IT staff to use VLE.	16.1%	37.4%	27.9%	15.8%	2.8%

Lecturers’ Technology and Pedagogy Know-how on the Use of VLE

Lecturers’ knowledge on the use of VLE is another issue to consider. Although, 72.7% (Table 2) of lecturers use VLE, they are

not confident. They lack technical and pedagogical knowledge of VLE integration. Lecturers agree (38.6%, Table 2) that they find it difficult to use VLE and 63.6% (Table 2) lack pedagogical know-how of integrating VLE in their teaching

and learning. This is an important issue for the college to address. To use VLE effectively, lecturers need a different set of skills and pedagogy in using technology in teaching and learning because mirroring traditional didactic approaches (Stiles, 2000) in technology mediated classroom is likely to be less effective. Barajas et al. (2002) rightly pointed out that, “teaching using VLEs needs technological and organizational competency and new skills in applying relevant didactical methods, new strategies for teaching/tutoring and moderating/facilitating” (p. 9). A 40.9% (Table 2) of the lecturers disagree on the difficulty issue, which is quite high. The study on the VLE log shows that VLE is used as a repository to uploading semester plans, a few lesson notes, and assignments. The training conducted in the beginning of the implementation of VLE was more on technical aspect. The interviews with the lecturers suggest subject specific training with more emphasis on the pedagogical aspect would be more helpful to integrate technology in teaching and learning.

The student teachers (70.8%, Table 3) agree that lecturers use interactive materials in the VLE. However, this is proved otherwise. Only 4.5% of the lecturers use quizzes, 2.3% use SCORM activities, 20.4% do not use any of the features mentioned, and 54.4% only upload assignments (Table 4). The claim is further consolidated when half of the lecturers interviewed said, “We only upload reading materials and semester plan in VLE for student teachers.” The other interesting and encouraging finding is that female lecturers use at least three VLE features, and male lecturers use only two (Table 4). However, in general, lecturers using interactive material to enhance learning are far less than expected. During the interviews, some lecturers strongly expressed that, “if we can create interactive materials to give concept or extended learning activities, our teaching will be productive.”

Table 3
Response from Student Teachers

	Strongly agree	Agree	No Comment	Disagree	Strongly disagree
My lecturer uploads interactive materials on VLE.	32.5%	38.3%	22.1%	5.8%	1.3%

Table 4
Use of VLE Features by the Lecturers

Which feature do you use the most?	Discussion forum	Assignments	Grade book	Quizzes	SCORM	Question bank	None of these features
Reported by % totals	7.0%	54.4%	9.0%	4.5%	2.3%	2.3%	20.4%
Reported by gender in raw numbers	F-0 M-2	F-10 M-7	F-2 M-0	F-1 M-0			F-4 M-3

One possible measure to encourage lecturers using VLE to supplement face-to-face teaching is by sharing the good and

exemplary work done by other lecturers in VLE. The author strongly feels that the college may put the system in place where

VLE is inextricably linked with curriculum and assessment (Freeman, Holmes, & Tangney, 2001). This may be done for the larger interest of the student teachers, or else the use of VLE will remain status quo. With the growing number of distance learners, lecturers need to put extra effort and time to include discussion forum, SCORM activities, quizzes and making links to other useful and relevant sites. Distance learners will not benefit much if the lecturers continue to use VLE as a repository.

Support from the College Administration

According to the survey, lecturers (53.5%, Table 2) get required support from the management in using VLE. Technical staff and ICT lecturers provide help in using VLE to the lecturers as and when they need. It is also alarming to note that 27.9% had no comment, and 18.6% (Table 2) of the respondents do not agree on this issue. During the focus group interview, they clarified that they do not use VLE much and when they face problem, they do not seek help and drop the idea as a whole. To address this issue, the college may institute proper support system to provide help on time.

The college has included one professional development (PD) program on the use of VLE in the college academic calendar 2013. The author feels that one PD is not enough to address the two major issues: technical and pedagogical aspects of VLE integration. IT lecturers have a plan to mentor lecturers (two lecturers per IT lecturer per semester) in setting up their VLE materials including the delivery. The college may also consider conducting VLE refresher workshop during the planning period of each semester until the lecturers

are competent in using VLE.

Conclusion

Paro College of Education has instituted VLE system to provide enriching experiences in teaching and learning paradigm. Lecturers and VLE administrators were trained through various in-house workshops. ICT lecturers were trained to handle VLE by experts from Colombo University of Computing, Sri Lanka. However, lecturers have not used VLE optimally and as a result there is no substantial impact on the process of teaching and learning.

The study suggests the college address the following issues to make optimal use of VLE:

1. Adequate ICT facilities should be put in place;
2. More PDs may be conducted for lecturers to equip them with technical and pedagogical aspect of using VLE;
3. Some PDs should be on developing interactive material; and
4. Proper support system should be instituted to help lecturers in using VLE.

Some measures are put in place such as increasing Internet connectivity, providing new hardware to lecturers, mentoring lecturers who need help, and replacing old computers in the labs. There is much more to be done especially in the pedagogical aspect of using VLE and developing interactive materials. The ICT skills of lecturers must also be enhanced as O'Leary (n.d.) in her article rightly said creating online "resources that are stimulating, appealing, easy to use and educationally sound is time consuming and requires considerable expertise" (p. 1).

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THE ENTAILMENT OF CULTURAL VALUES IN EDUCATION AND THE PROBLEM OF NATIONAL IDENTITY AND DEVELOPMENT IN NIGERIA

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Abstract: *This paper argues that cultural values are essential ingredients in the ‘business’ of education. It is argued that beyond economic, scientific, and technological relevance of education, the paper insists that the cultural values of the society must be necessarily entailed in such education. The paper posits that the present practice of education in Nigeria has failed to be cognizant of cultural inputs. As such, the present education is modeled more to fit western culture. This trend, we argue, promotes not only individualistic and materialistic lifestyles, it seriously undermines efforts at development. Like Huntington and Harrison we argue that culture matters in the matrix of education. To redress the trend, we argue that teacher education needed to chart a new course in exposing pupils to positive traditional and western values that can mitigate the current orientation.*

Key words: Nigeria, culture, education, cultural values

Introduction

At the outset of colonial rule in Nigeria like many other African countries, the missionaries and other colonial agents ensured a denigration of anything African as fetish, barbaric, and backward; as such, all that is African must be destroyed. It is only after this that Africans can be shown and directed in the path of what properly constitute humanity. The utterances of Western philosophers, scholars, and politicians were instructive in this regard. At the end of the colonial rule, Europe succeeded in brainwashing Africans to believing that nothing is worth preserving in its culture. To this extent, Nigerian education, like most other African countries, is solely patterned along Western type with no cognizance of African cultural values. In lamenting this, we posit that the European colonizer, knowing the supreme importance of culture and fearing the threat posed by men with confidence in their own past and heritage, made the conquest both a political and mental one. Hence the energy dissipated on the fact that Africa had no valid past after having taken away the material base and systematically

dismantled the socio-political and economic structures on which Africa had built its way of life.

This trend also affected the education of Africans. In the beginning the colonial masters and their agents got Africans educated purely for economic purposes and religion to convert them from their ‘fetish’ way of life. Hence Nigerians became educated away from their environment. In the words of Ekeh as cited by Ogbogbo (1999), “the colonial period is unmatched in our history in the growth and development of institutions, constructs and social processes. The moral and social order which formerly encased the pre-colonial indigenous institutions is burst by the social forces of colonialism....” As such Nigeria education and the society remain in a limbo of cultural confusion, social incoherence, and moral purposelessness. This unfortunate situation made Thairu (1975) to assert that:

The self-conscious educated African boasts of African values but denounces them most openly by his mode of life. He knows *what* he would like to be, but does not know *how* because his

intellectual master, the pink man, has not yet told him how.

It is in line with this Ologbenla (2007), in his own analysis of the government's futile developmental efforts and social problems besetting African countries especially Nigeria, identified lack of honest leadership, government control of the economy, economic adversity, and ethnic loyalties as a bane. While scholars like Wraith and Simpkins (2011) argued that the problems lie in the failure to develop a strong moral sense from our cultural environment in present day society. By implication, the non-incorporation of our cultural values and norms into our educational system informs the rupture in social vices.

A case in point is a perusal of Nigeria's National Policy on Education (2004) which shows a big gap between knowledge acquisition and moral value: the relegation of values that can properly be said to sustain African societies. African scholars like Fafunwa (2004), Obanya (2007), and Osokoya (2008) have separately argued that education in Africa is fundamentally functional and all encompassing. According to Fafunwa (2004), education in Nigeria like in other parts of Africa had been in existence before the advent of the West and the eventual escapades of slave trade and colonialism. Fafunwa insists that the West's impression at this time that Africa was a dark continent without an iota of education was untrue. As such, Western brand of education which was introduced so as to make Africans think and act in the same way a white man will do was a ploy to kill anything African. As such when colonies in the Third World started agitating and clamouring for political independence in the late 1950s and 1960s, political pundits of the West argued and demonstrated to the world that newly independent African nations could sustain development if they adopted Western

strategies. Two of the strategies, the *human capital* and *modernization* theories became so attractive.

Unfortunately, the Nigerian nation began to place much emphasis on education as a vehicle for modernization and socio-economic development. The inherited western conception of education ignored the cultural matrix embedded in education. Education was tied solely to the drive for economic development and technocratic visions of societal reconstruction. Ironically, the ignored African cultural factor can be likened to the internal mechanism which is central to proper functioning of a machine. Imposition of the western category to utter neglect of African cultural imperatives has so far continued to affect the desired development earnestly craved.

Interestingly, Nigerian political leaders have tenaciously strived, despite changes in political and economic environments, to invest in education with the same western mindset. There is a belief that such an investment will generate direct benefits to the state by providing the necessary high-level manpower and carrying out development-oriented research. Investment in higher education would also in many ways serve the needs of society by rendering various services and advice to policy-makers. Because the movement to expand educational opportunities in the developing world especially in Nigeria was strongly tied to socio-economic development, education remains an area in which Nigeria maintain a strong commitment although it continues to fail to produce the desired results. In Nigeria, like many other African countries, industrialization, modernization, secularization, economic growth, employment creation, import substitution, social engineering, manpower development, and so on, were the key slogans that dominated the higher education scheme that began after

independence. African development was then conceived as an attempt to come up to the living standards of more industrialized countries by adopting development methods used in those countries while abandoning the cultural and values aspects of it.

However, the fact is that education for development cannot divorce itself from its cultural imperatives. Huntington and Harrison (2000), quoting Daniel Patrick Moynihan, argue that the place of culture in human affairs cannot be overemphasized. In the words of Moynihan, “the central conservative truth is that it is culture, not politics that determines the success of a society” (Huntington & Harrison).

Despite the many efforts made by the Nigerian government to invest in education and to bridge the development gap between it and some African nations on the one hand and other advanced industrialised world on the other hand, their investment remains unproductive to national development. In other words, while increasing expenditure on education to provide essential infrastructures for national development, education has threatened national development to an unprecedented degree. For example, the type of education bequeathed to Africa by colonialism has only succeeded in producing new educated elites who have been educated away from their environments and culture. The educated elites, especially among the political class revel at squandering the national resources and becoming individualistic and excessively materialistic in their outlook. Educated leaders loot federal, state, and local government treasuries and are unfortunately applauded by the ruling class. The judiciary in Nigeria is renowned for absolving thieves who have looted Nigeria’s treasuries of its billions of naira. Such is the level of scandal reverberating in the Nigerian society. Western education

to an extent has acted as ammunition in the hands of the educated elites in Nigeria to migrate to the developed countries. The new elites who, for the want of any better terminology, may be called the new diaspora, as distinct from the emigrants of the earlier eras, include the young, virile, and talented men and women of Africa who tend to be closer and far more sensitive to the realities of industrialised economies than the African environment.

This leads us directly to examine what exactly constitutes education and its essence and relationship with culture. The term “culture,” of course, has multiple meanings in different disciplines and different contexts. It is often used to refer to the intellectual, musical, artistic, and literary products of a society. Anthropologists, perhaps most notably Geertz (1973), have emphasized culture as “thick description” and used it to refer to the entire way of life of a society. In its simplest form, culture is the totality of material and non-material aspects of a people’s way of life. It entails the norms, values, knowledge, and belief systems of the people. Culture can also be defined as the entire way of life of a society: its values, practices, symbols, institutions, and human relationships (Geertz). Whereas, education is the transmission of norms, values, knowledge, and all that constitute the ways of life of the people to its young and new members of the society with the aim of perpetuating itself. As Peters (1970) puts it when he was demarcating the difference between reform and education, he asserted that education often consists of putting people in the way of values of which they have never dreamt. Education he further posits, suggests passing on the ultimate values of a community. He concludes ‘education is of the whole man.’

Historical Review of African Indigenous Education

Following from the above, education in the African setup is an all-encompassing concept that integrates the young ones into the society and puts them in way of positive value. For example, the Yorubas of the south west of the country place premium on the concept *omoluwabi*; regardless of one's vocation, individuals must show themselves as persons of good character; as such people of dubious character are seen as *eeyankeyan or eranko* (aberration of humanity or beast). Though this education may be regarded as informal, it is possible to integrate it into the formal system of education. It is an invaluable asset, to both the individual and the society, because it has been used from time immemorial, as a veritable instrument of cultural transmission. Thus education, in one form or the other, has always been an integral part of the human society. Generally, forms of education could be broadly categorized into formal and informal. Whereas, the former takes place in a formal or official setting, compartmentalized and certificated with designated learners and teachers, the latter is not so clearly designed. It has a longer life-span commencing from birth and ending in the grave with everyone around the learner constituting as a teacher even though no [teaching] certificate is required.

Yet, this form of education is as important as the former, if not more, if only for the fact that it is quite a practical thing with all the evidences of effective and functional noble expectations and objectives of the formal system of education. Indeed, it has a multilateral aim with the end objectives being to produce an individual who is honest, respectable, skilled, and cooperative, and who conforms to the social norms of the day.

According to Fafunwa (2004), seven aspects of these educational objectives can be identified and these include:

- To develop the child's latent physical skills.
- To develop character.
- To inculcate respect for elders and those in position of authority.
- To develop intellectual skills.
- To acquire specific vocational training and to develop a healthy attitude towards honest labour.
- To develop a sense of belonging and to participate actively in family and community affair.
- To understand, appreciate and promote the cultural heritage of the community at large.

Though the Nigerian formal education system abstract from these objectives as enunciated in the National Policy on Education (2004), the curriculum fails to properly and consciously reflect these values. According to the Policy, the broad objectives of Nigerian education should emphasize such things as:

- The inculcation of the right type of value attitudes for the survival of individual society.
- The training of the mind in building valuable concepts, generalizations, and understand of the world around.
- The acquisition of appropriate skills, abilities and competencies of both mental and physical nature as equipment for the individual to live in his society.
- The acquisition of relevant and balance knowledge of facts about local and world phenomena.

A cursory examination of the cardinal goals and the objectives stated in the National Policy of Education are clearly absent in the curriculum. Whereas, Nigerian education was to be geared towards self-realization, better human relationships, good character, healthy attitude towards honest labour, self and national economic efficiency, citizenship,

national consciousness, national unity, social and political progress, science and technological progress as well as national reconstruction. In pursuance of the objectives however, our educational institutions (pre- to post-primary) have not consciously designed programmes that can actually tap into those cherished values in such a way that functional individual who will be capable of contributing his/her quota to national development is produced. The functional nature of education is completely jettisoned; whereas, education which promotes autonomous and self-centered and materialistic individuals is celebrated. The hard fact, however, is that any education that fails to take cognizance of values that sustain the society under review is basically useless.

The Culture of Corruption in Nigeria

Ironically, while those positive values are fast fading off, the negative values of corruption, theft are fast gaining prominence. In Smith's (2007) words

Nigeria is rife with corruption, and no one is more aware of it than ordinary Nigerians. In various ways that I will describe and explain in this book, Nigerians are fixated on and passionate about corruption. Navigating corruption preoccupies people in all kinds of everyday endeavors, and talk about corruption dominates popular discourse. Much as I would like to be able to wipe the stigma of corruption from Nigeria's global reputation, Nigerians themselves regularly reminded me that corruption is one of their most pressing problems. Increasingly, instead of trying to minimize the significance of Nigeria's notorious corruption, I realize that explaining it is central to understanding the very fabric of Nigerian society. (pp. xiii-xiv)

The moral and value problems recurring in Nigerian society and educational sector inclusive have continued to be a source of worry by scholars and other stakeholders. The concern about loss of value both in the educational system and the society at large especially among the educated people is rife in recent times. Tella, Okanlawon & Ossai (1991) were alarmed by the perilous state of moral decadence in our society "...it is now a general belief in Nigeria today and held by all sensitive citizens of this country that we are at a cross road, in dilemma as far as National morality is concerned. We should in fact recognize that there is moral "nightmare" in our country at the moment, about which we must all find means to do something positive."

In the same vein, Obanya (2007) also lamented that Nigerian society has witnessed a radical shift in its value systems. The role model is no longer the *omoluabi* (a well-brought-up person), but the *omo jagidi jagan* (the person who simply tramples on the rights of others. In other words, learning for service to the enduring cultural values of society has been replaced by learning for narrow personal interests and material empowerment.) Obanya further noted the negative situation in Nigeria educational system thus:

Political instability and poor economic performance has produced the malignant phenomena of 'education for frustration', with a reigning mood of 'after schooling, what next?' The prevailing conditions in the education system therefore raise the following questions: Does Nigeria have clear societal development goals to which the goals of education can derive their inspiration? How best can Nigeria, through its education system, ensure that it correctly invests in the next generation?

Many in Nigeria today are aware that we are living in an era of moral decline. Not only are our streets unsafe and violence an everyday occurrence, but holders of public office are charged with serious breaches of ethics and corruption, young people abuse drugs and engage in acts that display high level of moral bankruptcy, television and the movies celebrate violence and sex. The continuous increase for individualistic lifestyle and corresponding dwindling of community is on the rise. The loss of community which Putnam (2000) dubbed as “this precious and diminishing commodity *social capital*” (p. 18) has increasingly been jettisoned. These and some other factors have made the educational system in Nigeria not only weak but also dangerous. Nigeria is a victim of the collapse of values: the politicians who steal public resources and live ostentatiously; the administrators who steal the funds meant for the education sector; the religious leaders who preach the message of miracles and prosperity; and parents who are willing to help their children cheat. We are in a society where majority of people no longer respect merit and hard work, but easy access and admiration to unaccounted wealth, culture of lawlessness, and faulty value system. Students and other stakeholders are always involved in sharp practices. This can be seen in the rampant examination malpractices, inadequate funding, and where funding is available outright embezzlement and corruption.

However, it is important to emphasise that there is a mutual interchange between society and education. While the society creates and influences education, educational system perpetuates and regenerates the society. Hence, education remains the means to correct societal ills and its own failings. In this case, the general loss of positive values in our society is a product of the failings of our educational system and vice-versa. The problem of corruption and dishonesty in

our official and business life are perpetrated majorly by the educated ones. As Aggarwal (2007) rightly puts it, “it is the students of today who are to be in charge of the various departments of life.” tomorrow” (para. 26).

This negative value of corruption has so much characterized the Nigerian landscape to such extent that many innocent ones have suffered humiliation outside the country because every Nigerian is believed by foreigners to be notoriously corrupt. A common sense experience, however, reveals that majority of those who have brought this negative perception on the whole country are the so called educated elites. This goes to confirm the fundamental flaw inherent in our educational system.

As already hinted above, the place of culture especially in terms of values in education cannot be overemphasized. Attitudes, values, and beliefs that are sometimes collectively referred to as “culture” play an unquestioned role in human behavior and progress. This becomes more evident when one observes nations, states, regions, inner cities, and companies at widely varying stages of development. The implication is that no country can successfully ignore the values and beliefs without grave consequences. The efforts at development cannot be hinged solely on economic, scientific, or technological development alone. An education, that aims to enhance development needs and enhance learners’ well-being, increase their ability to live well in a particular world, must necessarily and carefully take into consideration the nature of the ‘world’ in which the learner has presence.

Implications for Teacher Education

From the foregoing, I want to bring to bear the implication of the discourse to teacher

education. Teachers are without doubt crucial purveyors, transmitters, and moderators of values in and out of the classroom. Their role in transmitting values to students/pupils cannot be overemphasised. This is more evident considering the fact that values are embedded inextricably in school and classroom life. Teachers implicitly impart values when they select and exclude topics; when they insist on correct answers; when they encourage students to seek the truth of the matter; when they establish classroom routines, form groups, enforce discipline, and encourage excellence. Teachers mould certain forms of social life within classrooms and influence students' experience of community and school membership. In fact cultural and moral values saturate the daily life of classrooms. Character formation is intrinsic to classrooms and schools and an inescapable part of the teacher's craft.

To this extent, teachers must present cultural and moral values of the society in a critical manner so as to make the pupils gain insights and appreciate both old and new values. For example, lullabies, folk songs, nursery rhymes, riddles are important elements in formation of consciousness of the child's language and culture. Teacher education programme requires a conscious effort to promote positive social and national values of the past which is capable of securing the present and future. Bulut and Bars (2007) in citing Cemiloglu affirmed that the basic function of education is to "transfer the system of values to the younger generations" (p. 58). Teachers have a moral responsibility not to denigrate values that are core to the sustenance of the society they are serving. This is not to say that all values within the society are good enough to be transmitted but that teachers serve as the link to critically assess and preserve values that are

conducive to the perpetuation of the society to their pupils.

This becomes more imperative to teachers considering the value crisis besetting the society. As Hargreaves (1994) rightly puts it:

People are always wanting teachers to change. Rarely has this been more true than in recent years. These times of global competitiveness, like all moments of economic crisis, are producing immense moral panics about how we are preparing the generations of the future in our respective nations . . . Few people want to do much about the economy, but everyone – politicians, the media and the public alike – wants to do something about education. (p. 5)

Conclusion

In whatever way the term *development* might be conceived whether as synonymous with growth, economic development, scientific or technical advancement, all of these will remain a pipe dream when education which is meant to bring them to reality is divorced from its cultural roots. Education is first and foremost about cultural transmission of societal values, norms, knowledge and all that can help perpetuate the society and make individual within the society contribute meaningfully to the society and individuals good. Any government or teacher education programme which undervalues her culture in the bid to educate her young members or new members is bound to founder on many fronts. Hence, the culture of a people remains cardinal towards educating her people not only towards economic, scientific and technical development but to producing culturally and morally conversant people. Hence teacher education programme in Nigeria and elsewhere as a matter of necessity should ensure review of curriculum to ensure

emphasis of the place of culture in education. As de Souza (1974) argues industrialisation and advancement lead to economic growth but do not necessarily lead to development. He contends that economic growth is not development unless it leads to the achievement of particular human goals. Development to my mind entails both the positive improvement and exploitation of natural resources and in addition, inculcation of positive values that promote social order. Positive development in terms of resources exploitation can only be guaranteed when the human factor has been groomed to be communally responsible and others regarding. In this way individuals within Nigeria relate with others in an intersubjective way. By intersubjectivity, I mean consideration of others' interests

without necessarily jeopardizing an individual's own interest. This is contrary to the present individualistic and materialistic tendencies exhibited by majority of individuals. Positive values that is inherent in the African communal system needed to be integrated into our educational system so as to boost development in its ramifications.

In conclusion, the role of teacher in all of these remain cardinal in the perpetuation of society and as such teacher education programme must be well positioned for this highly tasking responsibility of promoting positive traditional moral values so as to have a balanced content of knowledge and pedagogy wrapped up in an holistic educational system.

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COMPETENCIES FOR TRAINING KNOWLEDGE PRODUCERS: POSSIBILITIES THROUGH INTERNATIONAL COOPERATION

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Abstract: *International education creating opportunities for the improvement of Brazilian graduate courses through master's and doctoral degrees and postdoctoral studies abroad contributes to a higher-level of human resources formation needed for the development of science and technology. This paper focuses on international education and analyzes the contribution of two programs of international cooperation for developing educational competencies in professors and/or researchers in Brazil. The first program aimed at the competencies developed by doctoral and postdoctoral Brazilian students during their training period as part of the Joint Research Project Brazil-USA in 2008-2011; the second was stimulated by the first and corresponds to a study that had intended to identify the competencies developed by teachers' education abroad. Both views had a qualitative approach using textual analysis. General competencies are identified for the formation of knowledge producers; they are classified in two groups: competencies of planning and of implementation. Both competencies meet the demands of the knowledge society for quality education as well as proposals for the Coordination for Enhancement of Higher Education Personnel [CAPES] for qualifying scientific knowledge producers.*

Keywords: teaching competencies, quality of graduate studies, internationalization of education

Introduction

International education plays an important role in the development of human resources and especially in the quality of higher education. From this perspective, the concept of quality in higher education needs to be developed as a construct related to the context of societies. For Angela Gurria, Secretary General for the Organization of Economic Cooperation and Development [OECD] (2010), improvements in some standards of educational quality that are isolated and of a regional or national nature no longer make sense in a globalized economy because only those systems of education with uniform standards of quality in the international scope provide parameters for success. To this end, some internationalization strategies are necessary. Among them are (a) the

internationalization of studies, (b) the importance of networks of research work, and (c) external stimuli and incentives, such as funding for academic mobility.

In Brazil, international education, as a systematic model, began in the 1970s and focused on the development of graduate studies. Until this time, a Napoleonic model of education aimed basically at teaching predominated, and graduate studies and research were rarely developed. During this phase, policies were implemented towards the scientific and technological development of the country accompanied by the conception of the research university. For this model to succeed, scientific labor with quality doctorates is necessary.

It is worth highlighting improvement programs for professors in higher education institutions of Brazil to complete

their full doctoral study (4 or 5 years) in renowned universities from the North, such as the United States, England, France, and Germany. One of the objectives of this incentive was the impact this education would have on the home universities of the professors who received this training and in general on the country. This policy was established and promoted the development of graduate studies in the country through the presence of a critical mass for the development of various areas of expertise, and the creation of knowledge networks based on the relations with the countries in which these professors were educated.

On the path of international education as a form of developing science and technology in the country, a second phase was introduced: the funding of cooperation for full doctorates was reduced and funding for sandwich doctorates (up to one and a half years abroad) increased. In other words, funding for a complete period – the full doctorate – is expensive for the country. In addition to paying taxes to the host university, study scholarships must be offered so that the Brazilian student can cover all expenses during the stay, and if the student is married and has children, the expenses increase.

In the 2000s, a third phase began through professor training, via a post-doctorate (a program up to one and a half years for doctors) in qualified universities. At the same time, a south-to-south horizontal international cooperation program began. Through this international education program, Brazil through solidarity, helps other underdeveloped countries in their qualification process of higher education.

Currently, the policy of internationalization is decisive in qualifying the country. Higher education has expanded greatly in terms of HEIs, also in terms of new programs such as technology programs and others of various durations. Therefore, the full doctorate, sandwich doctorate, and post-doctorate

programs have been maintained and today are extended to undergraduate students.

The present paper is focused on international education and analyzes the contribution of two international cooperation programs for the development of educational competencies in professors and/or researchers in Brazil. To this end, we present below a brief overview of professor competencies, the method used in this investigation, the analysis and a discussion of the data, the final considerations and references, which served as a basis for this article.

Conceptualizing Competency

According to Sugumar (2009), proponents of higher education insist that teaching institutions at this level promote a closer relationship between the world of competent learning and the world of qualified work. Only this way can the framework of teacher competencies end up having a decisive impact on the reinforcement of student competencies. Competency, according to Sugumar, refers to knowledge, attitudes, and skills necessary for the professor to exercise the teaching practice. The same author defines competency as “An underlying characteristic of an individual that is causally related to criterion referenced effective and or superior performance in a job or situation” (p. 3). Consequently, in a job, there is a close relationship between performance, success and competencies. The latter can thus be defined as measurable and observable knowledge, skills, capacities, and behaviors aimed at performing a determined function.

There are two ideas related to the development of teaching competency: the development (planning) and implementation (execution) of professional knowledge, as well as skills and ideas that the professor has (Medley, 1978; Vogt & Rogalla, 2009). For these authors, competent professors demonstrate the

skills of expression and questioning while interacting with their students, which means they are implementing the skill. When professors know whether a skill is adequate or not, they are developing that skill.

The development is aimed at the objective of teaching and is related to knowledge of the discipline, including a perspective on how the class can or cannot be developed. The implementation requires adjustments in teaching methods or in classroom management strategies, also involving diagnostics regarding understanding the students and the need for support or changes (Morosini & Felicetti, 2010).

This evidences the need for training that contemplates the planning competency as well as the execution competency in order to validate the improvement of the quality of education. This way investing in education means investing in professors so that they can become competent and motivated to be committed to the teaching practice. In line with this, the international cooperation programs have been contributing to developing, improving, and/or increasing the quality of teacher competency.

International Cooperation

The international cooperation projects by Coordination for Enhancement of Higher Education Personnel [CAPES¹], and by National Council for Scientific and Technological Development [CNPq], support Brazilian research groups by means of international exchanges and building excellence in graduate studies, by providing the opportunity to achieve the

¹ The Coordination for Enhancement of Higher Education Personnel [CAPES] is assigned the mission of strict sensu post-graduate evaluation, access to and dissemination of scientific production, investment in the training of high-level expertise and promoting international scientific cooperation. Other information: http://www.brasil.gov.br/para/study/exchange/capes-2013-coordination-for-enhancement-of-higher-education-personnel/br_model1?set_language=en

Brazilian educational standard. Through international cooperation, CNPq pursues international scientific and technological cooperation by means of (a) funding joint research projects and scientific visits; (b) providing education and training exchanges of Brazilians in other countries and foreigners in Brazil; (c) inviting direct participation with other international cooperation agencies in programs and projects supporting scientific and technological development; and (d) providing human resource training among other responsibilities (Morosini & Felicetti, 2010).

International cooperation in the scope of CAPES comprises joint research projects; Brazilian graduate programs abroad; joint doctoral degrees; grants and individual aid; special cooperation programs; and exchange programs and university partnerships (Morosini & Sousa, 2009). Among the most common exchange programs are the incentives for “sandwich” doctorates, in which the doctoral student spends a part of the study period abroad and a part in Brazil, and in post-doctoral studies.

Over the past five years, CAPES has provided a total of 17,062 grants distributed over full master’s, sandwich master’s, full doctorate, sandwich doctorate, post-doctoral grants, and senior internships, which are presented in figure 1 below.

The qualification of a graduate program is also based on the criterion of their internationalization, which contributes towards the qualification of a high level program. Studying abroad, supported by study grants, includes high level human resources in the academic and research environments, thus supporting the efforts of graduate programs in Brazil regarding their quality.

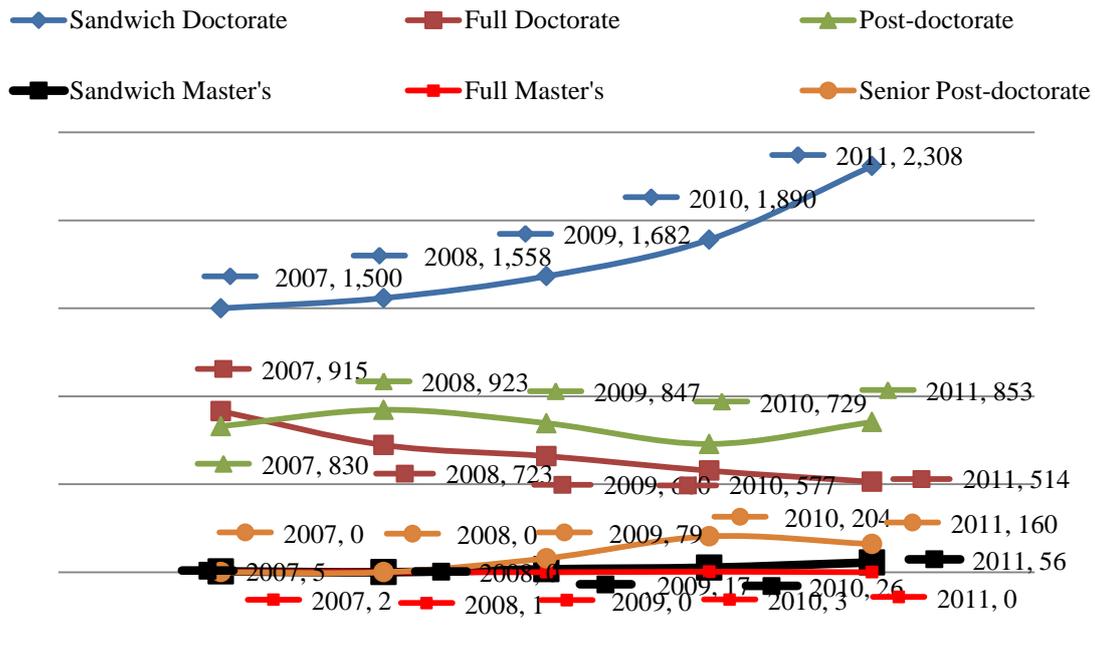


Figure 1. Distribution of CAPES grant holders abroad. **Source:** Adapted from GEOCAPES/Statistic Data. Available at: www.capes.gov.br/estatisticas

In line with this, Table 1 presents the required competencies and their possible

indicators for the qualification of scientific knowledge producers abroad, CAPES/Brazil.

Table 1

Competencies proposed for the qualification of academic/scientific knowledge producers, CAPES/Brazil

GENERAL COMPETENCIES	INDICATORS
1. Mastery of a foreign language	1.1. Passing a proficiency test.
2. Engagement	2.1. Full-time dedication to study plan activities. 2.2. Mobility of the participation in different academic study contexts;
3. Scientific exchange	3.1. Joint scientific production. 3.2. Teamwork
4. Mastery of an area of expertise	4.1. Credits completed in the Graduate Program 4.2. Average course grade 4.3. Qualification exam and/or dissertation project approved.
5. Mastery of skills	5.1. Selection by the HEI 5.2. Self-discipline 5.3. Independence
6. Excellent conduct	6.1. Visa for the destination country
7. Contract agreement	7.1. Commitment to the study project

Source: Adapted from Morosini and Felicetti (2010)

The candidate needs to study abroad include all the skills presented in Table 1 and make their request for scholarship to study abroad in accordance with legal procedures. CAPES and CNPq analyze the request and the documents given, then decide whether or not to award the grant.

To meet the competencies proposed above in Table 1 for qualification at the graduate level, we present in this article as a pilot study involving sandwich doctorate and post-doctorate students from a private higher education institution from Rio Grande do Sul in Brazil who have studied abroad. The objective of this pilot study was to identify the competencies developed and/or improved by these Brazilians abroad, comparing them between the two groups of students.

Method and Analysis of the *Corpus*

This study was carried out based on two groups of documents analyzed: that is, the database was composed of research reports by students who studied abroad during the 2008-2011 period and answers from a questionnaire applied to professors who completed their graduate studies abroad before 2005. Both groups who completed their graduate studies abroad are from a private higher education institution from Rio Grande do Sul in Brazil and were part of the graduate program in education in 2012 at the time of this research. This characterizes a study carried out in this program, in which students in the Brazilian exchange program were not invited.

The questionnaire included closed and semi-closed questions of a socio-demographic nature and open questions. Therefore, the methodological approach used in this investigation was qualitative due to the corpus composed: reports and essay questions because the closed and semi-closed questions are inherent to this research.

The documents were analyzed according to a textual discourse analysis, which, according to Moraes and Galiazzi (2007), is established based on a set of documents called a *corpus*. By carefully reading the corpus, the initial analysis began by highlighting the common and relevant points, which were grouped and organized leading to a set of competencies of planning and implementation achieved by the students abroad during the 2008-2011 periods, as well as by those who completed their graduate studies abroad before 2005.

Students Abroad from 2008-2011

In the spirit of internationalizing knowledge, the CAPES/UTexas Joint Research Program: Quality in Higher Education within the call CGCI n° 024/2007 contemplates the objectives of international cooperation through activities carried out by the participants of this program. The participating institutions of the CAPES/UTexas Joint Research Program are the Pontifical Catholic University of Rio Grande do Sul in Brazil, and the graduate program of the College of Education at the University of Texas at Austin in the United States. The group of Brazilian participants was represented during the 2008-2011 period by three doctorate students and three professors in post-doctoral studies.

According to the reports presented by the Brazilian participants of the program, planning and implementation competencies and their respective indicators were identified, which are in Table 2. Observe in Table 2 the knowledge networks that have been built. These knowledge networks were developed through a repertory of experiences, composed of learning as well as teaching. This means that while one is learning, one is teaching, because there has been an exchange of cultural, scientific, and other

kinds of knowledge, which can be debated and related to the realities of each country.

Plurality in research provides not only its own development, but also the development and improvement of verbal and written skills, in order to establish improved communication. Exchanging knowledge was made possible through joint studies, in seminars, conferences, through courses taken at the university, as well as classes in loco, such as the course *Survey Research Methods in*

Postsecondary Education, where questionnaire building, application, and evaluation was learned in the community colleges. Through the activities carried out, a knowledge foundation capable of supporting and developing new teaching and learning proposals was built. This base made it possible to rethink and/or restructure educational practices and improved and developed the knowledge. In sum, a better qualification of the program participants took place, supported by the CAPES international cooperation.

Table 2
Planning and Implementation Competencies Gained by Knowledge Producers in the CAPES/UTexas Joint Research Program, Brazil, 2008-2011²

Planning Competencies	Indicators	Implementation Competencies	Indicators
1. Forming academic networks	1. Elaborating of the articles, presentations and educational projects	1. Forming academic networks	1.1 Team work 1.2. Mobility of relocation and adapting to differences.
2. Plurality of research	2.1 Developing research 2.2 Using different research 2.3. Building one's own theory (method and/or technique) for the teaching and learning process.	2. Communication	2. Verbal and written capacity to establish communication: 2.1 using language correctly in each situation 2.2 expressing ideas and concepts 2.3 making oneself understood in different contexts. 2.4 socializing Brazilian cultural and social diversity.
3. Knowledge of an area of expertise	3.1. Constant readings on the intended investigation 3.2. Associating the theories read, developed and learned in practical situations.	3. Knowledge of an area of expertise	3.1. Applying different pedagogical practices (activities) 3.2. Using well-founded theories 3.3. Applying various languages in order to establish a connection.
4. Critical-reflective values and thinking	4.1 Identifying differences between: 4.1.1 the socio-cultural reality of countries; 4.1.2 the university reality; 4.2. Reorganizing research techniques; 4.3. Identifying educational events related to the area of study; 4.4. Identifying positive and negative evidence about an object of study; 4.5. Expressing opinions; 4.6. Perceiving right and wrong; 4.7. Understanding the ideas of others.	4. Critical-reflective values and thinking	4.1. Reorganizing research techniques; 4.2. Identifying educational events related to the area of study; 4.3. Identifying positive and negative evidence about an object of study; 4.4. Expressing opinions; 4.5. Perceiving right and wrong; 4.6. Understanding the ideas of others.

Source: Adapted from Morosini and Felicetti (2010)

² The complete table can be found at:
http://www.iiis.org/CDs2010/CD2010IMC/KGCM_2010/PapersPdf/GB034WG.pdf

Students Abroad Before 2005

After outlining the planning and implementation competencies gained by the knowledge producers in the CAPES/UTexas Joint Research Program during the 2008-2011 period, the answers to the questionnaire given to a group of higher education professors who also had studied abroad though prior to 2005 were analyzed. This analysis led to the

identification of similarities between the competencies presented by the grant holders of the Capes/UTexas Joint Research Program and the professors who obtained a degree prior to 2005. All ten professors invited from the Graduate Program in Education from the institution in focus, who had studied abroad, answered the questionnaire. The education they completed abroad is presented in Table 3.

Table 3
Education Abroad Completed by the Respondents Prior to 2005

Respondent	Master's	Full Doctorate	Sandwich Doctorate	Post-doctorate
R1	United States	United States		United States
R2			France	France
R3			England	United States
R4		France		Canada
R5			United States	
R6		United States		
R7	United States			
R8				Spain
R9				Spain
R10				Germany

As can be observed in Table 3, the country that appears with the highest number of studies completed is the United States, with 7, then France with 3, Spain with 2 and England, Canada, and Germany with 1 each. Regarding the study period from 2001 to 2005, six degrees were completed; from 1991 to 2000, six degrees were completed; from 1981 to 1990, there were two; from 1971 to 1980, there were three, and none prior to 1971. The highest number of studies abroad has occurred

over the past 15 years. These data are in line with the new educational reform, as well as the efforts made by CAPES and CNPq to better qualify the graduate education of Brazilian professors. The last question on the questionnaire asked the professors to report how they perceived the competencies they developed and/or acquired, influencing the improvement of the quality of Brazilian higher education. These competencies, as well as their indicators, are presented in Table 4.

Table 4
 Planning and implementation competencies gained by Brazilian knowledge producers abroad³.

Planning Competencies	Indicators	Implementation Competencies	Indicators
1. Critical-reflective observation	1.1 Observing the university system of the other country; 1.2 Approximating the realities between the countries; 1.3 Global view of knowledge production; 1.4 External observation of Brazilian education; 1.5 View of the scientific line from different angles;	1. Communication	1.1 Oral and written connection 1.2 Fluency in technical writing for articles, facilitating international publication; 1.3 Cooperative publications between students and professors; 1.4 Dissemination abroad of the Brazilian educational context
2. Forming academic networks	2.1 Elaborating: 2.1.1 articles 2.1.2 presentations 2.1.3 educational projects 2.1.4 research projects 2.2. Exchange between professors and students; 2.3 Organization of 3 international events	2. Forming academic networks	2.1 Team work 2.2. Exchange between professors and students 2.3 Participating in academic events 2.4 Consolidation of research groups
3. Knowledge of an area of expertise	3.1. Constant readings on the intended investigation; 3.2. Intensive studies;	3. Knowledge of an area of expertise	3.1. Applying different educational practices (activities) 3.2. Using well-founded theories 3.3. Applying various languages in order to establish communication.
4. Improvement as a researcher	4.1 Improving the study area ; 4.2 Innovative research 4.3 International qualification of the research in focus;	4. Improvement as a researcher	4.1 Applying new knowledge in the area of study; 4.2 Developing innovative research; 4.3 Providing the opportunity of entry to new programs; 4.4 Advancing in the scientific field of the area; 4.5 The research begins to guide educational activities; 4.6 Editor and co-editor of international journals.
5. Improvement as a professor	5.1 Innovation in teaching	5. Improvement as a professor	5.1. Applying different teaching strategies in class; 5.2. Using current literature; 5.3. Applying various languages in order to establish communication; 5.4 Encouraging new grant holders.
6. Plurality of research	6.1 Developing research; 6.2 Using research spaces; 6.3. Building one's own theory (methods and/or technique) for the teaching and learning process.	6. Plurality of research	6. Autonomy in investigative practices.

Source: Translated from Morosini, Felicetti and Santos 2010

³ The complete table can be found in: Morosini, M. C.; Felicetti, V. L.; Santos, B. S. dos. *Quality of the competences for training knowledge producers*. In: XIV World Congress of Comparative Education Societies, June 14-18, 2010, Istanbul – Turkey.

Through the competencies developed by the professors who answered the questionnaire, the internationalization of knowledge has been taking place and the improvement of the quality of higher education is in fact being built with the qualification of its faculty. This has become evident, because the professors indicate planning as well as implementation competencies, which they developed as students abroad, as well as identifying their respective indicators.

Drawing a relation between the competencies in Table 2 and Table 4, the latter, resulting from the study with professors who studied abroad in the period prior to 2005, presents two more competencies than the table referring to the Brazilian participants of the CAPES/UTexas Joint Research Program. The two extra competencies correspond to improvement as a professor and improvement as a researcher. One can attribute this to the fact that these studies ended more than five years ago, giving time to actually apply these competencies, while the analysis of the reports occurred after the graduates returned to Brazil.

The competencies presented in both tables contemplate the indicators presented in the competencies proposed for the qualification of knowledge producers by CAPES presented in Table 1. The competencies which have emerged also contemplate various reasons for the internationalization of higher education listed by Knight (1999) in decreasing order of relevance: (i) mobility and student and professor exchange; (ii) collaboration in teaching and research; (iii) academic norms of quality; (iv) research projects; (v) cooperation and support for development; (vi) curriculum development; (vii) international and intercultural understanding; (viii) promotion and improvement of the institutional profile; (ix) diversifying the source of professors and students; (x) regional productions and integration; (xi) international student

recruitment; and (xii) diversifying income generation. Clearly, the initial competencies presented by CAPES, as well as the reasons listed by Knight (1999) do not represent final answers to the internationalization of higher education. They change, broaden, correlate, and complement one another or even contradict one another within the different interests of the various groups of stakeholders.

Final Considerations

There is a close relationship between internationalization, globalization, and the qualification of higher education (Zolfaghari, Sabran, & Zolfaghari, 2009). Similarly, the need for a quality higher education becomes clear (Souza Santos, 2005). To this end, it is necessary for professors who perform at this level of teaching to have a quality education, capable of aiding in knowledge production and the development of quality human resources. Graduate study is an essential factor in professor training, as well as in the development of a nation, because coupled with it, is the education of professors who work on prior levels of education as well as the development of the sciences, which enable scientific and technological growth. In Brazil, knowledge production has traditionally occurred in universities. More specifically in graduate programs, which include master's and doctoral programs.

One of the criteria that qualifies a higher level program is the internationalization of the graduate program. This criterion contemplates the efforts of graduate programs in Brazil towards broadening knowledge and competencies pertinent to this level of education, and consequently, improving the level of previous levels of education, as well as the quality of scientific production, since this training broadens the horizons of knowledge contributing to the building of knowledge

networks and joint research on an international level. This means the scientific and technological advancement of the nation.

In the scope of the paper presented, we perceive that the investment in the qualification of knowledge producers has been taking place through efforts invested by the responsible organizations, CAPES and CNPq, by means of the International Cooperation Program. The results presented in the analysis, though still in its early stages, point to a series of improved and developed competencies, signaling the relevance of courses taken abroad. This is denoted by the set of indicators built and developed during the process of investing in knowledge. In this way, we need

comparative studies that demonstrate the skills developed in post-graduate among graduates who studied abroad during this period and graduates who studied only in Brazil. Graduate studies must be continuously improved, balancing the fulfillment of criteria, of future evidence and projections of development.

International Cooperation, supported by CAPES and/or CNPq, only makes sense if it is at the service of Higher Education, and in the present context, especially graduate studies, teaching institutions, their courses, and students. This investment is not an end, but a means to advance in the knowledge society because it improves the competencies required of a quality education.

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QUALITY SCHOOL EDUCATION: CAPABILITY APPROACH

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Abstract: *Every missed opportunity for an education is a loss for the child because quality education promotes human empowerment and transforms society. Without it, the most marginalized children will only fall further behind, burdened by shrinking opportunities and reduced productivity that will also weigh heavily on economies and societies. During the 59th Central Advisory Board of Education (CABE) meeting on June 6, 2012, Kapil Sibbal felt that “though India is having a demographic advantage, we can take advantage of the same only if we embrace the agenda of equity and quality.” He stressed that “investment in the minds of our young people, is the best way forward to unleash the kind of economic development that the country is talking about.” However, according to the Quality Education Study (QES) 2011, involving five metropolitan cities (Delhi, Mumbai, Kolkata, Bangalore and Chennai) with Wipro found that contrary to perception, most of the teachers and students believe that rote learning is not bad as long as it comes with the understanding that less dependence on memory will give way to artificial intelligence, which may hamper the innovation in the long run. For example 17 percent of class IV students think that Indira Gandhi and Rajiv Gandhi are still alive. If this is the situation of metro cities then what type of quality education is provided in rest of the country? How can this type of rote learning generate higher order thinking skills in students? The main cause of these misconceptions is the environment in schools which is not providing opportunities to develop a child’s full potential. Developing inherent capabilities of each student is required. The Capability Approach (CA) by Amartya Sen proves relevant. Thus the present paper tries to analyze the conversion factors and underlying reasons of teacher and student behavior which are hurdles in achieving a quality education and the use of CA to improve education.*

Key words: Capability Approach, higher order thinking skills, quality education

Introduction

Since the beginning of time education has aimed at developing flourishing humans and an enlightened citizenship and nurturing self-governing adults. Education is the procedure of making an individual, a sensitive human and allowing for more liberal thinking to understand and respond to social issues. The philosophy of education took different forms in response to different historical and cultural contexts. The development of nations should be based on the educational development of the individual and the revival of the cultural context. Philosophy of education should be embodied with the ideal of philosophy as pedagogy – the philosopher as a teacher and teacher as philosopher.

A quality education equips children to thrive and actively pursue growth and well-being. Providing education to every child irrespective of socio-economic disadvantage required the implementation of The Right of Children to Free and Compulsory Education (RTE) Act in India, 2009. This is a revolutionary step because it gives a rights-based approach (RBA) to education. The following are highlight to the RTE Act, 2009:

- Every child of the age of 6-14 years shall have the right to free and compulsory education in a neighborhood school till completion of elementary education. [Section 3 (1)]
- No child shall be liable to pay any kind of fee or charges or expenses which may prevent him or her from pursuing

and completing the elementary education. [Section 3 (2)]

- An out of school child above 6 years of age, not enrolled or dropout, shall be admitted in a class appropriate to his or her age. [Section 4]
- A child admitted in a class appropriate to his or her age shall have arrived to receive Special Training and shall be entitled to free education till completion of elementary education even after 14 years. [Provisos of Section 4]
- A child shall have a right to sick transfer to any other school except private un-aided and special category school if there is no provision for completion of elementary education in his/her school. [Section 5(1)]
- Where a child is required to move from one school to another, either within a state or outside, for any reason whatsoever, the child shall have right to seek transfer to any other school, except private aided and special category school, for completing elementary education. [Section 5 (2)]
- The head teacher or in-charge of the school shall immediately issue the transfer certificate to a child seeking transfer to any other school and the delay in producing transfer certificate shall not be a ground for either delaying or denying admission in such other school. [Section 5 (3)]
- No child shall be denied admission in a school for lack of age proof. [Section 14 (2)]
- No child or his/her parents shall be subjected to any screening procedure and shall be made to pay any capitation fee. [Section 13]

Quality Education

For India to emerge as a knowledge super power of the world in the shortest possible time, it is imperative to convert our demographic dividend into knowledge

powerhouse by nurturing and honing our working population into a knowledge or knowledge-enabled working population. Quality education includes healthy learners and a safe, gender-sensitive environment with the outcomes in knowledge, skills, and positive attitude.

This quality education will create enlightened citizenship and human development. A report published by the World Literacy Foundation revealed that illiteracy is costing the world economy a massive \$1.19 trillion each year out of which Indian economy alone is losing \$53.56 billion annually (as cited by Tondon, 2012). The report says that illiterates earn less than their literate counterparts as they do not have the literacy skills required to further vocational education training to improve their earning capacity. The earning capacity cannot improve without quality education.

The literacy rate of India is 74.04 percent; there are still 25.96 percent of the people who cannot read and write. Even the children who are in schools are not getting quality education. India did not compare well on the Programme for International Student Assessment (PISA) 2009 according to the report by the Organisation for Economic Co-operation and Development (OECD, 2009). In this test very few 15 year old students performed well in simple reading paragraph. These results were in line with the results where Indian students remained at the bottom with only Kyrgyzstan performing worse.

To become knowledge powerhouse it seems that human resource development would certainly be the key, consequently demand quality education. Thus the capability approach (CA) by Amartya Sen has become an important paradigm that has shifted the focus of development from economic growth to human well-being as its goal (Walker & Unterhalter, 2007).

The aim of an intervention with CA is to identify the capabilities of teachers and students and to provide reasons to value so that improvement efforts to widen experiences can be expanded. The achieved function from CA can be used to boost morale and well-being of teachers and students for their personal achievement and investment in quality education through positive reactions.

Capability Approach (CA)

Evaluating human well-being, equality, freedom, and rights stand at the center of the capability approach. For understanding the capability approach, capabilities should be understood. Sen defines capability as “a person’s ability to do valuable acts or reach valuable states of being; [it] represents the alternative combinations of things a person is able to do or be” (Sen, 1993, p. 30). Thus, capabilities are opportunities or freedoms to achieve that an individual reflectively considers valuable. This approach can be used in education to value achievements of students. It can be used in determining what types of desirable conditions can be created for students to achieve an appropriate outcome and how the resources like curriculum, pedagogy, and learning materials can be redistributed to achieve that educational outcome. CA helps in determining what kinds of inputs (ideas, teachers, learning materials) will shape particular opportunities to achieve desired outcomes (economic growth or social solidarity). As Bernard (1999) said “In all aspects of the school and its surrounding education community, the rights of the whole child, and all children, to survival, protection, development and participation are at the centre.”

This means that the focus is on learning which strengthens the capacities of children to act progressively on their own behalf through the acquisition of relevant knowledge, useful skills, and appropriate

attitudes and which creates for children and helps them create for themselves and others, places of safety, security and healthy interaction” (Colby & Witt, 2000). Hence CA can provide a basic tool for quality education.

Capability approach can be explained with an example: Two 15-year-old girls participating in an international study of learning achievements both achieve poor results in mathematics. For one, despite attending a well-equipped school with highly qualified and well-motivated teachers and ample time for additional learning support, a major reason was her decision to spend less time on mathematics homework and more time with friends in a range of leisure activities. For the other, despite her interest in mathematics and schoolwork generally, her results were partly due to long periods of absence by her teacher who was paid infrequently. In addition her poor result stemmed from the lack of supportive culture in the school or at home for this girl’s lack of achievement in mathematics and heavy demands on her to perform housework and childcare for other family members. While the functioning of the two girls are the same, their capabilities are different. If we evaluate only the functionings achieving a certain grade in mathematics, and do not look at the conditions of choice of the learners, our social policy is unlikely to be wide enough in scope to address some of the injustices underneath apparent similarities of outcome.

The capabilities approach draws on debates in philosophy and economics to highlight this disparity and seeks to provide ways of thinking that look behind the actual functionings to the opportunities or freedom people have to function (Walker & Unterhalter, 2007). Thus the CA emphasizes that evaluating the achievement of student-only functionings are not important; capabilities also play a significant role. Achievement is concerned

with what we *manage* to accomplish, and freedom with the *real opportunity* that we have to accomplish what we value. The two need not be congruent (Sen, 1992). The same example is implied with every student in the classroom.

Many issues related to school especially those related to teachers and students go far beyond inputs and test scores and are more closely linked to well-being and agency. Quality education should not be measured only in terms of input (infrastructure) and output (scores on tests). Human development should be valued and measured in terms of process (interaction between student and teacher). To analyze process, teachers' and students' behavior should be analyzed and conversion factors become relevant here.

Conversion Factors and Teacher and Student Behavior

Analysis of behaviors of the teacher and student can give insight about constraint in providing quality education in schools. As in The Right of Children to Free and Compulsory Education (RTE) Act, 2009, implementation of the main issues arises about quality of teachers so it is relevant to analyze the teachers' and students' behavior. To better understand it is useful to examine the conversion factors and choices involved in behaviors in order to illuminate constraints on capabilities and functionings that may not otherwise be recognized. Thus to analyze behaviors conversion factors should be understood.

Conversion Factors

Robeyns (2005) acknowledges that 'goods and services' are instrumental in the achievement of functionings but states that it is not the market value of a resource that is important; instead, it is the characteristic of the goods that enables a functioning to be achieved. For example, a teacher is not interested in a textbook because it is an

object made out of paper, but instead she is interested in it because it can make her job easier and more effective. However, a teacher's ability to convert such goods into a functioning is influenced by three conversion factors. These include (a) personal conversion factors (such as intelligence, training, and skills, amongst others); (b) environmental conversion factors (such as geographical location and logistics); and (c) social conversion factors (such as social norms and power relations). The same applies to students' behavior. This is where a CA framework goes beyond input/output models because it acknowledges the broader environmental, personal, and social factors that affect the conversion of goods into action.

The simple presence of an input will not guarantee its use; thus, the conversion factors affecting it need to be arranged so that capability sets are expanded and consequently it will improve quality education. A deep analytical approach is required to study teachers' and students' behavior and their relationship with conversion factors because conversion factors provide the reason why a particular problem exists.

Teacher Behavior and Conversion Factors (Table 1)

Robeyns's (2005) conversion factors are helpful in order to understand behavior of the teachers because conversion factors give the reason why the problem persists. After analyzing the underlying reasons for the behaviour of the teacher, a blueprint can be made to provide quality education in schools because the behavior can be changed. President of India Smt. Pratibha Patil in her address to both the Houses of Parliament on 12th March, 2012 had announced as "The teacher is at the core of the education system. My Government intends to launch a National Mission for Teachers aimed at improving teacher

education and faculty development” (para. 14)

In 59th Central Advisory Board of Education (CABE) meeting on June 6, 2012, quality of teacher education was a main concern. For the advancement of teacher education and a National Mission on Teachers is proposed. The following table presents the relationship of conversion factors and teacher behavior.

Student Behaviour and Conversion Factors (Table 2)

In combination to teachers’ behavior is students’ behavior. The following chart describes these reasons. These reasons are based upon various data on primary education and may be not exhaustive. We need to analyze the conversion factors which are responsible for students’ behavior. The factors underlying students’ behavior are very crucial when we talk about quality education in schools. To improve the quality of education these factors need to be considered by academia and policy makers.

Table 1
Descriptions of Teacher Behaviors

Perceived problem	Goods and services	Conversion Factors (Reasons why ‘the problem’ exists)	Capability	Choice	Functioning (or lack thereof)
Absenteeism (or being extremely late for class)	n/a	PCF: Hungry, tired, more administrative workload, lack of motivation ECF: Too many classes, too many students, too many papers to mark, lack of adequate infrastructure SCF: Other teachers skip class and it is ‘overlooked’ by the head teacher	Freedom or opportunity to come to class	Many teachers are over-worked and thus resentful. This low motivation affects their choice in coming to class	Teaching for the maximum allotted time
Withholding content or teaching very little during class	Content from syllabus and textbooks	PCF: They have the content and time to teach extra tuition classes, underestimating child’s capability ECF: Low salaries warrant secondary income generation and there are students willing to pay, no incentives for good teaching SCF: It is a common practice among other teachers and not condemned by management and principal	Freedom or opportunity to maximise the teaching of content in class	Many teachers withhold content because they’ve chosen to put their needs first (by generating income through tuition).	Teaching all subject matter during class
Rote Teaching methods	Teacher Training	PCF: Not trained in or does not agree with child-centred innovative pedagogy ECF: 50-70 students in a class and no supplementary teaching materials, less knowledge of ICT SCF: Teachers view new innovations with skepticism; and rote teaching is considered the best method for preparing students for national exams	Freedom or opportunity to teach with a child-centred pedagogy	Most teachers believe rote teaching is very effective for large classes, and taking on new methods would add to their workload.	Teaching with child centred-methodology

Table 1 continued

Perceived problem	Goods and services	Conversion Factors (Reasons why 'the problem' exists)	Capability	Choice	Functioning (or lack thereof)
Corporal punishment	n/a	PCF: Tired, daunted by large classes, have not been trained in any other form of classroom management ECF: 70+ students per class SCF: Corporal punishment conveys teachers' authority, teachers experienced it themselves, it is overlooked' by management	Freedom or opportunity to manage a class in a nonviolent manner	Corporal punishment makes a teacher's life easier as it is seen as the easiest and fastest way to discipline.	Managing a classroom without using violence
Gender bias in treatment of students	Teacher Training	PCF: Not trained with gender sensitive pedagogy, consider it natural phenomena ECF: Textbooks and materials are highly gendered SCF: Social reproduction of gender bias in teacher training and deep rooted patriarchy in society	Freedom or opportunity to teach students with equity and enhance girls' learning	Most likely an unconscious choice (to cater to boys and assign gendered tasks) due to social norms	Equitable treatment of students and enhancement of girls' learning

Source: Adapted from Tao (2010). Acronyms: Personal Conversion Factor=PCF, Environmental Conversion Factor=ECF, Social Conversion Factor, SCF.

Table 2
Description of Students' Behavior

Perceived problem	Goods and services	Conversion Factors (Reasons why 'the problem' exists)	Capability	Choice	Functioning (or lack thereof)
Irregular attendance	n/a	PCF: malnutrition, recurrent illness, dislike or fear of teachers, socio-economic condition ECF: Far distance to walk to school, family's need for labour, or caring for sick members/siblings SCF: Other students miss class and parents condone it, less importance to education	Freedom or opportunity to come to class	After missing too many classes, many feel like they've fallen so behind that there's no reason to continue	Attending class on a regular basis and not falling behind
Lack of engagement during class	Content from syllabus and textbooks	PCF: Illness or hunger during class, boredom due to rote methods, fear of teachers, possible learning disability ECF: Lack of textbooks, teaching materials, teacher absenteeism, lack of basic amenities like sanitation SCF: Authoritarian atmosphere and gender bias can cause girls to be very inhibited and docile	Freedom or opportunity to engage or participate in class	Would rather not participate or ask a question due to fear of embarrassment or discipline	Proper learning of subject matter during class
Poor performance on tests	Content from lesson and textbooks	PCF: Absenteeism, lack of time to study due to chores, dislike and fear of school, possible learning disability, household workload ECF: Lack of textbooks, teacher absenteeism and withholding content, based on descriptive rote memory SCF: Marks lower than 50% are considered normal. Only a handful of students are classified as 'intelligent' and expected to do better.	Freedom or opportunity to strive to do well on exams	Most do not choose to study due to chores and lack of encouragement from parents	Good performance on exams

Table 2 continued

Perceived problem	Goods and services	Conversion Factors (Reasons why 'the problem' exists)	Capability	Choice	Functioning (or lack thereof)
Low completion rates (dropping out)	Financial Resources	<p>PCF: Opportunity cost of child staying home to work, child marriage</p> <p>ECF: Lack of resources for uniforms and other charges</p> <p>SCF: Value of education is not high in rural areas/ for girls</p>	Freedom or opportunity to stay in school	Most students do not have a choice if the family can't afford ancillary fees	Finishing primary school

Tables 1 & 2: Source-Adapted from Tao Sharon (2010) Acronyms- Personal Conversion Factor=PCF, Environmental Conversion Factor=ECF, Social Conversion Factor, SCF.

A preliminary analysis of the data from Tables 1 and 2 would seem to indicate that immediate actions should be taken to improve conversion factors. Possible measures such as health services, incentives for teachers or feeding programme could address certain Personal Conversion Factors (PCF). Environmental Conversion Factors (ECF) such as a lack of materials could be reconciled through efforts to acquire subsidised prices for materials, dispensing of uniforms in poorer areas, and incentives to families to offset opportunity costs of lost labour and adequate infrastructure. Social Conversion Factors (SCF) would require staff, parents, and community engagement in order to restructure social practices at school (such as corporal punishment or redressing gender bias) (Saito, 2003). If these conversion factors are addressed, subsequently quality education could be achieved.

The above analysis suggests that child-centred education should be promoted for the development of all the capabilities of children and to eliminate the lacuna which persist in system. This gap should be understood with the help of conversion factors. The intrinsic aim of educational policy should be to expand people's capabilities; whereas need to use the right discourses strategically, that is, when they are likely to contribute to expanding people's capabilities. Many crucial issues emerge when we see the relationship between CA and education. Is there need

to develop a core curriculum for children for enhancing their capabilities? Are our teacher training institutions are competent enough to generate this core curriculum? There are many more questions in order to enhance quality education. In order to make education more qualitative and effective many approaches have been adopted and adapted for example: discussion method, dialogue building, storytelling, and information and communication technology (ICT) techniques, etc.

Patanaik (2012) argues that the removal of a cartoon can scarcely be held to constitute a violation of "freedom of expression" and reveals that the first lesson of a democracy will be deconstructed if pedagogy is dictated. Hence for improving quality of education included in democracy is needed because democracy is intimately connected with public discussion and interactive reasoning (Sen, 2005). Why is the private lobby silent on this quality pedagogy issue? Many questions overwhelm the public when quality concern comes to education. Hence these questions should be resolved if quality education is to be provided in schools.

To resolve the quality issue, relevance and philosophy of education can play significant role because philosophy provides deeper thoughts. Thus teacher educators should be trained in the philosophies of education which will give birth to liberal thinking and thought process to understand the issues more profoundly. Here universities and

institutions, which are working hard to establish Master of Arts in Education, need overwhelming appreciation.

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**WEST MEETS EAST:
A TEACHER EDUCATOR NEGOTIATES THE EDUCATIONAL DIVIDE**

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Abstract: *This paper highlights the significant strategies and approaches found effective in teaching English writing to Chinese doctoral students at Peking University (PKU) during the academic year 2011-12. In this study, a veteran American teacher educator aligned her instruction with student-centered methods rather than with the traditional teacher-centered instruction of China. Despite the many differences in cultural and educational approaches between the United States and China, PKU students responded well to the constructivist practices introduced to them. Inquiry, peer response, and self-reflection enabled students to take ownership in their learning and discover their voices in writing that was meaningful for them. This study illustrates how best practices can be tailored to the context and needs of both students and teachers. Such practices are adaptable across cultures, providing bridges between educational systems that may be politically and philosophical contradictory.*

Key words: constructivism, student-centered practices, writing, China, English learners

Introduction

The profession of teacher education demands that we keep current about the research on best practices. Yet how many of us are given the opportunity to examine and confirm those practices in a country and culture so different from our own? Furthermore, are the practices we consider best for our own educational settings universally applicable?

Teaching English in Beijing at Peking University (PKU) for the academic year 2011-12 reconfirmed much of what I know about effective teaching while also challenging some of my preferred practices. Hired as an expert foreign English teacher with American proclivities, I was expected to provide my Beijing students with an Americanized educational experience. That expectation gave me permission to instruct as I preferred with the hope my students would be able to adjust their learning styles to my instructional style. However, foundational to effective teaching is utilizing students' learning preferences in order to help them succeed. Negotiating the territory between my entrenched way of teaching and their

accustomed ways of learning would be critical if we were to have a successful year.

Three practices in particular provided a framework to negotiate our differences: (a) learning to construct knowledge together (Brooks & Brooks, 1999), (b) adopting a strategic approach to language acquisition (Graham, MacArthur, & Fitzgerald, 2013), and (c) inviting personal connections with the reading and writing we pursued (Olson, 2010). However, none of these practices was familiar to my Chinese students. Such pedagogy was, in fact, the antithesis of their experiences of what happens in classrooms and the roles we assume as teachers and students. The first few weeks of my teaching would prove important in establishing routines and methods suitable and acceptable to all of us.

**Western Constructivism Meets Eastern
Traditionalism**

Over the thirty years of being a teacher educator, I have come to appreciate "isms" that help define what I philosophically value and try to put into practice. One of

these is "constructivism," a term used to describe one theory of how we learn: we consider what we think we know in light of new knowledge gained via inquiry, discovery, application, and reflection. In a constructivist classroom, the teacher facilitates students' exploration of ideas, theories, concepts, and texts by guiding questions or posing problems for consideration. Together as a community of learners, teacher and students "construct" possible scenarios, solutions, or perhaps more questions that enlarge their initial understanding or that clarify previously held misconceptions. The classroom becomes a lab where the process of learning itself is examined and multiple viewpoints considered. Student input and inquiry are not only invited and valued, but expected (Brooks & Brooks, 1999).

In preparing to teach at PKU, I wondered how such an "ism" might play out at a prestigious Chinese university with China's most outstanding graduate students, educated entirely by direct instruction, teacher-dominated discourse, and rote-learning. They were masters of memorization, recitation, test-taking, and following their teacher's every word (Vernezze, 2011). Perfecting these behaviors had given them access to the "Harvard" of Chinese universities. Although highly literate and intelligent, these students would be unaccustomed to asking questions of their professor and reticent of sharing their thinking with peers. Was it possible to create a student-centered classroom with pupils so unfamiliar with this model? What would be their response, and what adjustments would I have to make to my teaching?

To prevent a hostile take-over (either mine or my students'), I reviewed what I know about initiating a non-threatening climate for learning: find out what students already know and can do and "seek to understand before being understood" (Covey, 2004).

With the aim to establish trust and mutual regard, two essential characteristics of a constructivist classroom, I used the following methods the first day of class:

A PowerPoint presentation. What? In a student-centered classroom? It seems anathema to the goals of interaction and mutual exchange. In truth, I have never been a PowerPoint instructor. However, my Chinese students were expecting a formal presentation. I could use their expectation to my benefit. The PowerPoint would be an acceptable medium to them, and I could use it effectively to introduce less familiar interactive activities (note: I would continue to use a weekly PowerPoint that was both informative and interactive. Students appreciated being able to see and read the English I was speaking and to review posted PowerPoints after class; this medium proved effective on many levels).

Through that first PowerPoint, I introduced myself by way of five personal statements that I hoped would bridge our cultural differences: (a) I was born and raised in the state of Utah, home of the 2002 Winter Olympics; (b) I married my husband five weeks after our first date; (c) We have four children (all sons!) and eight grandchildren (all boys!); (d) This is my first time in China; (e) I love fresh chrysanthemum tea. These statements helped us connect through shared values (the Olympics, marriage, sons, tea). Students had to guess which statements were true and which were false. Once they had written their assumptions, I showed pictures of my state, home, family (two sons & two daughters), my first trip to China, and me drinking herbal tea. Through these pictures, students verified the truthfulness (or not) of my statements. My self-disclosures also modeled their first in-class writing assignment. In small groups of four and using English as much as possible, students wrote and shared their own five statements and peers guessed

which ones were true or not. There was a lot of laughing and smiles as students exchanged their statements. But more than a successful ice-breaker, the activity established the behaviors of a constructivist classroom – student participation, inquiry, sharing, and mutual regard. In addition, students wrote enough English for me to pre-assess their ability to write clear sentences about information they already knew.

A student survey. Surveying students upfront has many advantages if designed purposefully. The data from all 140 of my students provided information about where and how they practiced their English, if they were currently using their English in their research studies, what fears they had about taking an English class from an American, and what genres they were interested in writing. I summarized the data and shared the results with them the next week. Thus began their sense of how I would use their input to decide goals and strategies based on this background information.

A timed writing exercise. I initiated the first exercise we would practice each session – a non-graded, timed quick write or free-write (Elbow, 1998). Such writings develop fluency because students must keep pens moving the entire time (usually 7-8 minutes) without stopping to correct a word or consult their electronic dictionaries. For each quick write I offered several topics to choose from in order to encourage self-selection. I discovered that having choices to write about was not an aspect of my students' past writing experiences, so students initially struggled with options. Quick writes would also become the vehicle for sharing and improving reading fluency as well as initiating discussion. Danling Fu, a native Chinese speaker and ELL professor at the University of Florida, concurs that starting with writing as a means to develop reading and speaking

fluency is an effective way to improve these three skills in language acquisition (Beers, Probst, & Reif, 2007, p. 119). However, these initial quick writes were difficult and frustrating for my students who had not practiced English writing for years. They were demonstrably reluctant to share them publicly until they had become more fluent and felt comfortable with their classmates. Postponing the sharing relieved their anxiety without lessening the impact of the exercise.

Still, in these first two hours of class, the practices introduced began to foster the values and behaviors I hoped to establish. I had managed to keep teacher-talk to a minimum and let student input govern the time. My students' positive responses encouraged me; they had willingly dipped their toes into strange water, so to speak. Warming to that water over the next few months, most would become immersed in the invigorating challenges of constructing knowledge together. Peer reviews, collaborative presentations, panel discussions – these methods would become acceptable to them not through my insistence, but through thoughtful scaffolding and continued negotiation on my part.

Strategic Writing Meets Scored Writing

Answers to my survey informed me that my Chinese students had started learning English as early as first grade, if not earlier. They had much more experience reading and listening in English than in speaking and writing it. That was because they concentrated on those aspects of English that would be tested and scored for advancement. Eighty percent of the English exams they took each year emphasized proficiency in reading and listening with 20% or less devoted to writing proficiency. Also, English writing is introduced at a much later stage than the other skills under a mistaken belief that reading, listening, vocabulary, and

grammar skills will make writing happen automatically. Their writing consisted of short paragraphs on assigned topics, from which many phrases (if not entire texts) were memorized to recall for the test. Richard (his chosen English name) aptly describes the consequences of such practice in his portfolio final:

When the test was over, nothing remained – no useful sentence lasting very long, no powerful skill accumulating in my mind, no real feeling worth cherishing, and worst of all, no meaningful intention to write any more. Honestly, no matter how much score I got in a test, I would not touch the pen of writing again until I had to face the next examination.

Furthermore, many students had not had an English class since high school or early college, often creating a four-to-six year gap in their English language development. Now, their graduate studies mandated a single course in English writing and one in oral communication as refreshers in order to compose and present professional reports at international conferences where English was the universal medium.

Knowledge gained from the survey convinced me to design a writing course that emphasized strategies rather than correctness. Writing or speaking perfect English would be an impossible goal for even the brightest of these students. Getting them more confident with their English, however, seemed possible. Also teaching them strategies that they could apply to multiple writing genres across content disciplines seemed a reasonable approach in the 16 weeks we had together.

In *Strategic Writing*, Dean (2006) argues for teaching students to become consciously aware of the strategies that promote their best writing and to intentionally select those strategies when composing. Such an approach focuses more on writing as choice-making rather

than writing for correctness. It requires thoughtful consideration of the purpose, audience, and context that drives the discourse (Dean, pp. 4-7). Such an approach, however, seemed alien to the way my Chinese students thought about their English writing. When asked what they most wanted to learn in writing, many students answered "to write beautiful sentences" and "to not make any mistakes." Clearly, these students' priorities included errorless papers, a goal which often paralyzed them to take risks in their writing. Again, we faced a needed paradigm shift. Would it be mine or theirs?

An early discussion about what constitutes effective writing proved enlightening; many students thought that good English writing meant long sentences with large vocabulary words. To them, the structure of a sentence was more important than its clarity, appropriate word choice, emphasis, or contribution to the overall text. Their misconceptions about effective English writing stemmed from their past writing exams that rewarded complex sentences and multi-syllabic vocabulary (as do popular computerized scoring programs in America). My student Ben explained, "Many teachers told us that we should use long sentences, because teachers who review our essays would give us higher marks."

Once these misconceptions were uncovered, I introduced the idea of taking a strategic approach to their writing. Choosing this approach would require selecting strategies that were accessible and applicable to multiple rhetorical situations. Focusing on strategies rather than surface errors would generate more and better writing. When properly applied, they would improve students' writing, and that improvement would be visibly apparent.

I chose two key strategies to practice initially: annotation and summarization. Annotating texts together began our observation of the choices writers make and how these choices affect the reader. Annotation also allowed my students to note what English they understood and what English confused them. Individual annotations revealed the idiosyncratic ways we read and introduced them to reader response as a way into textual analysis (Schweibert, 2004).

Summary writing is a strategy these graduates should have been practicing, but more often than not, their summaries tended to be paraphrases taken directly from the texts they were using. In the People's Republic of China, plagiarism is not a concept that fits their culture. Knowledge is considered community-owned, so copyrights to printed material are dismissed or ignored by individuals and society as a whole. Of course, as an American trying to prepare them for international conferences that expected adherence to copyright, I could not accept plagiarized writing. Arming students with a strategy for writing original summaries became paramount to both their English language development and their adoption of international expectations regarding authorship.

Once these two strategies were in place, I added one new strategy per week to their arsenal. Some of the more successful were Noden's (1999) syntactic brushstrokes, which metaphorically compare to the strokes which form a Chinese character. Luminous reflected about these strategies. "Using these brushstrokes to write is much like you had a wonderful pen to paint. You can organize your sentence in a more flexible way. It is magic! The brushstrokes are the colors that make your paint look more colorful and rich."

Personal Connections Meet Public Personas

Chinese students are not used to being asked their opinion by professors. They are taught to honor the expertise of their teachers and the views of their texts. However, when they become graduate students, they are thrust into a climate that demands they contribute original thinking to the academic discourse of their major. They must move beyond the theories and findings of others to discover new propositions, knowledge, and applications. Yet, they have had little practice thinking beyond the obvious, questioning the status quo, or acknowledging the contribution of personal investigation and reflection.

In addition, most PKU doctoral students spend 10-12 hour days in their discipline-specific labs, pouring over research in their fields, worried how they will ever contribute to the body of knowledge already available. It seems a daunting task, particularly difficult for first and second year students. Comfortable with conformity and often feigned aloofness, they tend to assume a public persona in the classroom that shields them from voicing their fears, grappling with ambiguities, or trusting their own intuitions and creativity. The added language barrier that English creates can restrict them even further when they attempt to communicate personally or creatively. Richard, in his portfolio introduction, points out this problem:

In China, most materials for English education, in order to be suitable for examination, are mainly about facts, such as an introduction of a city, a scientific process, a tale of human history. The words and sentences we learned, especially the usage of them, are seldom helpful to us in expressing our feelings, as it is not necessary for testing. As a result, what we learn and what we write always lacks emotion, or worse, is without soul.

Under these circumstances, selecting genres for my writing assignments became a challenge. I could take the practical and expected route by choosing genres typical of academic writing: proposals, abstracts, analytical essays. Or I could expose students to genres that beg writers to express a creative perspective or narrate from personal experience. What if I offered them choice of genre in which to practice the strategies I introduced? Would any of them choose the genres requiring personal connection, introspection, and creative expression?

In way of compromise, for shorter papers of 3-6 paragraphs, I assigned topics that leaned toward experience, observation, or opinion. For lengthier, substantive papers of 600 words or more, I offered a choice between traditional academic genres or creative, artistic ones. I came to this decision after reading the students' first short paper which asked them to write about their name. To expose them to the personal short essay, we annotated an excerpt from Sandra Cisneros' *House on Mango Street* about the narrator's name and my own essay about my name. This topic proved to be one that initiated much interchange, inquiry, and awareness of cultural differences. My students were surprised to find that American names are often generational in which children receive a part of their father's or mother's name either as middle names or first names. In my culture, this tradition honors family members. In theirs, however, naming a child after a parent or a relative is considered extremely disrespectful.

The name essay also served a diagnostic purpose. Some students felt comfortable expressing a personal response to their name as modeled in both the Cisneros' essay and mine. Such responses had voice, interest, and energy; but other students struggled for enough to say, were repetitive and void of originality or used borrowed language from historical

sources. Clearly, those willing to risk a personal view or experience were at an advantage in these shorter papers. Offering genres that required an objective, less emotive voice for the longer essays would level the playing field for my close-to-the-vest writers.

Working on description, narration, and point of view throughout the semester helped most students become more comfortable expressing personal voice in their writing. The final essay stretched them even further by asking them to imagine a new concept of time, describe how it would operate in their own lives, and imitate the stylistic features found in Alan Lightman's *Einstein's Dreams*. This essay required them to conceptualize time in a different way, building an argument through description, narration, illustration, and summary. Again, I offered a more traditional alternative assignment that required them to read two English essays about an issue of interest and then build their own argument about the issue. Evidence could come from a variety of sources but had to be properly documented and cited. Only 25% of the students selected this option. The rest ventured beyond their comfort zones and were delighted with the results. They eagerly exchanged their essays, intrigued by the time worlds their colleagues had imagined. While admitting that this was their most difficult assignment, many acknowledged it was also their favorite.

Results

With so many variables and no controlled study, it is difficult to prove that the course's effectiveness resulted from a strategy-based, student-centered pedagogy with an emphasis on making personal connections to writing. But if students' final essays analyzing their progress serve as evidence, their noted improvements most often credited specific strategies: peer feedback, options to write with

personal voice, and teacher suggestions for revision. Many students stopped lamenting their mistakes and began valuing additional kinds of feedback besides edited corrections. Richard's conclusion about trial and error showed a definite attitude shift. He wrote,

The first time when I heard Professor Butler encourage us to make mistakes, I was shocked. But when I think twice, I realize it is absolutely right: if I fear making mistakes, I will lose the courage and opportunity to overcome them. Specifically, only after the imperfect sentences are written, can I find out what problems are and how to improve them.

Pleased with the speed he had gained in his English writing, Gene noted that his first essay took a week to complete, approximately two hours per day, while his last essay only took 4 hours in one day and received a better grade. He attributed his increased fluency to the quick-write exercises. Jessica gained an appreciation for the contributions of peers, noting, "Terry, Mary, Young, Arthur, and I changed and modified the essays this semester. From that, I acquired much knowledge from different visual angles."

Being able to recognize improvement gave my students confidence and some impetus to continue to practice their English once the course was over. Jackson noted,

I approach my writing more confidently than I have in the past. Because of my past writing capacity, I was afraid of writing. After the writing study from this course, I grasp some useful writing techniques to improve my capacity. My confidence of writing has grown up with development of my writing skill.

The full effects of this English course on my students' future writing are impossible to ascertain without follow-up. However, since returning to teach at my home

university, I continue to hear from students about their gains in their English acquisition. Several have passed the dreaded TOEFL test with high scores, for example. Recently, Frank sent me his 28-page research paper and asked for help revising it. I noted similar errors I'd seen from past papers, but they were few and easily corrected. The technical clarity and evidence he presented were impressive. His English was fluent and professional; with careful editing, his paper would be published.

Implications for Teacher Education

The international opportunity to teach in a country so foreign to my own forced me to reconsider the practices I use and model in my American English education courses. I had to carefully and thoughtfully examine my pedagogy and select methods based on the experience and responses of my Chinese students. I had to negotiate our different approaches to learning in order to build trust within the classroom and establish a community of writers (Elbow & Belanoff, 1999). I had to help students consider the processes and choices they made both cognitively and affectively that contributed to their understanding and application of strategies. I downplayed the traditional error-finding, correction-fixing role in their writing and adopted a strategy-based, facilitative role that promoted fluency, production, and voice. In turn, students moved toward valuing authentic human response to their work rather than a score that gave little, if any, meaningful feedback.

As teacher educators, we need such opportunities in order to refine and reflect on best practices. We must continue to study the effects of our practices on students whose educational experiences have been radically different from our own and be willing to tailor our methods in response to both formal and informal assessments of students' needs and

expectations. In the maze of technological innovation, digital literacies, and heavy emphasis on pragmatic discourses in which our international conversations now find themselves, I urge teacher educators to preserve the human touch, the personal

voice, the imaginative discourse. It was through these avenues that West (me) met East (my Beijing students) and, in order to learn from each other, used negotiation as the best practice of all.

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STRENGTHENING IDENTITY OF TEACHER IN THE WORLD THROUGH ESTABLISHMENT OF A TEACHER SYMBOL

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Abstract: *Recognizing the identity, dignity, and status of teaching profession, a 'teacher symbol' was created to establish identity of Teacher in the global society. It covers various letters, concepts, and interpretations concurrent to teacher and teaching profession in form of script and sketches. The English word 'teacher' considered and manipulated as abbreviation 'Tr' in cursive writing as 'TṚ'. Thus the teacher symbol formed. It covers sketches of teacher and student visualizes full love and healthy student-teacher relationship having 'hands in hands'. Teacher presents as an emotional mother of her own student, where the teacher possess unborn baby in conceptual womb. Various colours are utilized like black, yellow, white, and sky-blue with specific metaphor. It is easy to adapt. It is unique, easily identifiable and can be easily manipulated. It is single line drawing, aesthetic, pleasing, legible, visible, readable, complete, universal identity, and applicable to computer. It is breaking the boundaries of identity of teachers at various disciplines, levels, places, and time. Teachers can find themselves in this symbol and acknowledge the right path of their task. The global society can utilize it for the purpose of establishing identity of teacher in the world. It is useful to create on teachers' identity card, visiting card, name plates, stick on vehicles and honour the teachers through memento. Having such characteristics the teacher symbol is applicable to the teacher and teaching profession in the whole world for healthy progress and development of the global society.*

Key words: unity in teachers, Teacher Symbol, emotional mother, hands in hands

Introduction

The world society is dynamic in nature. It is influenced by the ever demanding field of education. It has been rendering knowledge and showing the right path for its application in life. Education has been bringing desirable changes in the behaviour of the individuals as demanded by society. The formal setting of education is emphasized in society. Here the teachers are playing major role from elementary to higher education.

The teachers are universal in nature. They are rendering major performance of shaping the human society. Their verbal and non-verbal behaviour is creating

the learning environment and strongly influencing the students. So, the teachers and teaching profession are drawing attention of the world. There is a need of universal and unique identity as well as recognition of teachers and teaching profession in the world.

Need of Teacher Symbol

Need of Global Unity among Teachers

The teachers' existence is ever expected in the world for teaching the students. They have to teach in varied forms of disciplines, levels, places, and times of teaching. There are various disciplines like education,



science, humanities, social services, technology, etc. The education or knowledge covers all the disciplines or subjects in an integrated way as well as supplementary and interrelated to each other.

There are different levels or stages of education like elementary, secondary, higher secondary, higher education, professional courses etc. The teachers are teaching the students and mutually depend on efforts of one another. When a student completes his/her own education, efforts of all the teachers are reflected in the behaviour of the student. Effective performance of teachers at every stage of education is needed.

Teachers are teaching in different places like in the world. They perform in a particular context and prepare students. Their learning would not be utilized in that particular context only or pre-decided place. Its utilization may be at anywhere in the world. So, the teachers in various places are not working for their specific context only, but for anywhere in the whole world.

Teachers are performing their tasks of teaching at different times i.e. past, present, and future. Teachers have performed their roles in the past, are performing in the present, and will perform in future. We cannot separate all of these times. Teaching in different times is sequential and cumulative in a chronological order and none can break it at a specific point. Thus, teaching is continuous from the evolution of the human being on the earth. So, there is a need to remove isolation among disciplines, levels, places, and time of education and establish unity among teachers.

Need of Role Perception for Teachers

Teachers are performing their roles in the different manners as they perceive. Apart from being human beings, they should be aware about their specific existence and behave in that manner. They have to acknowledge about themselves and receive recognition and respect from the society as well. There are various ways and means for giving professional identity to the teacher in the world. Establishment of a symbol for identity of the teacher will be unique and wonderful. There are various organizations and professions having their specific visual identity in the form of logo, symbol, motto statement, words etc., which are unique in the society and can establish unity in own endeavour.

In concern of status of teachers UNESCO (1966) recommended, "The status of teachers should be commensurate with the needs of education as assessed in the light of educational aims and objectives; it should be recognized that the proper status of teachers and due public regard for the profession of teaching are of major importance for the full realization of these aims and objectives." (p. 4). In this concern a 'Teacher Symbol' has been developed and offered to teachers and teaching profession to establish identity and recognition in the world utilizing different concepts concurrent to concept and role performance of teacher.

There are very few efforts found in the development of the teacher symbol in the world. The authors found Japanese teacher symbol in Kanji fonts '先生' (Sensei) and Chinese teacher symbols '老師' (Laoshi) as well as '师' (Shi1). These symbols are nation specific and containing very few concepts of teachers and teaching profession. They are fulfilling very less characteristics of being a symbol. So, there is need to develop a teacher symbol, and the creators have done a conscious attempt to create it.

Creation of Teacher Symbol

The symbol creators/designers have made a conceptual journey and created a 'Teacher Symbol'. They have collaboratively thought and discussed various aspects of the concept of teacher, the teaching profession, and criteria of a symbol. It was originally created on paper after many attempts, and then a symbol was formed. They then created it on the computer using Paint, Photoshop, and CorelDraw. As a result, the Teacher Symbol has evolved.

English Language

English word teacher. The English language is at the first rank as per the number of speakers in the world as an international link language. The English word 'teacher' also has worldwide universal identity and usage. The designers of teacher symbol have taken it into consideration and derived at its design philosophy from English language of the Latin script and the word teacher.

Manipulation of teacher as 'Tr' in cursive writing. This word manipulated as abbreviation considering the first letter of the word 'T' and last letter 'r' in a short form as 'Tr'. The doctors are using 'Dr.' and engineers using 'Er.'. So it may happen with teachers as Tr. for their identity as a teacher.

The abbreviation 'Tr' created on paper in English cursive writing as '℄', where the '℄' is 'T' and '℄' is 'r'. The derived symbol is acceptable for the world society. The symbol is breaking the boundaries of languages in the world because it can represent any language.

Attachment between Teacher and Student

Honour of teacher by student. The teachers educate students for their

wellbeing; whereas, the students follow the teacher. The student honours and respects the teacher through leaning or bowing towards teacher. The teacher also tries to make the student stand up. The student bowing towards the teacher does not mean to be insignificant, but is receiving education only. The teacher also blesses student for wellbeing. This concept is also covered in this symbol. One can visualize it in this symbol '℄' and its two sketches of both of them as the sketch '℄' as student and '℄' as teacher. This symbol stands for whole system of education as well as applicable at its every stage.

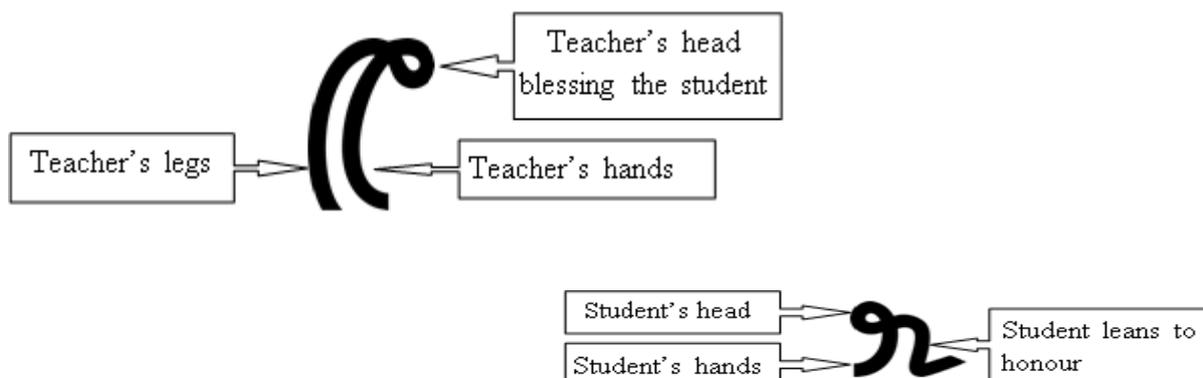
Holding hands to uplift. With observation of the symbol, one can visualize the teacher and student hand in hand at the middle and bottom of this symbol. It indicates healthy relationship and attachment between teacher and student. The teacher expresses affection to the student and does not let the student lean, but makes the student stand up with supports of the teacher's own hands. This interpretation exhibits full love and healthy student-teacher relationship in this symbol. The teacher and student holding hands at the bottom of the symbol means the student is at a specific level, and the teacher reaches to that level and provides education.

The 'hands in hands' has another interpretation as both of them have a give and take relationship. The teacher provides learning experiences to the student; whereas, the student also provides learning experiences to the teacher about what, when, and how to teach. So, exchange of learning experiences also exists in this symbol.

Gravitational pull. The teacher and student move in the world for their own deed. Whenever they move alone, they move being straight, while they assemble to each other, there occurs a gravitational

pull. Both the teacher and the student affectively attract towards each other and due to such attraction and gravitational

pull, they lean to each other. It is also being visualized in this symbol.



Unborn Baby in Womb of Mother

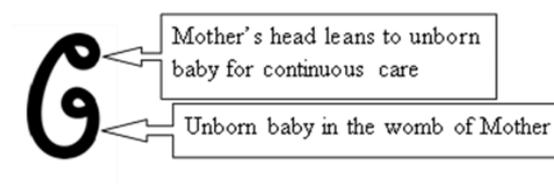
Teacher as an emotional mother.

Teacher is just like a mother and student is a fetus in her womb at the time of learning. The mother takes care of her unborn baby in her womb. She takes care of her own diet and thoughts for the sake of baby. She lives in the company of holy atmosphere; holy and personality-oriented literature and music and retains a pleasant mood. In the same way the teacher is an emotional mother for student, and the student is in the conceptual womb of teacher during the process of education. The teacher takes nutritious and good food in the form of reading books, discussion with others, and utilizing available resources to learn and strengthen teaching; preserves her own mental and physical health for the sake of student's wellbeing; takes part in seminars, workshops, training programmes, projects, research works etc.; and takes prescriptions from the experts, educationists, literatures, research, etc. for the betterment of the student.

Consciously or unconsciously the unborn baby in the womb of a mother is at the centre in thoughts, speech, and action all day and night. Even she takes more care of her own for the promotional stage of baby

to getting birth. In the same manner, teacher is also conscious about own thoughts, speech and action all day and night for better learning and promotion of students to the proceeding stage. Even the teacher takes care of own behaviour in presence of student as well as in their absence too.

Conceptual birth to child. Mother cares about the child and after a period of time – around nine months – a baby is birthed with enough growth and development. Teacher also takes care of student's all-round development and after a period of time, the student proceeds to a promotional stage. At the time of completion of the grade/standard/year in around ten months or one year, the student is emotionally birthed. So, the teacher is an emotional mother, and student is an unborn baby in teacher's conceptual womb. It is also exhibiting through a part of this symbol in a sketch 'G' of an unborn baby in the womb of a mother.



Teacher symbol in Colour and Circle

The teacher symbol has been given colours and circle. The colours utilized are black, yellow, white, and sky-blue, each with a specific meaning. (See complete symbol on the first page of this article.)

Black colour. The teacher symbol is in black colour, which is common to other types of symbols. The black colour is appropriate for white background paper.

Yellow colour. The yellow colour is metaphor of knowledge. The yellow colour is in the head of the teacher, which reveals that the teacher's head is full of knowledge, and it is oozing towards the student.

White colour. The white indicates emptiness, purity, and containing seven colours i.e. violet, indigo, blue, green, yellow, orange, and red. The student's head or mind filled up with white colour. It means the student's head is empty. The emptiness does not mean nothing is there in student's mind. It has the knowledge of entry level; it has the space for receiving new knowledge. Having eagerness, it is ready to receive and bear the knowledge oozing from the teacher's head. Apart from it, the white colour is the colour of purity, and the student is ready to grasp knowledge with purity of mind. There is another meaning also as the white colour contains seven colours, which interprets as various fields of education.

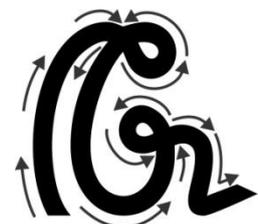
Sky-blue colour. The sky-blue colour indicates broadness as well as colour of Globe visualizing from space and colour of sky/space from the globe. It means teacher and student exist everywhere on earth as well as in space, and both of them are universal in nature. The teacher and student in sky-blue colour indicate entire relationship between them in wide range of openness with broadness of mind.

Circle. The circle indicates shape of Earth and boundary in the form of society. The teacher symbol is in circle, which tells that the earth is full of teachers. The circle represents the society; it means human society as well as every types of society on earth have teachers and students. The process of education is going on in the whole world, so the whole world or globe is full of teachers and students.

Easy to Adapt as a Symbol

Covering the concept of teacher. This teacher symbol is covering and containing all the concepts of teacher's role and teaching profession. All the human being of the world can recognise it quickly and identify easily with visualization of the expected behaviour of teacher.

Easy and aesthetic single line drawing. The symbol is created with a continued up and down curved line design in two directions as a freehand drawing. The curved line of symbol has three bases and the first base i.e. teacher's legs are firm and stable, which is balancing the other two bases. It is an effortless design of the symbol. To create this symbol, one has to draw in a left- to right-hand direction as shown in the picture. Its shape is very easy to reproduce on paper because it is in a single line, and one can manipulate without lifting pen from the paper. They can recall it with easiness because of its recognition and visualization, and can represent it at ease. In this sense it is very easy to adapt. In this consideration it fulfills the characteristics and criteria of being a symbol. It bulges in two directions and looks beautiful, aesthetic, delightful, and attractive with possession of the concept of teacher.



Inverse colour and small sizes. The inverse colours of the symbol are also effective. One can create black coloured teacher symbol on white background as well as white coloured on black background. Creation of its smaller size is also possible. Such smaller size of this symbol is also identical.



Establishment of Unity among Teachers

The teacher symbol breaks the boundaries of teachers' identity in terms of disciplines, levels, places and time and establishes a common platform for all teachers. It brings equality among all teachers as well as all the human beings of the world. It is applicable to all the teachers of the world. In this manner it is supporting the globalization on this earth.

Answer of 'Who Am I?'

The 'Teacher Symbol' containing the concept of teacher and teaching profession. When any teacher observes this symbol, one can accept it and find oneself in it. If teachers are duly performing their duties, then the symbol will attempt to satisfy and strengthen the teachers' performances and carry on the roles. If they are not and are consciously or unconsciously missing some behaviour, then teachers will acknowledge and modify through their observation of this

symbol. Thus, this symbol is expressing about the teachers' role performance and utilizing to get to the answer of 'Who am I?'

Implementation

This teacher symbol is neat and legible to reproduce as same or smaller sizes. It establishes association and relationship with other professions across the globe. It can be used as computer fonts. It is applicable to draw, print, or create for different purpose. Educational organizations can utilize it in their own logo as well as on their letterhead and on the identity card of teachers. For own identity teacher can draw it easily instead of writing the word 'teacher'. They can use it as their initial as '.'. They can create or stick it on their name plates, visiting cards, vehicles etc.

The education society in specific and world society in general can honour the teachers through this teacher symbol created on Memento. They can honour individuals other than the area of education also in this way for their best services for education.

The message of 'Teacher Symbol' is available on website-
<http://teachersymbol.webs.com>.

Conclusion

Recognizing the identity, dignity and status of teaching profession, a humble attempt has been made to establish identity of 'Teacher' in the global society. The teacher symbol possesses various letters, concepts and interpretations concurrent to teacher and teaching profession. It is communicating the message of 'Teacher' with different interpretations in the form of script and sketches. The English word teacher, sketches of teacher-student, teacher as an emotional mother exists. The colourful creation is possible with right

interpretation. It is single line drawing and aesthetic. It is very easy to create, interpret, and adapt. It is establishing direct relationship with the role of teaching profession. It is unique, easily identifiable and can be easily manipulated. It is aesthetic, pleasing, legible, visible, readable, complete, unique, universal identity, and applicable to computer. It is breaking the boundaries of identity of teachers at various disciplines, levels,

places and time. Even the teachers find themselves in this symbol and acknowledges about right path of their task. The global society can utilize it for the purpose of establishing identity of teacher in the world. Having such characteristics the teacher symbol is applicable to the teacher and teaching profession in the whole world for healthy progress and development of the global society.

Reference

UNESCO. (1966). *Recommendation concerning the status of teachers*. Retrieved from www.unesco.org/education/pdf/TEACHE_E.PDF

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