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Articles

From the editor

As the editor of JISTE, I am glad to welcome professor Peggy J. Saunders, Weber State University, USA back on board as our experienced Associate Editor. Peggy Saunders previously held the position as associate editor of JISTE from 2011-2016. The former Associate Editors, Leanne Taylor and Vera Woloshyn, both from Brock University, Canada wanted to step down after finalizing the previous issue of JISTE. They have worked extensively, contributing an immense amount of time to the work of JISTE, for which I am very grateful. They agreed to review and edit one of the articles in this issue as well. As the editor of JISTE, I would like to thank Leanne and Vera for contributing to raising the standard and content of the individual articles and the issues of the journal.

I would also like to thank Peggy for her willingness to move into the Associate Editor position again. This allows us to maintain the standard of the journal as an internationally accredited, and respected journal on educational issues, and to ensure that JISTE continues to be well-served.

Finally, I would like to thank the many reviewers who have contributed with several and repeated reviews on the submitted articles for this issue. We are grateful for the active support from scholars from all over the world, members and non-members of ISfTE who have spent their time and used their expertise to review the manuscripts.

Editor of JISTE,

Karen Bjerg Petersen, Denmark

About This Issue – JISTE 22.1
Education: Teaching and Learning for the Future

By Karen Bjerg Petersen
Convener of the 2017 Denmark Seminar
Editor of JISTE

Most of the articles in this edition were originally presented in paper groups at the 2017 seminar of the International Society for Teacher Education, which was sponsored by the Danish School of Education, Aarhus University, Denmark. The convener and members of the organizing committee of the 2017 Denmark seminar, held in the city of Aarhus, were the present editor of JISTE, the long-time ISfTE members, Karen Bjerg Petersen, Lotte Rahbek Schou, and an ISfTE member since 2016, Hanne Balslev Thingholm. Many other persons played important roles in helping us to arrange the seminar in Denmark. As convener and members of the organizing committee, we enjoyed seeing the fruitful discussions and activity in the paper groups and the interest and engagement of the participants in the local cultural and social program.

Former and future hosts of the ISfTE seminars acknowledge that the position as a convener of the yearly seminars is very work intensive and lasts for more than two years before the seminar. During the seminar, the activity of the convener and organizing committee is even more demanding. Nevertheless, it was a great pleasure to organize the seminar in Denmark and to introduce the local environment of education and culture for the global audience of ISfTE delegates, friends, and members. I am sure former and future conveners agree with me that the work spent for arranging a yearly seminar carries the reward in itself.

The focus of the 2017 seminar is reflected in the theme of this issue of the *Journal of the International Society for Teacher Education* – JISTE 22.1 – entitled *Education: Teaching and Learning for the Future.* The authors in this issue address a multiplicity of topics. The titles and content of the articles evidence how many various aspects of education that teaching and learning researchers and teacher educators are facing throughout the world. The articles witness the continuous engagement, representative for ISfTE members, dedicated educators throughout the world and demonstrate a deep interest in the development of education, teaching, and learning for the future.

PROBLEM-BASED AND SCHOOL-TYPE AS CONTRIBUTORY FACTORS TO THE SENIOR SECONDARY SCHOOL STUDENTS' PRACTICAL SKILLS IN CHEMISTRY

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Abstract: *The study assessed effects of problem-based learning approach on senior secondary school students' practical skills in chemistry and the role of school type as a moderating variable. A pretest, posttest control group quasiexperimental setting with non-equivalent groups design was adopted. A total of 124 students (54 from coeducational and 70 from single-sex) of federal government colleges in Lagos and Oyo states of Nigeria participated in the study. A 33-item Chemistry Manipulative Skills Scale (CHEMMSS) with Cronbach alpha of 0.87 was used along with the treatment manuals as instruments. Findings show that students exposed to problem-based learning approach performed better in practical chemistry than those taught using conventional method. The result also revealed that students from single-sex colleges had higher mean score gain in practical skills in chemistry than those from coeducational colleges. Chemistry teachers are therefore enjoined to adopt problem-based learning approach in the teaching of practical chemistry and that teachers in coeducational schools should motivate and encourage their students so as to benefit meaningfully in the approach.*

Keywords: problem-based learning, chemistry teaching, school type, practical skills

Introduction

Chemistry is a branch of science which teaches about elements as the constituents of matter, their existence, and their interactions. These interactions manifest in what is seen today as new discoveries. The Nigerian National Policy on Education stipulates that education should aim at producing self-reliant citizens through innovations (Federal Republic of Nigeria [FRN], 2013). So, educational activities should be centred on the learner for maximum self-development, self-fulfilment, and self-confidence. Secondary education has its contributions to achieving this through its comprehensive core curriculum which includes chemistry as an almost indispensable subject towards the development of science and technology. It has been identified as one of the veritable tools for solving socio-economic problems as it contributes immensely to both individual and national development (Adewunmi, 2006; Akinola, 2007; Williams,

2003). Chemistry, being an experimental science, is full of activities which enhance the acquisition of certain skills and competences that can make an individual become scientifically literate and self-adaptive.

Through adequate exposure to practical exercises, discoveries are made, and new things are invented. The practical nature of chemistry cannot easily be overlooked because it even enhances the understanding of the theory aspect of the school subject and builds up manipulative skills necessary for cognitive development. The examining bodies in Nigeria such as West African Examinations Council (WAEC) and National Examinations Council (NECO) emphasize this importance of practical chemistry and apportion a remarkable part of the overall candidates' scores in their examinations, 25% and 24% respectively to practical chemistry (Osokoya, 2015). Despite this, there has been a continuous underachievement and low performance by the students in practical

chemistry over the years. The chief examiners' reports from 2004-2010 continuously had comments such as: "inadequate and insufficient exposure of students to practical exercises; inability to link theoretical knowledge with actual practical work; inconsistent burette readings; inadequate knowledge of the properties of common salts, etc." as some of the weaknesses observed from the students' performances (WAEC, 2013, 2014). The general performance of students in this aspect of chemistry has great impact on their success in the subject.

Research studies have revealed major learning difficulties in practical chemistry, and the main causes are insufficient qualified teachers, ill equipped laboratories, students' study habits, and students' attitudes among others (Adesoji & Olatunbosun, 2007; Ezeasor, 2003; Osokoya & Opateye, 2009). It is believed that many of the difficulties in learning and understanding chemistry in general and practical chemistry in particular are caused by how instruction is passed across to the learners. Methods of instruction such as problem-solving techniques, laboratory skills method in practical skills teaching (Sikiru, 2004) had been used to teach practical chemistry in order to enhance the performance of students but not much improvement was noticed.

Problem-based learning (PBL) is a student-centred method based on the principle of using a problem as a starting point for the acquisition of new knowledge (Vasconcelos, 2010). PBL is also an investigative approach whereby learners in their small groups are needed to proffer solutions or suggestions to tasks or problems in their environment using acquired or current knowledge in chemistry. PBL originated in the 1960s at the medical school at McMaster University, Hamilton, Ontario, Canada and has since diffused into many other professional fields including education, law, economics, architecture, chemical, and civil engineering. In education, aspects of the approach were applied to K-12 classrooms by Bruner, Dewey, and Piaget among others as early as the 1920s (Dochy, Segers, Van den Bossche, & Giejbels, 2003). Paige and Smith (2013) required nursing students' collaboration to develop strategies to resolve problems, consider alternative solutions, and justify their solution to others. One of the benefits of PBL strategy is the potential to enhance retention and recall concept learned. The approach aims to bridge the gap between the stated problem and various solutions by using what has been learned previously and being learned currently to solve the prevailing pressing need and thereby learn more. In other words, PBL approach requires that the learner uses the previously learned principles together with the presently taught or discovered facts to figure out solutions to the problem at hand in academics or real-life situations (Chukwuka, 2006; Orji, 1998).

PBL is an active learning strategy which gives students opportunities to become aware and determine their problem-solving abilities and learning needs thus making knowledge operative and perform in group work especially when faced with real life problem (Akingolu & Tandogan, 2007). The students become each other's teachers and make use of self-selected resource materials such as textbooks, journals, and libraries' online resources and discuss more among one another than in the traditional classroom settings (Vernon & Blake, 1993). The lack of problem-solving abilities of students has been identified as one of the reasons for students' poor performance in science, especially when the question required application of skills to answer (Adewale, 2002; Akuche, 2007). As earlier stated, PBL is student-centred and activity focused; therefore, practical work thrives more in it as it encourages students' participation. Students' ability to handle different apparatus for practical chemistry counts a lot because they would not know how to use these apparatuses if they were

not exposed and allowed to use them adequately enough to establish mastery. It should also be noted that the teaching of practical chemistry focuses on the development of appropriate skills, abilities, and competences related to the psychomotor domain of the student. The objective of this aspect of chemistry study synchronizes with the purpose of self-reliance advocated in the national policy on education (FRN, 2013). As the cognitive and the psychomotor aspects of the child are developed, the affective would naturally be motivated to give the child self-confidence in handling challenges and interest in the study of practical chemistry. This study, therefore, investigated the effects of exposing chemistry students to the use of the PBL approach on their learning outcomes.

In Nigeria, there are two categories of schools: same/single sex school and coeducational school. These categories or arrangements may influence learning outcomes because there might be some characteristic behaviours exhibited by students in same-sex schools that may not be prominent in coeducational set-up and vice versa. It is pertinent to note that the influence of gender is always considered important in the process of learning and has been proved by various studies to be a strong predictor of human behaviour (Mbah, 2003; Onuebunwa, 2000; Tatarinceva, 2005). Attitudes, behaviours, and achievements of males and females most times differ towards different subject areas or fields of study (Adeagbo, 2004; Adeyinka, 2005). Various research works have been carried out to ascertain whether there are disparities in the academic performance and behaviours of students in single-sex school and those in coeducational school settings (Butler, 2000; Chanlin, 2001; Collins, McLeod, & Kenway, 2000; Webb & Macdonald, 2007). Mulholland, Hansen, and Kaminski (2004) compared performances of students in single-sex and coeducational schools. Their analysis demonstrated that both boys and girls who were educated in single-sex classrooms scored higher than boys and girls in coeducational settings. The report also speculated that boys and girls in single-sex schools would behave better, find learning more interesting, and the curriculum more relevant than their counterparts in coeducational schools.

Consequently, there seems to be some peculiar challenges inherent in same-sex educational set up that never occur in a coeducational setting, which are capable of affecting learning. Hence, the inclusion of school type as a moderator variable in this study and assessment of its effect on learning outcomes in practical chemistry.

Statement of the Problem

Chemistry, though an experimental subject, is generally being taught and learnt theoretically in most schools in Nigeria. This makes the abstract nature of the subject very prominent and understanding of the concepts difficult for learners. The method of teaching practical chemistry becomes pertinent so as to arrest and sustain the interest of the students and enhance understanding and better performance. Using real problems as a starting point for new learning in practical chemistry may create in different types of schools a fertile ground for students' committed participation. This study, therefore, seeks to determine the effects of PBL approach and school type and their interactions on students' achievement in practical chemistry.

Research Question/Hypotheses

In view of the above stated problem, the following research question was answered and three hypotheses were tested in the study. This study sought to answer the following question:

What are the mean differences in pre-test and post-test scores of students' achievement in practical chemistry by (a) treatment? and (b) school type?

The study was based on the following three hypotheses:

Ho$_1$ – There is no significant main effect of treatment (problem-based learning approach) on students' practical skills in chemistry.

Ho$_2$ – There is no significant main effect of school type on students' practical skills in chemistry.

Ho$_3$ – There is no significant interaction effect of treatment and school type on students' practical skills in chemistry.

Methodology

Research Design

This study adopted a pretest, posttest, control group quasiexperimental setting. The layout of the design is as shown:

Experimental group – $O_1 X_1 O_2$
Control group – $O_1 X_2 O_2$
Defined as follows:
O_1 = represents pre-test achievement in practical chemistry for each group.
O_2 = represents post-test achievement in practical chemistry for each group.
X_1 = represents group taught with problem-based approach
X_2 = represents group taught with conventional method (control group)

Sampling Procedure and Sample

Two states, Lagos and Oyo, out of the six in the southwest educational zone in Nigeria were randomly selected, and two federal government colleges were selected from each state. One single-sex and one coeducational were purposively selected out of a minimum of three in each of the states to make a total of four schools for the study. A male's only school was selected from one state (Lagos) while a female's only school was selected from the other state (Oyo). One single-sex and one coeducational school were used as experimental while the other pair served as control. Simple random sampling was again used to get one intact chemistry class each from the participating schools. One male's only school class of 42 boys, and a coeducational school class of 29 students (16 boys, 13 girls) made up the experimental group, while one female's only class of 28 students and a coeducational of 25 students (14 boys, 11 girls) participated as the conventional group (control) in their respective schools. These numbers gave an average number of thirty-one students per class.

Table 1 shows a 2 X 2 factorial design of the study with treatment operating at two levels in which there is an experimental group of PBL approach and the conventional method of teaching which served as control. Type of school is also operating at two levels namely single-sex and co-educational.

Table 1
Factorial Design

Treatment	School Type	
	Single-sex	Co-educational
Problem-based approach	42	29
Conventional method of teaching	28	25

Instrumentation and Data Collection

The researchers developed and validated one instrument used for collection of data and two treatment manuals. This instrument is the *Chemistry Manipulative Skill Scale* (CHEMMSS) used for both the pretest and posttest. The two treatment manuals are (a) *Operational Manual of Instruction on Problem-based Learning Approach* (OMIPBLA) and (b) *Operational Manual of Instruction on Conventional Method of Teaching* (OMICMT). Both are defined in *Chemistry Treatment Manual* (CHEMTM)].

Chemistry Manipulative Skill Scale (CHEMMSS). The researchers developed this instrument used to measure the knowledge and manipulative abilities of the students towards the use of basic chemistry practical apparatus in the laboratory and understanding of the procedural steps required. The practical aspect of focus is "Introduction to Volumetric Analysis" according to senior secondary school class 2 (SS2) scheme of work for the term. The proctors used the prepared 33-items scale to test the students. A 4-point Likert scale response options of very good (VG), good (G), fairly good (FG), and fair (F) was used. The skills are listed and value scores of 4-1, respectively, were apportioned or awarded for different levels of mastery by the research assistants. The face and content validities of the items were established by having them vetted by experienced chemistry teachers. Further validation was done to ascertain the psychometric properties by trial testing it on 34 SS2 chemistry students of a public secondary school in Surulere, Lagos. Cronbach alpha was used to estimate the reliability coefficient value of 0.87.

Chemistry Treatment Manual (CHEMTM). The researchers developed this manual that was used by the research assistants. This manual was meant to ensure conformity of depth of coverage. The categories for application of the instrument are (a) experimental group exposed to problem-based approach; (b) then the control group was taught using the conventional method. The research assistants were the trained chemistry teachers of the intact class randomly selected for treatment in the schools of study along with their respective laboratory attendants. They administered the pretest and posttest manipulative skill scale, which required observations and scoring.

Operational Manual of Instruction on Problem-Based Learning Approach (OMIPBLA). This manual prepared by the researchers was to guide the teachers and the students on the various steps applied while using the PBL approach. Because the focus was more on students' participation, the activities they performed were highlighted in an orderly manner and in very explicit language. The OMIPBA was a guide for practical chemistry.

Operational Manual of Instruction on Conventional Method of Learning (OMICML). The conventional method is the prevailing and the traditional teaching and learning method known and commonly used by the teachers and students in schools. It involves lecture, talk and chalk, an occasional demonstration because of the experimental nature of chemistry, and students listening and watching.

Research Procedure

The study lasted for a period of five weeks. The first two weeks were used for the training of research assistants, students' orientation, and administering of the pretest. The remaining three weeks were used for the treatments, that is, implementing the new approach in the classroom and for posttests immediately after the treatments using the developed instrument – CHEMMSS.

Training of participating research assistants. The training was organized to provide step-by-step explanations on the use of the treatment manuals and the learning guides for the treatments as well as the manipulative skill tests. This training was conducted by the researchers for the participants in their respective schools due to the distance between the schools. One week was used for these trainings.

Necessary corrections and amendments were made at this stage in the treatment manuals and learning guides. These changes were majorly with respect to the sequence of some steps and the need for more elaborate descriptions of certain steps. The researchers thus benefited from the experience of the teachers who subsequently served as research assistants. The manipulative skill raters, who were also the monitoring and implementing group of five, were trained together to ensure high interrater reliability, a value of 0.79 was obtained using Cronbach alpha, this indicates uniformity of operation. The same pilot school in Surulere, Lagos was used for this step.

Data analysis. The statistical tools used to establish the pretest and posttest mean difference as well as the main effect and the interaction effects of the independent on the dependent variable for this study were descriptive statistics and analysis of covariance (ANCOVA) respectively.

Results and Discussion

To answer the research question, a pretest and posttest were given to discover the students' achievement in practical chemistry by treatment and by school type. The CHEMMSS had a maximum of 132 points (33 test items with a 4-point Likert scale).

Table 2 shows that PBL group had higher posttest mean score in practical skills (X=110.75) than conventional method group (X=81.47). When the posttest mean scores are compared with corresponding pretest mean scores, the PBL group had higher mean gain practical skill scores 62.96 than conventional method group, which had a mean gain score of 41.77, indicating better learning with PBL approach.

This difference in increased mean scores can be deduced from the submission of Ausubel (1968) that meaningful learning can only take place when a person consciously and explicitly ties new knowledge with relevant concepts or propositions they already possess or are able to discover in the process of trying to solve a problem. This idea provides evidence that the individual has been able to internalize a new stimulus and is reflected in the ability to apply the new knowledge to other situations. In contrast, rote learning (memorisation), which mostly characterises the traditional lecture method of teaching (conventional method) even in practical lessons, only arbitrarily results in new knowledge. This type of new knowledge, which only arises when it is randomly incorporated into the cognitive structure of the students, cannot be applied to relevant new situations. Both groups, however, have higher posttest practical skill mean scores than pretest scores.

Table 2

Summary of Mean Difference of Students' Practical Skills in Chemistry by Treatment

Treatment	n	Pretest		Posttest		Mean Gain
		Mean	*SD*	Mean	*SD*	
PBL	71	47.79	5.042	110.75	8.817	62.96
Conventional	53	39.70	4.213	81.47	7.347	41.77

Table 3 reveals that the posttest students' practical skills mean scores in chemistry is higher in single-sex colleges (X=112.28) than those from coeducational colleges with posttest practical skills mean score of 102.55. Also, students from single-sex colleges have a greater mean gain score (63.59) than their coeducational colleges' counterpart with mean gain score of 58.71.

Table 3

Summary of Mean Difference of Students' Practical Skills in Chemistry by School Type

School Type	n	Pretest		Posttest		Mean Gain
		Mean	*SD*	Mean	*SD*	
Single-sex	70	48.69	5.033	112.28	7.177	63.59
Coeducational	54	43.84	5.218	102.55	19.56	58.71

Results and Discussion for Ho₁

Table 4 presents the results of analysis of covariance (ANCOVA) for main effect of treatment (PBL and conventional) approaches on students' practical skills in chemistry. Having adjusted covariate, the results show that there was a significant main effect of learning approaches on students' practical skills in chemistry — $F(2,126) = 211.59$, $p < .05$. The covariate was the pretest score of respective students. The *p* value ($p = .000$) is less than 0.05, so Ho₁ (there is no significant main effect of treatment [PBL approach] on students' practical skills in chemistry) is rejected. From the adjusted *R* squared value of 0.814, the independent variable accounted for 81.4% of the variation observed in students' practical skills in chemistry. The partial eta-squared estimated for treatment was 0.708; this shows that treatment (PBL approach) accounted for 70.8% of the variance observed in students' practical skills in chemistry.

These results are similar to those found in the exploration stage biological science curriculum study (BSCS) model of five "E's" (engage, explore, explain, elaborate, and evaluate), which revealed the advantage of the students having the opportunity to get directly involved with the phenomena and materials during the practical application process (BSCS & IBM, 1989). From the modified description of 5E phases, the exploration phase involves students in exploring objects, observing, identifying variables, and establishing relationships. The teacher at this stage serves as the facilitator (Bybee et al., 2006). The process of taking students through the PBL approach to acquire practical skills in chemistry in general can be likened to engaging, exploring, explaining, elaborating, and evaluating as they interact with the teaching-learning materials, the teacher and among themselves. Involving students in these activities makes them to develop a grounding of experience with the phenomenon and as they work together in teams, they build a base of common experience which assists them in the process of sharing and communicating for better performance.

Table 4

Analysis of Covariance (ANCOVA) of Posttest Mean Score of Students' Practical Skills in Chemistry by Treatment and School Type

Source of Variation	Type III Sum of Squares	df	MS	F	P-Value	Eta-Squared
Corrected Model	8386.992	3	2795.664	68.859	.000	.826
Intercept	17578.186	1	17578.186	432.963	.000	.623
Pre-Practical Skills	664.571	1	664.571	16.369	.000	.059
Treatment	8590.552	1	8590.552	211.591	.000	.708
School Type	1554.625	1	1554.625	38.292	.000	.128
Treatment & School Type	342.004	1	342.004	8.424	.004	.031
Errors	5115.600	126	40.600			
Total	33420.000	124				
Corrected Total	6095.981	123				

Note: $R^2 = 0.789$ (Adjusted $R^2 = 0.814$)

$p < .05$

The above results imply that the treatment improved the students' practical skills in chemistry with PBL approach showing a more pronounced contribution to this improvement on the students' practical skills. The reason could be because during the intervention, while in their groups, the students were allowed to use the chemistry practical apparatus individually up to the point of mastery. This practice boosted their confidence and interest; the result of which showed in their improved performance in practical chemistry posttest scores. Because the students were allowed to use the apparatus to carry out the practical instructions long enough and given ample opportunity to practice with them, they developed some characteristic expertise in operating them, making it easier for the students to use during chemistry practical tests/examinations. On the other hand, the results also address and solve the problem expressed by the chief examiners reports of NECO and WAEC (2004-2006), which state that students do not have a firm grip of the use of chemistry practical apparatuses and cannot relate them to their functions. The skill they now acquired would then enable them to use any of those apparatus or a related one anywhere anytime.

The result also reflects the findings of Hmelo-Silver (2004) and Hmelo-Silver and Barrows (2006), which emphasized the monitoring duty of the facilitator (chemistry teacher) to ensure that all students are involved and encourage them to externalize their own thinking and to comment on each other's thinking concerning their discoveries. The teachers' effective monitoring during the treatment sessions resulted in this improved performance in practical chemistry.

Results and Discussion for Ho2

Table 3 shows that students from single-sex colleges had higher mean gain score (X=63.59) in practical skills in chemistry compared to their co-educational counterparts with mean gain practical skills score of (X = 58.71). This result implies that students from single-sex colleges are better in chemistry practical skills in chemistry $F(1,126) = 38.29$, $p < .05$. In view of this result, hypothesis Ho2 (there is no significant main effect of school type on students' practical skills in chemistry) was rejected because school type has significant main effect on students' practical skills in chemistry. The partial eta-square value of 0.128 indicates that school type accounted for 12.8%

of the variance observed in the posttest students' practical skills in chemistry which was significant enough to make a difference.

Further analysis of the result revealed that students from single-sex colleges had higher mean gain scores in practical skills in chemistry than their counterparts in coeducational colleges, meaning that they performed better in practical skills than the students from coeducational colleges after the treatment. The reason could be that of gender sensitivity where female students in coeducational colleges are less active in their heterogeneous group leaving the male students to do most of the practical works, thereby slowing down the activity rate which may lead to incomplete exercise consequent to slow perception and low scores. Whereas, in a single-sex school there is no such gender sensitivity; everyone is there on his or her own right for the chemistry practical and participate fully at every stage of the exercise. This full and unreserved participation leads to better performance in practical skills in chemistry in a single-sex school shown in the result above. So, chemistry teachers in single-sex colleges can freely use the PBL approach to teach practical chemistry for a more positive response, irrespective of being boys only or girls only school.

Results and Discussion for Ho$_3$

Table 4 shows that there is significant interaction effect of treatment (PBL and Conventional) approaches and school type (single-sex and coeducational) on students' practical skills in chemistry $F(1,126) = 8.42$, $p < .05$. Ho$_3$ (there is no significant interaction effect of treatment and school type on students' practical skills in chemistry) is then rejected. This result depicts that school type (single-sex or coeducational) of students has effect on the treatments (learning approaches) used in this study. Chemistry teachers could use the learning approaches by considering the type of school,

whether single-sex or coeducational, for greater effectiveness. This result is also in agreement with the study of the British Office for Standards in Education (OFSTED, 1998) whose studies also found that students in single-sex schools have a significantly more positive attitude towards manipulative skills than their coeducation counterpart.

Conclusion and Recommendations

The findings of this study show the following implications in the teaching and learning of practical chemistry in federal government colleges in Nigeria. The positive effects of PBL approach on students' practical skills in chemistry is an indication that learning takes place easier and better when a problem is used as a starting point for new knowledge. Students learn better when given opportunity to interact among themselves in small groups, and when learning topics are structured to solve real life problems, students find it easier to relate apparatus with functions and theory with practice in practical chemistry. Furthermore, because they worked in groups and the teacher acted as a facilitator, students freely expressed their fears and ignorance to their fellow students and then by exchange of knowledge, they helped one another to understand better. Studying becomes a cooperative affair and learning is facilitated and internalized. This structure yields more encouraging learning outcomes for the students.

The study also reveals that school type, specifically single-sex colleges benefit more on practical skills after being exposed to the PBL approach. This result is an indication that single-sex arrangement has the ability to instil high levels of self confidence in their students, making them participate fully in practical chemistry, irrespective of the sex, either boys only or girls only than the coeducational colleges. Consequently, chemistry teachers in coeducational colleges using this PBL approach

should motivate and encourage their students well enough during practical chemistry for a positive response. The society is made up of both male and female students who are ready to acquire similar knowledge and skills from various learning experiences provided by school; school counsellors should therefore be around to guide in this direction.

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METACOGNITIVE PROMPTS WITHIN AN ONLINE COURSE

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Abstract: *This study attempted to answer whether strategically designed and placed metacognitive prompts within an online prerequisite teacher education course can make a difference in the amount and quality of student self-reported use of metacognitive strategies. The study found significant metacognitive results for students in an online introductory education course. Three themes about metacognitive use emerged from student online postings: the importance of transforming online material into more useable formats, the need to structure the learning environment to increase student attention, and the importance for students to make personal connections to the content.*

Keywords: metacognition, online learning, metacognitive strategies

Introduction

Metacognition, a construct first proposed by Flavell in 1976, is often referred to as thinking about thinking. A more formal definition 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). Researchers originally believed metacognition starts to develop around age five and continues to develop throughout the school years. It is now recognized that metacognition continues to develop through adulthood (Stewart, Cooper, & Moulding, 2007).

An abundance of research exists about the importance of metacognition in educational settings (Hattie, 2009; Joseph, 2009; Nietfeld, Cao, & Osborne, 2006; Preston, Stewart, & Moulding, 2014). It is known to improve student performance in academics as metacognition has been found to be a strong predictor of academic success (Hattie, 2009). When students are encouraged to be more metacognitive, they frequently outperform students who are not taught to use metacognitive skills (Joseph, 2009). The ability for a teacher to encourage and model metacognition is an important but often underdeveloped skill of practicing teachers.

Metacognition is often separated into two components: knowledge and regulation. Metacognitive knowledge is knowledge about oneself as a learner and the factors that influence learning. Metacognitive regulation includes planning, monitoring, and evaluating. Planning includes the ability to think about and select appropriate strategies and resources to achieve a task. Monitoring is awareness of understanding and progress in learning. Evaluation is appraising the end results and efficiency of one's learning (Shraw & Dennison, 1994). Metacognitive regulation can be considered a subset of the broader construct of self-regulation. Self-regulation is usually defined as the ability to control and sustain behavior, emotions, and thoughts (Woolfolk, 2013), while metacognitive regulation focuses only on the ability to control and direct one's own thoughts.

Metacognitive strategies can be taught (Halpern, 1996) and are associated with successful learning (Borkowski, Carr, & Pressley, 1987). Successful learners usually have a repertoire of metacognitive strategies to select from and can

transfer them to new settings (Pressley, Borkowski, & Schneider, 1987). However, not all learners have developed these strategies; therefore, instructors need to prompt learners to become more metacognitive and think about what they are doing as they complete learning tasks (Biemiller & Meichenbaum, 1992). Instructors should take care not to do the thinking for learners or tell them what to do because this runs the risk of making students experts at seeking help rather than experts at thinking about and directing their own learning.

Unfortunately, McKeachie (1988) found that few college instructors explicitly teach metacognitive strategies for monitoring learning. They assume that students have already learned these strategies in high school, but many students have not developed and are unaware of the metacognitive process and its importance to learning. Rote memorization is the usual—and often the only—learning strategy employed by high school students when they enter college (Nist, 1993). Simpson and Nist (2000), in a review of the literature on strategic learning, emphasized that for effective student learning to occur, instructors need to go beyond teaching reading strategies to helping students develop the cognitive and metacognitive skills that underlie these traditional reading strategies.

The last decade has seen an increase in the number of online courses and the number of students taking online courses (National Center for Education Statistics [NCES], 2016). With increasing numbers of students taking online courses, has come a new challenge of helping students develop metacognition. Garrison (2003) suggested metacognition can be achieved in online courses by providing opportunities for students to reflect and collaborate. More recently researchers reemphasized the need for reflection to build metacognition in online courses (de Bruin, Kok, Lobbestael, & de Grip, 2017; Watkins, 2016).

Further, Watkins (2016) found that in order for students to have metacognitive levels of reflection in online courses, students needed open-ended prompts. These prompts request students to reflect but are open in the ways in which they can formulate their reflections. Even more powerful are providing opportunities for students to share their reflections with other students and being able to discuss their reflections with others (Watkins, 2016).

Despite the abundance of literature on the importance and benefits of metacognition in face to face and online courses, many educators struggle to implement metacognitive strategies within the limitations of time constraints during live class sessions or pedagogical constraints of an online courses. While the research on promoting metacognition in online courses does identify the types of experiences students need to have, it does not thoroughly explain how to implement them. This study examined the effectiveness of inserting metacognitive prompts within an online course. Specifically, the study examined whether student metacognition can be enhanced with minimal online intervention.

The present study sought to answer the following research question: What effect does a minimal level of metacognitive intervention in an online course have on student reported use of metacognitive strategies?

Method

This study intended to discover whether strategically designed and placed metacognitive prompts in an online course would help students develop metacognitive use. *Education (EDUC) 1010 – Exploring Teaching* is an introductory, prerequisite course for entrance into this American university's teacher education program. All students applying for acceptance into the undergraduate teaching major must successfully take and pass this course. The

participants in this study were primarily freshman and sophomore students (N=111). The data collected in this study were the number of metacognitive practices students reported to use during each module of the online course. All 111 students responded to the discussion modules.

The online section of the course included ten different modules for students to complete. Each module has selected readings and assignments which demonstrate student understanding of the readings. Additionally, there are three exams. The first exam covers information from modules 1-3, the second modules 4-6, and the third exam covers modules 7-10.

This study had two different interventions. Intervention 1 was used in online course sections 1 and 2. For intervention 1, prior to the first module, the instructor created an informational page containing the syllabus and directions on how to progress through the course using the "next" button. The very first "next" button takes the student to a page about metacognition. On this page, there is text describing metacognition and its importance. Additionally, a couple of informative short videos were available that go into more depth on the importance of metacognition in helping students become higher achieving students and the three metacognitive areas of planning, monitoring, and evaluating.

The "next" button from the introduction to metacognition took the students to an Overview page of what the first module covered. Next, they were taken to a page that read:
Metacognitive Planning Questions:
Before beginning the module, take a minute and ask yourself the following questions. Questions I need to ask myself before I do the module.
- What do I already know about this topic?
- How much time will I need to complete the module?
- How can I motivate myself to do the assignments to the best of my ability?

Then students advanced to the next page and began working through the module. Part way through each module, students advanced to a page that read:
Now would be a good time to stop and ask yourself some *Metacognitive Monitoring Questions*. Questions I need to ask myself *while* doing the module.
- Am I using the best strategies to learn this material? If not, what should I do differently?
- Am I trying to go too fast? Am I going too slowly?
- Am I understanding the information in this module? If not, what can I do?

Finally, at the end of the module after all other assignments were submitted, students were shown a page that read:
Metacognitive Evaluation Questions:
Now that you have completed the module, it would be helpful to stop a minute and ask yourself the following metacognitive evaluation questions.
Questions I need to ask myself *after* I am finished with the module.
- How well did I do on this module?
- Did I use the best strategies for each assignment in the module?
- What are the main things I learned doing this module?
The same questions were repeated in each module.

The next page after each module asked the students to reflect on their use of metacognition in the module. The instructions on this page read, "1. Please post a paragraph describing some of the metacognitive processes you used in this module. 2. Comment on at least one other person's posting about the metacognitive processes they used. You can compare your experience, ask or give advice." The learning

management system used by this university (Canvas is its name) provides an optional setting requiring students to make their own initial posting prior to being able to view their peers' postings. This Canvas option was not utilized. Students could view peer posts before and/or after their own posts. Allowing students to read other's postings before their own was hoped to provide them stimulus to be more metacognitive.

Intervention 2 was used in online course sections 3 and 4. All four course sections had the same "before", "during", and "after" metacognitive prompts. However, in intervention 2, the assignment beginning with "Please post a paragraph describing some of the metacognitive processes you used in this module" was followed up with an additional sentence, "Do not discuss the topic of the readings, rather talk about your thought processes, what practices you used to learn and remember the content, and what you would do differently in the future to help you focus and learn." The statement was preceded by ******** and followed up with **** to draw attention to the clarification to the original instruction.

The final four questions of each exam were questions about whether or not they had done the metacognitive prompts in each module. Students were asked to indicate "True" or "False" "I completed the metacognitive planning questions; I completed the metacognitive monitoring questions; I completed the metacognitive evaluation questions after each module".

A follow-up email was sent to 18 participants receiving the first intervention after the course was finished. Only three students responded to the following questions,

- Did the instructional videos about metacognition and its importance provided at the beginning of the course make any difference in your life on either increasing your then current level of metacognition or making you want to become metacognitive? Why or why not?
- Did you feel like the metacognitive prompts in each module of the 10 Utah Effective Teaching Standards (UETS) helped you become more metacognitive? In what ways? If not, why?
- Have you continued to use any of the metacognitive strategies you wrote about in the *Metacognition Discussion* board? Which ones?
- How has your use of metacognition changed from before you took EDU 1010?

Analysis

The data in this study underwent varied analysis. The first analysis conducted was of the number of metacognitive responses each student wrote in their Canvas discussion board. This analysis was strictly a count of the number of different strategies the students reported using during the course modules. Included in accepted metacognitive strategies was their comments about strategies they planned to use in the future. The second analysis was conducted using the chi square. This analysis allowed us to compare the number of responses with an expected number of responses.

After each module, students posted their reflection on their use of metacognition in the Canvas discussion board. Analysis of each student reflection was performed by two researchers. Each student response was coded either 0 – no metacognitive statements, 1 – one or two metacognitive statements, or 2 – three or more metacognitive statements. All participants were identified by a number. One researcher coded all of the odd numbered participants while the other researcher coded the even numbered participants. To ensure rater reliability, the researchers coded the first ten participants together. After the initial coding of participant responses, a second reading of ten random

responses was performed by the opposite researcher to check for reliability of coding.

Data were analyzed using chi square test of independence with an alpha of .05 as criterion for significance. This test of goodness of fit was used to determine if there was a difference the number of actual responses and the statistical anticipated number of responses.

In addition to coding the number of metacognitive strategies, all student posts were read a second time by both researchers for content analysis. Specific strategies were organized and grouped into broad categories. Next, the researchers performed a thematic analysis in an attempt to identify emerging themes (Fraenkel, Wallen, & Hyun, 2015).

Results

This study examined the amount of student metacognitive processing in an online course containing minimal levels of metacognitive intervention. Table 1 displays the total number of metacognitive statements made by students during the course. Statements are grouped by either no metacognitive responses, 1-2 metacognitive responses, or by 3 or more metacognitive responses. Section 1 had 39 students. Section 2 had 18 students. Section 3 had 25 students. Section 4 had 29 students (see Table 1). Responses were tabulated from all ten course modules.

Table 1
Number of metacognitive responses by section

Course	Zero Metacognitive Responses		1-2 Metacognitive Responses		3 or more Metacognitive Responses		Total Metacognitive Responses
	n	%	n	%	n	%	N
Section 1	305	78	67	17	18	5	390
Section 2	174	97	6	3	0	0	180
Section 3	23	9	90	36	137	55	250
Section 4	52	19	101	36	127	45	280

We sampled 1100 responses from section 1 (n = 390), section 2 (n = 180), section 3 (n = 250), and section 4 (n = 280) to test whether the number of metacognitive responses in each section was significant. Data were analyzed using chi square test of independence with an alpha of .05 as criterion for significance.

According to the test of independence, the difference in number of metacognitive responses was statistically significant (x^2 (4, n = 1100) = 472.77, $p \leq .000$). To follow up the findings, Phi was calculated to determine effect size of the different sections. The finding of Phi = .629 provides evidence of a moderate correlation between each section and the number of metacognitive responses. See Table 2 for counts of observed and expected responses by course section.

Table 2
Observed compared to expected number of metacognitive responses by section

	Zero Metacognitive Responses		1-2 Metacognitive Responses		3 or more Metacognitive Responses	
	n_o	n_e	n_o	n_e	n_o	n_e
Section 1	299	225	73	127	18	37
Section 2	180	103	0	59	0	17
Section 3	132	144	96	82	22	24
Section 4	24	162	191	92	65	27

Note: n_o = number observed, n_e = number expected

As shown in Table 1, students in sections 1 and 2 did not make very many metacognitive statements. The follow up email sent to students asking them about their perceived benefits of the metacognitive videos and assignments reveal that several students felt the metacognitive reflection assignments were a waste of time. One student responded to the email question "Did you feel like the metacognitive prompts in each module of the 10 UETS helped you become more metacognitive? In what ways? If not, why?" by writing,

> "No, not at all. I thought they were silly. No one even addressed them appropriately. I am honestly the only person who EVER addressed metacognition in any way in our posts. Everyone else just talked about what they liked or didn't like about the module."

Student comments from intervention 1 primarily focused on the content of the modules and not the metacognitive processes used during learning. A typical comment was:

> "This module was so interesting to me. In my own experience, I have seen how many teachers can lose control of their classrooms. I was excited to learn some tips and strategies on how to bring the classroom's attention back."

From student statements, it appears that most students were not aware of their metacognition.

In intervention 2, the metacognitive intervention was adjusted slightly. An additional prompt was added to each module reminding students to focus on their thinking, what they were doing to increase their learning, and what they could do differently to learn more effectively. The number of students with one or more metacognitive statements increased by 70% (see Table 3). Only 16% of statements in the first intervention sections had more than one metacognitive statement, while in the second intervention, 86% of response had more than one metacognitive statement.

Table 3
Number of metacognitive responses by intervention

	Zero Metacognitive Responses		1-2 Metacognitive Responses		3 or more Metacognitive Responses		Total Metacognitive Responses
Course	n	%	n	%	n	%	N
Intervention 1	479	84	73	13	18	3	570
Intervention 2	75	14	191	36	264	50	530

We sampled 1100 responses from intervention 1 (n = 570) and intervention 2 (n = 530) to test whether the number of metacognitive responses in each intervention was significant. Data were analyzed using chi square test of independence with an alpha of .05 as criterion for significance.

According to the test of independence, the difference in number of metacognitive responses was statistically significant (x^2 (2, n = 1100) = 514.60, $p \leq .000$). To follow up the findings, Phi was calculated to determine effect size of the different sections. The finding of Phi = .629 provides evidence of a moderate correlation between each intervention and the number of metacognitive responses. See Table 4 for counts of observed and expected responses by intervention.

Table 4
Observed compared to expected number of metacognitive responses by intervention

	Zero Metacognitive Responses		1-2 Metacognitive Responses		3 or more Metacognitive Responses	
	n_o	n_e	n_o	n_e	n_o	n_e
Intervention 1	479	279	73	158	18	133
Intervention 2	157	357	287	202	286	171

Note: n_o = number observed, n_e = number expected

Additionally, there was a change in the quality of student statements. The following is an example of a typical comment from students in Sections 3 and 4 who received the modified intervention. "I didn't take notes this time as I should have, but I was thinking I would make myself some flash cards next time, those are quite useful. I read the articles aloud and then read them more than once. I told what I had learned to my dog, pretending I was teaching these concepts to someone else."

In intervention 2, students made comments in which they reflected on the effectiveness of the metacognitive strategies they were using. For example, one student wrote,

> During this module, I found it helpful to research some of the topics I was less familiar with. I also found it helpful to make sure I had a dedicated time to study and played soft music, which helped me stay focused. I was a lot less distracted this time, as I scheduled my study times during times when my children were in classes. I also found that reading the articles a second or even third time, really helped me gain a

better understanding as well as remember the information better.

Not only were students in these sections identifying more metacognitive approaches, but they were reflecting on their effectiveness and frequency of use. The process of self-regulation was becoming more explicit and more frequent.

From review of all student posts, three themes emerged from student statements in intervention 2. The first theme is the importance of transforming online material into more useable formats. The second theme is the need to structure the learning environment to increase student attention. The final theme identified is the importance for students to make personal connections to the content.

Several students wrote about changing the online material into formats better suited to their learning needs. For example, some students printed the readings. Others mentioned the importance of taking notes on the online articles, particularly handwritten notes. Yet, others mentioned the importance of accessing the readings on devices with screens larger than

their smart phones such as Kindles, iPads, and computers.

The second theme was structuring the learning environment to increase student attention. Students wrote about scheduling quiet time to work on their assignments. Some discussed doing their homework without the distractions of other people. Another strategy was playing classical music to drown out distractions. Finally, some students mentioned their phone being a distraction and thus placed it in a different room.

The third theme was the importance of making personal connections with course content. Many students mentioned thinking about how the content related to their previous relevant life experiences. Still other students discussed making connections of the content to what they are currently doing. Additionally, others processed and made deeper connections with the content by discussing their thoughts with other people.

Discussion

The results of this research suggest that a minimal intervention in an online course can encourage student metacognitive thought. The positive impact of open-ended prompts in this study are similar to the findings by Watkins (2016) that open-ended prompts are necessary to promote metacognitive reflection in an online course. This study further clarified the nature of effective prompts. The results of this study showed that not all open-ended prompts foster metacognitive reflection. Instead, the prompts need to be very specific otherwise students discuss the content of their learning, but not the process they use to achieve their learning. Students need specific support to make the jump from thinking about content to thinking about their own learning. Both Garrison (2003) and Watkins (2016) emphasized the importance of students sharing their metacognitive reflections

with other students in online discussion forums. It appears that this process may encourage students to be more aware of their metacognitive use and to try metacognitive strategies modeled by their peers. Numerous studies in face to face classrooms (Borkowski et al., 1987; Hattie, 2009; Joseph, 2009; Pressley et al., 1987) described the positive impact of metacognition on academic achievement. Further research is needed to determine if students' increased metacognition also impacts student achievement in the online environment.

The first theme is the importance of transforming online material into more useable formats. It is somewhat surprising that students in an online course often reported printing out the readings in order to process the information more deeply. It may be that as students become more metacognitive, they are better able to monitor their learning effectiveness. The students seemed to intuitively realize what researchers are beginning to document. Singer and Alexander (2017b) reviewed research completed since 1992 examining student comprehension in print versus digital text. They found that when the text was more than one page, comprehension was higher when students read a printed text. When Singer and Alexander (2017a) further explored this relationship, they found no difference in comprehension when students were identifying the main idea, but if college students were asked to recall key details and other relevant information, students performed better when reading print. It appears that when the task requires deeper level of processing there is something about the digital text that hinders learning. One possible explanation suggests the process of scrolling for longer texts increases the cognitive demand on the reader and thus negatively impacts comprehension of digital versus print mediums (Kerr & Symons, 2006; Wästlund, Reinikka, Norlander & Archer, 2005). Another possible explanation centers on the speed with which readers read text. Lenhard, Schroeders, and

Lenhard (2017) reported participants read digital medium more quickly than print, which led to decreased depth of processing of the text.

The second theme is the need to manage distractions so students could focus attention on the learning task. Many strategies focused on reducing distracting environmental "noise" by either removing themselves from the situation or masking it with classical music. The other type of distraction was technology. Winter, Cotton, Gavin & Yorke (2010) found graduate students pursuing a Ph.D. struggled with minimizing distractions, particularly electronic distractions during online learning. It is no wonder that students in our study, who are just beginning their college career, would also struggle with this same issue. Rosen, Carrier, and Cheever (2013) observed high school and university students studying in their homes. They found on average, students studied less than 6 minutes before becoming distracted by technology.

The third theme identified in this study is that students reported trying to make personal connections with the course content. This result supports the findings of Nilsson (2008) where science pre-service teachers had to connect with the content in order to make use of it. In addition, Hume and Berry (2011) reported that many students struggle in their understanding of course content and naturally look for ways to personally connect the content to their current understanding.

One limitation of this study is that the data collected were based on student self-reporting. Another limitation is that it is not clear if students actually increased their use of metacognitive strategies or just the number and type of strategies reported because they were able to read other students' postings about their use of metacognition. Additional research is required to identify the influence of students reading other students' metacognitive strategies.

Conclusion

The number of metacognitive strategies students reported in an online course was increased by the insertion of carefully crafted prompts within the course. It is important to remind students of the difference between sharing what they learned and sharing the strategies they used to learn. Three themes emerged from student posts about their metacognitive strategy use: the importance of transforming online material into more useable formats; the need to structure the learning environment to increase student attention; and the importance for students to make personal connections to the content. A minimal level of metacognitive intervention in an online course can increase student reported use of metacognitive strategies.

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IMAGINARY DIALOGUES: IN-SERVICE TEACHERS' STEPS TOWARDS MATHEMATICAL ARGUMENTATION IN CLASSROOM DISCOURSE

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Abstract: *The purpose of this qualitative study was to explore in-service teachers' first experiences with imaginary dialogues – a form of mathematical writing where students are introduced to a written and unfinished dialogue between two imaginary persons discussing a mathematical problem. Students are supposed to continue working with the problem and to complete the initial dialogue between these persons. In-service teachers were enrolled in a continuing university education mathematics course. They were given the task to try out imaginary dialogues in their classes from grades 4 to 10. Based on in-service teachers' responses in open-ended self-evaluation forms, the study examined how the in-service teachers perceived imaginary dialogues as a tool to approach students' mathematical argumentation. The study also sought to investigate how they identified levels of argumentation in their students' written dialogues based on the background of Balacheff's levels of proofs in school mathematics practices.*

Introduction

Proofs in school mathematics has in Norway traditionally been linked to upper secondary education. However, many researchers claim that the corresponding activity of proving should become part of students' mathematical experiences throughout the grades, and students should be made familiar with explaining and reasoning their ideas. Expressing oneself orally and in writing are basic skills in the sense that they are fundamental to learning mathematics (Ministry of Education and Research, 2013). Teachers in primary and lower secondary education are committed to make students familiar with explaining and reasoning in dealing with these two basic skills, but how can teachers support students making up their mind for asking questions, arguing, and explaining a process of thinking using mathematics, and engage them in arguing and justifying their solutions? In teacher education, we were looking for a teaching approach that may motivate mathematical reasoning and students' learning of argumentation and proving, and at the same time let teachers know how students reason. In that way, imaginary dialogues may come into play and raise teaching possibilities.

Imaginary dialogues have been introduced as a method to approach students' mathematical thinking process (Wille, 2017a). The starting point is a written dialogue in which two imaginary people are facing a mathematical problem. Students are then asked to proceed on this initial dialogue, writing a continuation of the initial dialogue while they are investigating the problem further. In a broad number of studies during the last decade explored the potential of individual dialogue writing to support students' ability to build a mathematical argumentation on different topics in mathematics (Wille, 2017a, 2017b). This exploration was done in different German classrooms with students aged 10-16, most of them 10-14 years. She found the method to initiate reflection processes and argumentation. Askevold and Lekaus (2018) applied the method of imaginary dialogues for working in small groups of 2–4 students, aged 10-12, in Norwegian classes. Analyzing

students' construction of arguments and their conceptions about proofs as expressed in their written texts, they found differences between the mathematical methods and representations applied by the students from different classrooms and grades. Also, while the method of imaginary dialogues was developed for school children, it turned out to be helpful to detect different aspects of mathematical conceptions when used on single student teachers in pre-service teacher education in Austria (Wille, 2017b). Results for Lekaus and Askevold (2015) and Wille (2017a) showed that writing imaginary dialogues may help students develop their mathematical ideas and that traces of their own thinking appear in the continued dialogues between the imaginary students.

Seeing aspects of students' reasoning become apparent through their written dialogue inspired us to apply the method as a tool in further mathematics education to help in-service teachers to gain more insight into their students' conceptions, arguments, and their line of argumentation. Imaginary dialogues have been tried out by teacher educator-researchers analyzing students' continued dialogues (Askevold & Lekaus, 2018; Wille, 2017a). However, there is a lack of research on in-service teachers' implementing the method of imaginary dialogues in their classrooms. It remains to be explored how useful imaginary dialogues will prove for in-service teachers when implementing the method in their classrooms, which types of obstacles they will experience and which types of argumentation they will find in students' written dialogues.

In continuing education courses in mathematics, we emphasize the issue of reasoning, focusing teachers' challenges and roles, and encouraging in-service teachers to work with arguments and proving them in their classes. After an introduction to the idea of imaginary dialogues as a teaching approach in mathematical reasoning, they have been assigned to try it out

in practice. The initial start dialogue provided for the task was designed to introduce the handshake-problem (see Procedures in the Method section for description of this problem).

This article is based on an analysis of in-service teachers' documentation of their first experience with implementation of imaginary dialogues in their classrooms in grades four to 12, and their analyses of mathematical texts written by their students. In contrast to the original method (Wille, 2017a) that required students to work individually, the students in the in-service teachers' classrooms worked in pairs.

Research Questions

This paper examines in-service teachers' work with the mission of stimulating and analyzing their students' argumentation and mathematical reasoning. In-service teachers' first experiences with implementation of imaginary dialogues may differ. This could, in turn, have important implications for teachers' possible subsequent use of the method. We therefore sought to answer the following research questions:
1. How did in-service teachers perceive their first experience with imaginary dialogues in their classroom?
2. Which types of obstacles did in-service teachers experience when implementing the method of imaginary dialogues?
3. Which types of argumentation could in-service teachers find in their students' written imaginary dialogues?

From answers to these questions teacher educators may learn possible pitfalls and opportunities teachers who new to the method may meet. In this way, the teacher educators can help them prepare for "look fors" and better succeed with the new teaching possibility.

Theoretical Framework

The issue of what mathematics education researchers mean by proof and proving, and the meanings that proof may have for learners have been widely studied in the last few decades (Hanna, 2000; Harel & Sowder, 2007). There is no common definition of argument and evidence and the relationship between them within mathematics education literature. Stylianides (2007) defined a mathematical argument as "a connected sequence of assertions intended to verify or refute a mathematical claim" (p. 2) emphasizing the argument structure and convincing power. Harel and Sowder (2007) stressed a subjective evidence perspective when they defined "a proof is what establishes truth for a person or a community" (p. 806), closely relating argumentation, reasoning and evidence to an interaction context and emphasizing what is felt as a compelling argument.

Focusing on students' exposition to fully developed and logical deductive proofs is argued not to have the greatest potential in elementary school, and as such, teaching should focus on forming arguments and communicative aspects of the evidence in proof-similar activities throughout the grades (Stylianides, 2007; Yackel & Hanna, 2003). Facilitating a communication in mathematics class based on arguments and justifications has been found both to contribute overcoming the misconception that empirical arguments are proofs and to recognize the need for proof (Schwarz, Hershkowitz, & Prusak, 2010; Stylianides & Stylianides, 2009). A sufficient argument in class may meet certain criteria: (a) it is based on the established statements and definitions that are generally accepted in the community of the classroom; (b) it makes use of forms of reasoning that are valid, known to the students or within their conceptual reach; and (c) it communicates with forms of expression suitable and understandable to the students (Stylianides & Ball, 2008).

Within the setting of a learning community, Balacheff (1988) considered what a proof may entail. Using the term evidence in a broadest sense, since students feel the conjecture proved, he distinguished between pragmatic and conceptual forms. A proof is identified as pragmatic if depending on actions or visual representations. A conceptual evidence, however, rests on the formulation and the connections between the relevant properties of conjecture. He proposed four proof levels: (1) naive empiricism; (2) crucial example; (3) generic example; and (4) thought experiment. Their hierarchical relationship is based on the degree of generality and how much conceptualization of knowledge they require. The first three levels are all examples of pragmatic justifications. On the level of naive empiricism or "proof by example", the learner concludes based on only a small number of cases, while on the level of crucial experiment, the learner tests the conjecture with an example well outside the range so far considered to explore the extent of its validity. While proofs on these levels do not establish the truth of an assertion, generic examples indicate the level in which the assertion is made explicit using a prototypical case where an object is chosen not on its own but as a characteristic representative of its class. A generic example, verbal or symbolic, involves properties and structures, and encompasses the justification of generality. Thus, while not being a strict mathematical proof, the term proof is used. The level of thought experiment then is a conceptual justification detached from any examples where the learner arrives at structured deductive logical forms based on the use of formalized symbolic expressions. Balacheff (2010) reasoned that learners during the proof-making process likely will go through several of these levels, become aware of the necessity to produce valid arguments, and over time slightly move in this direction while developing their language to become a tool for formal evidence. The four terms describe very specific mathematical

approaches learners adopt in the proof process, making them useful in the analysis of students' reasoning and line of argumentation.

Method

The method section describes the procedures used for initiating and structuring in-service teachers' implementation of imaginary dialogues in their classrooms, including the nature of assignments they were given. It describes procedures for planning and receiving their feedback on their first experience with imaginary dialogue as well as on their first approach to identifying levels of argumentation in student pairs' written dialogue.

Participants

Subjects are in-service teachers enrolled in a national program of continuing university mathematics education for teaching staff under the strategy Competence for Quality in Norway. The program applies to teachers with teaching certificates who already work as teachers, provides scholarships for taking further training, and an exam to meet new qualification requirements for teaching mathematics in primary and lower secondary school.

A purposive sample was used with all in-service teachers in one class being willing to participate in the study. Forty-three (43) of 53 in-service teachers gave their informed consent to participate in the study, while 10 did not. These teachers (27 male and 16 female) ranged in age from 27 to 64 (mean 43.6, median 42.0, mode 41.0) and attended Algebra, Number Theory, Geometry, and Didactics (15 ECTS) as the first part of the Year 1 mathematics program delivered entirely online, autumn 2016. Their classes ranged mainly from grade 4 to 10 with seven in upper primary, 35 in lower secondary level, plus one of grade 12. In terms of ethics, in-service teachers' written assignments were

anonymized and cleared for any biographical data before analysis.

The Imaginary Dialogue Assignment

The basic mathematical handshake-problem is: How many handshakes will there be if each person in a group shakes the hand of every other person once? Several strategies may be applied to solving the problem. The problem allows to be adjusted to fit in primary and secondary school classes from an arithmetic problem to an algebraic problem by varying the number in the group. First primary graders may work on the task to figure out how many handshakes there would be if all students in class shook hands and act out the few simple cases with say two, three, and four people to find the path to a pattern. Progressing to the algebraic generalization would fit for secondary school level when asked for the number of handshakes for any group of n people.

The start dialogue, "Shaking hands", was designed to introduce the handshake-problem and to stimulate entering the dialogue and developing it further along with exploring the problem and arguing for findings. It is as follows:

Knut: Imagine how many handshakes it would be if everybody shook hands.

Idunn: That would be a lot of handshakes!

Knut: If you and I shake hands, it would be one handshake.

Idunn: Yes. Let us shake hands with one more person. Both of us shake hands with him. That makes another two handshakes. How many handshakes all together?

Knut: 2 + 1 = 3. Ok, we do the same with one more. How many handshakes all together now?

Idunn: I believe it is 6 handshakes.

Knut: What about five persons shaking hands? Or ten? Can we find out how many handshakes that will be? How many handshakes will it be when 100 persons shake hands?

Idunn: Oh - may be drawings or tables can help us.

In-service teachers were instructed to let their students work in pairs and collaboratively, without teacher involvement, in a problem-solving and reasoning context. The strategy suggested each of the student pairs had to continue the initial written dialogue in form of an imaginary dialogue, and help Knut and Idunn to come with a solution. Students were instructed to write without removing any once-written text, with deletions only indicated by striking through, so that the in-service teacher could read how the students were reasoning.

Setting and Procedures

The authors, in the role of in-service teacher trainers, gave the teachers a mandatory assignment and then used the assignments as data in a study. In-service teachers were assigned to plan and conduct a teaching session where they attempt to apply a modified method of imaginary dialogues in their classroom, presenting the "Shaking hands" - dialogue between Knut and Idunn and letting students continue working on the mathematical problem in pairs. Students writing and working in pairs and collaboratively, not individually, makes it a modification of the method of imaginary dialogues used by Wille (2017a).

The assignment included inviting a colleague to observe and video record parts of the session, and the in-service teachers self-reporting on their teaching experience, taking into consideration the feedback and insights offered by the peer. Observing, analyzing, evaluating, reflecting, and reporting entailed communication between observed in-service teacher and observer. The process was based upon Self-Assessment of Teaching Statement [SATS] (Spicer-Escalante & deJonge-Kanna, 2016), a guided teacher observation model which combines both self- and peer-observations. The SATS-approach is chosen to open for and force discussions and reflections between colleagues about the implementation of imaginary dialogues.

After the session as part one of the task, in-service teachers had to report on their experience, and as part two of the task, to pick up one of their students' dialogues and identify any mathematical arguments based on Balacheff's four proof levels.

In preparation, in-service teachers were introduced to Balacheff's distinction of mathematical reasoning in school mathematics by a video providing characteristics for each level as well as exemplifying how students may argue for the sum of two odd numbers to be even on the respective level. In-service teachers were also introduced to the idea of imaginary dialogues as a method to get students started and develop students' argumentative skills in the classroom. They were offered six examples of dialogues, called "start dialogues", among them the one on the handshake problem to be used in the task.

Data Collection

The mandatory two-part assignment made up the data for this study. Data related to part one answered research questions one and two, and

data related to part two answered research question three.

As part one of the assignment, the in-service teacher integrated self- and peer-observation notes responding to each point of a self-assessment form, called SATS-form:

1. What was happening in the teaching session?
2. What was agreed to be observed?
3. Aspects that went well.
4. Aspects that could be improved.
5. Lessons learnt from doing observations of teaching.

Point five of in-service teachers' responses related to the introduction and use of imaginary dialogues constituted the primary data for subsequent analysis. Other statements in their responses served as background information.

For part two of the assignment, in-service teachers' reflection notes, including the analysis of one of their student pairs' written dialogues based on Balacheff's four proof levels with the dialogues themselves attached, established the research data for the third research question. Both in-filled SATS-form and reflection notes were to be submitted in the learning management system by the deadline.

Data Analysis

NVivo software was used to help manage and organize the qualitative data from the SATS-form. Coding included identifying and classifying positive, negative, neutral, and mixed statements concerning aspects of the imaginary dialogues technique, or labelling "not shared" (N/A) if experiences and perceptions were not reported. Statements expressing favorableness were coded positive, and statements expressing skepticism or doubt were coded negative. Statements sharing experiences but not perceptions, saying that neither side of the experience is strong enough to sway to that side (neither to favorableness nor to skepticism

or doubt) belonged in the neutral category. Statements of being indecisive as to whether their experience was positive or negative were coded to the mixed category. If an in-service teacher stated two different views, such as being positive about one aspect and negative about another, this was not coded as mixed but rather multiple perceptions. While obstacle was a code emerging directly from a research question, memorable was used to mark quotes found illustrative for aspects of the research. Data chunks associated with each code, or combination of codes, were then grouped in NVivo and exported to Excel for further formatting, reading, and analysis. Two researchers independently performed the coding of data, then comparing and aligning was used to improve the validity of coding.

Classifying by coding and identifying themes in-service teachers' analyses was performed in two steps. First, researchers labelled according to which of Balacheff's four levels the in-service teachers identified in their students' written dialogue. Upon this labelling, cross tabulation was used to provide a basic picture of the interrelation between students' grade and level of proof as revealed by their teachers. Second, both independent researchers looked for interesting and often reported findings from in-service teachers' analyses as well as exceptional findings. They wrote a summary of observations for each case and made coding suggestions. When discrepancies were found, they were discussed until consensus was reached.

Results

Perceptions

Even though 11 of 43 participating in-service teachers did not respond explicitly by sharing perceptions on imaginary dialogues on the SATS-form, as they and their observers had agreed upon other teaching aspects to be observed, most of the in-service teachers

expressed positive experiences concerning aspects of the imaginary dialogues technique as to their first-time implementation. As Table 1 shows 62.5% of those who made any explicit statement about the method as being positive, 9.4% neutral, and 6.3% negative, while 21.9 % were indecisive as to whether their experience was positive or negative.

Table 1
Perceptions of Imaginary Dialogues

Statement	Responses		
	Frequency	Percentage	Percent Excluding N/A
Positive	20	46.5%	62.5%
Neutral	3	7.0%	9.4%
Negative	2	4.7%	6.3%
Mixed	7	16.3%	21.9%
N/A	11	25.6%	

N = 43; n = 32 for excluding the N/A

Qualitative Perception Data: Teachers' Written Statements

Positive:
- The method is very engaging for all students. Quite clear that the task and method were manageable for all students and challenging enough to stop them being bored. A bit surprised about the stamina of the students, even though some need extra encouragement and support along the way. [...] This is not a "routine" session, neither for the teacher nor student. The session needs good planning, especially regarding the summary. The students seemed to be very positive about sharing experiences regarding strategies, where the focus should be process, not result. [...] The students find a certain satisfaction in "discovering" the solution on their own. (grade 8)
- Imaginary dialogues seem to be a great way to get many students active. We have used thinking-writing previously, but not imaginary dialogues. Would absolutely try the method several times, in other subjects too. Many students took part in making their own proofs to a degree that they have never done before. We were both quite sure about the sum of engagement in the class was greater than in a "normal" session in mathematics. (grade 9)
- Trying out [the method] was interesting and informative, and an eye-opener when the best students in mathematics, also competent writers, got so little on paper. [It] requires good preparation and good knowledge by the teacher, and a willingness to encourage the students to go further if they are stuck. [But we] envision a great advantage for students getting used to this method, starting with shorter sessions. (grade 10)
- [The writing task] was open and exploratory, without any constraints on how to think or argue, and no solutions proposed. I felt engaged and curious about what students would spot. Presenting their dialogue in class, they likely felt a sense of mastery when getting a confirmation on their good and reasonable ideas. (grade 8).

Negative:
- The students had great problems creating dialogue, nothing productive came from it. They preferred to try without the dialogue. (grade 8)
- Very few or none, focused on the actual dialogue. (grade 10).

Neutral:

- The students understood well that the task was to think-write the dialogue between Knut and Idunn. I want to try the approach in grade 9. But, this method raises the "eternal" question: how do we engage all the students, and how do we ensure that everybody understands the solution? Have we managed to engage everybody if they all at least take part in testing though shaking hands? And has everybody understood the solution just because they have been participants in the group who together have used reason to arrive at the answer? (grade 7).

Mixed:

- The approach was quite demanding in the class with several unconcentrated students and some who had problems in receiving messages and easily to be distracted by irrelevant inputs or incidents, as to an upcoming test in a language course. What appeared most clearly, was that many students argued mathematically, but had problems writing the argumentation as text. One reason might have been that this [way of working] was new to the students. (grade 8)

In-service teachers being positive shared considerations to keep in mind when implementing the method. One of three suggested imaginary dialogues to be a variant of process-oriented writing pedagogy, where emphasis is on how writing can help us reason and develop. Referring to this first glimpse in a mathematics context and with many students responding well, their most frequent consideration was that more practice will be needed to be confident and proficient with the method. Some in-service teachers, in grade 8, also considered imaginary dialogues to give great room for differentiated teaching.

Obstacles

A content analysis of the responses reveals four categories of obstacles to using imaginary dialogues: (a) time and workload pressure, (b) lack of experience and training, (c) talking instead of writing, and (d) misconception. These categories are listed in descending order of the frequency with which they were mentioned in point five in the SATS-form.

Time and workload pressure (a) referred to general time squeeze and the amount of the teaching hours that could be devoted to inquiry and writing imaginary dialogues throughout the school year. Examples included, "This takes time and is at the same time very important for the student's [sic] comprehension" (grade 8); and "Many competence [sic] aims have to be achieved in the three years in secondary school. This is the reason why it often feels hectic in the mathematics education because we feel that we do not have the time to stop and wonder, elaborate and reflect" (grade 8).

Lack of experience and training (b) pertained to the method being new for both in-service teachers and students, or to any considerable prior approaches to inquiry and reasoning in the class. Utterances in this category leave the impression of in-service teachers seeking to explain results they perceived less successful than expected. Most of these teachers also expressed their expectation on doing better next time.

Talking instead of writing (c) referred to in-service teachers conceiving of students' written dialogue as being short compared to the dialogue the students had when talking to each other or not focused on by the students. For instance, in-service teachers described, "There were many good dialogues, but they were never put on paper" (grade 10); "The students became too focused on the task and forgot the dialogue" (grade 10); "Even on as high a level as grade 10,

this was more difficult than I had imagined, or maybe just because of this. We are so drilled in how we work with mathematical problems, that a task like this with writing added, is perceived as giving extra work. The students (and the teacher) are so focused on solution" (grade 10); "Had a bit too much focus on the students talking together, and the thinking-writing got less priority. Believe the learning outcome of the lecture was just as good, but would have liked to see more how the students thought and wrote it down" (grade 9).

Misconception (d) related to the nature of the task or the type of response expected. For one in-service teacher students' interpretations of the task were the biggest obstacle she faced. "Focus was declared to be on presenting the process, not the answer. [However,] One should not underestimate the possibility of misunderstandings or alternative interpretations of the tasks" (grade 8). One obstacle noted is on students' perception of what is an adequate response: "It took time to get the students to

understand. I had [...] several times to stop for a moment in the session to explain better some information. [Some] were too intent on getting an answer [...] They immediately worked out a formula [...] and did not move on to prove anything else. The formula worked and that was enough" (grade 10).

Types of Argumentation

As recorded in their statements (SATS-form) and reflection notes, all in-service teachers encouraged their students to explain and validate their findings in their written continued dialogue, though none explicitly demanded a conclusive proof. In-service teachers found their students establishing and entering a reasoning process, and identified one or more of Balacheff's levels of proof in the imaginary dialogue they picked for the task, as the cross tabulation, Table 2, shows.

Table 2
Balacheff's Levels of Proof in the Samples

Grade	n^a	Balacheff's Levels			
		1	2	3	4
4	1	1	1	0	0
5	2	2	0	0	0
6	1	1	0	0	0
7	3	2	1	0	0
8	13	10	9	1 (+1)	0
9	10	6	4	4 (+3)	1
10	12	8	4	2 (+1)	3
12	1	0	0	1	0

Note: n^a = number of dialogue samples. Count identification is listed under each level; counts with reservations are in parentheses.

Types of levels used in all grades, except grade 12, are the lowest two: naive empiricism (level 1) and crucial example (level 2). Generic example (level 3) was identified in eight student pairs' dialogues from grade eight and higher. In addition, in-service teachers made some

reservation in identifying level 3 in five additional student pairs' dialogues in grades 8-10 because argumentation on one side comprised both finding a pattern and using empirical methods to generate a hypothesis and formulated in their own words or visualized;

while, on the other side was no justification for why the pattern holds. Those in-service teachers stated that the dialogue moved towards level 3, but not fully reaching this level. Four in-service teachers claimed that the dialogue they picked included argumentation on level 4, a thought experiment, all written by students of grade 9 or 10. These dialogues included formulas for handshakes, $H(n) = 1 + 2 + 3 + \cdots + (n - 1)$ or $H(n) = \frac{n(n-1)}{2}$.

Most of the dialogues collected follow a typical pattern: In an initial part Knut and Idunn established a basis of knowledge, followed by exploring. Due to this basis, some stated a hypothesis and explored it, while others got stuck. In-service teachers found numerical, graphical, and/or symbolic representations used in students' argumentations. They found arguments and hypotheses expressed numerically, diagrammatically, graphically, and/or symbolically, and some students reasoning out a formula for handshakes. In-service teachers expressed that the dialogues in some cases let them know how students reason; however, in other cases the dialogues did not, as in the Figure 1 example.

The in-service teacher placed this dialogue on proof level 2. He justified it with the students "testing against an example and illustrating their attempt with a clear figure." Furthermore, "a formula is presented, but the students do not show how they think." The in-service teacher believed that students are "well on the way toward level 3" because they showed general mathematical relations, but also "used concrete examples."
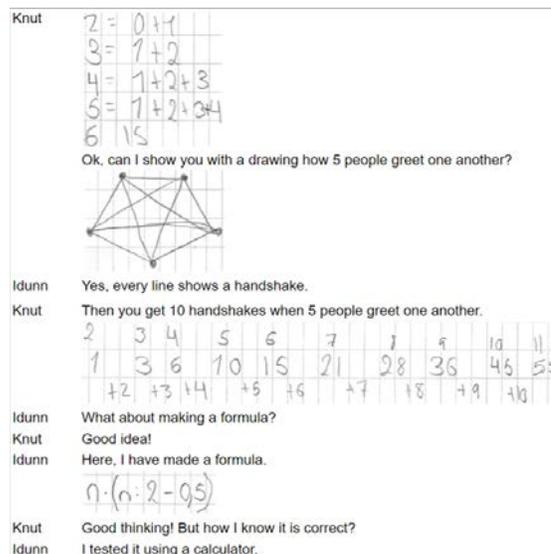
Figure 1. An imaginary dialogue, grade 10 (translated into English)

Discussion

Most in-service teachers were positive when implementing imaginary dialogues, envisioned the potential and will use further. Notwithstanding, this teaching approach needs getting used to, careful preparation, and classroom time. While Lekaus and Askevold (2015) found and discussed obstacles in the students' process as to what hampered students to come to a conclusion in their texts, this paper looked into obstacles that teachers met when implementing imaginary dialogue in their classes. The analysis reveals four categories of obstacles to using imaginary dialogues. The first two, time and workload pressure and lack of

experience and training, are best understood as a kind of excuse teachers use for why a lesson did not go as expected. The two others, however, talking instead of writing and misconception, are important to bring along when implementing the method. Teachers may expect challenges in keeping students on the track to achieve the best possible yield. Though verbal communication between students may be constructive, without writing it will not help their teacher in gaining insight into their thinking. Also, teachers may have to deal with students' task understanding to avoid unnecessary constraints.

We found evidence that the handshake problem and the approach using imaginary dialogues allowed in-service teachers to discuss possible student strategies and mistakes they might make. In-service teachers found that fragments of mathematical reasoning and argumentation could be traced in some of the written dialogues, which is consistent with Wille (2017a) and Lekaus and Askevold (2015). In the samples, teachers identified students' path of argumentation and one or more of Balacheff's levels of proof in the imaginary dialogue. Our identifications, however, do not always concur with the teachers' identifications. One example is the teacher placing the imaginary dialogue in Figure 1 on Balacheff's proof level 2: crucial experiment. While the students test on a batch of examples, they did not explore the validity of an example well outside the range of the series. Another example is four teachers identifying Balacheff's level 4, when students came up with formulas though we do not see neither any evidence of verbal argumentation, nor by complete induction, a competence goal in upper secondary education.

Although we admit that the reasons for the difference of level identification are not clear, it could be argued that these differences might reflect that in-service teachers seem to note an expectation to find higher levels of mathematical argumentation as their students'

progress through school. It might also reflect diverse teaching approaches applied in the different classrooms. The students' process requires the practice of mathematical reasoning and a specific state of knowledge. This result is largely mirrored by Table 2 and consistent with previous studies (i.e. Balacheff, 1988). According to Balacheff (1988), the practice of a level 4 proof would involve a commitment to a rigorous, theoretical problem-solving approach, not only the use of formulas, which is a level not intended for students in Norwegian primary and lower secondary education.

More room for reasoning, argumentation, and proving in the classroom does not mean teachers merely cultivating formal arguments but strengthening reasoning that may bring out mathematical proof ideas. In elementary school, we consider generic and generalizing arguments as a form of evidence. The focus is on exploring problems and statements, arguing for findings and developing students' capacity to discuss and communicate mathematical ideas, and understanding mathematical concepts more deeply. This continuum begins gradually then by the time students are in upper secondary education, informal reasoning may be expanded to formal proofs.

Generic thinking involving characteristic properties and structures may help seeing through the particular to the general. We have seen that the handshake problem opened for figurative and numerical generalization. Arguments for how the number of handshakes increases for groups of five, six, seven, eight ... people (i.e. for a series of single examples) could be used on any number of persons and handshakes between them. The way of thinking will be transferable from a "generic evidence" with prototypical, generalizable structure to an algebraic proof.

A limitation of this work is considered collecting data with the SATS-form, as students could

leave the issue of imaginary dialogues unobserved, thus lowering the number of informants for research question one and two. However, all in-service teachers analyzed one dialogue from their class.

Conclusion

We conclude the method can be potentially useful for teachers, not only on individual students (Wille, 2017a), but also in a pair context, as also found in a similar research (Lekaus & Askevold, 2015). Taking a longer view, we see in-service teachers benefit in being introduced to imaginary dialogues as a tool in their continuing university education mathematics courses. The lecturer's individual feedback to their analyses may contribute to in-service teachers gaining more insight into mathematic-didactical theories on reasoning and proving.

Future Work

Based on the data sample of this work, a number of students' imaginary dialogues are suggested to be paired with their in-service teachers' analysis, to analyze in more detail how these dialogues let the in-service teachers know how students reason. Further, future research may include case studies undertaken on in-service teachers' first implementation of imaginary dialogues in their classroom. A suggestion is to observe a small number of in-service teachers and follow them more closely, for instance, by interviews, both after their intervention activities and after having identified levels of argumentation in their students' dialogues.

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A NEW EDUCATION PATHWAY FOR MARGINALIZED YOUTH IN THE US: A MODEL FOR DENMARK AND SCANDINAVIA? REFLECTIONS BASED ON THE APPROACH OF THE P-TECH SCHOOLS

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Abstract: *Denmark has persistent challenges with an unacceptably large 'residual group' of young people with no upper secondary education. Vocational education and training programs continue to suffer low enrollment and high dropout rates. Far too many ethnic minority boys drop out of school and educational system in Denmark. At the same time, there is a growing shortage of labor within science, technology, engineering, and mathematics (STEM). In this article, we introduce and discuss an educational approach, invented in the Pathway-to-Technology (P-Tech) schools in the US, as a reflection model for Denmark and Scandinavia and for teacher educators. P-Tech is the concerted pedagogical efforts of various educational institutions, businesses, and political initiatives aimed specifically at the large marginalized and vulnerable residual youth groups in the US.*

Keywords: P-Tech, disadvantaged students, new approaches to education and marginalization, education and socioeconomics

Introduction: The Residual Group Challenge in Denmark, Europe and the US

Dropout rates and non-completion of upper secondary education – in Denmark often referred to as the "residual group challenge" – have long been familiar and discussed issues in Denmark, Europe, and the US. In 2015, the statistical office of the European Union, Eurostat, published statistics on all 28 Member States showing that in spite of a general decrease over the past ten years, 16% of all young Europeans aged 16-24 had not completed post-secondary education (Eurostat, 2015). The figure for Denmark was 10%. However, there are large variations behind this figure regarding gender: the percentage of young men in 2015 who had not completed an upper secondary education in Denmark was considerably higher than for young women.

Eurostat (2015) pointed to risks associated with dropout rates and failure to complete a secondary school education program. These risks included increased unemployment, poverty, and social exclusion. According to

Eurostat, almost 60% of the European population aged 18-24 "with at most lower secondary education and who were not in further education or training were either unemployed or inactive in 2015" (Eurostat, 2015, n.p). Not being enrolled on an upper secondary education program, therefore, leads to marginalization and inactivity. This trend was confirmed by a 2016 survey from the Danish Economic Council of the Labor Movement (Arbejderbevægelsens Erhvervsråd, 2016), which showed an increase in the size of the group of young people who drop out of the formal education system in Denmark. In 2017, following the recommendations of an expert group a new, major engineering initiative "Engineering in School" was launched in the Danish primary and lower secondary school system (Danish Ministry of Education, 2017; Engineer the future.dk, 2017). At the same time, other surveys showed that many STEM talents (science, technology, engineering, and mathematics) get lost in the Danish education system (Andersen, 2015). Furthermore, still other surveys indicated an increasing shortage of skills within precisely

these disciplines in Danish society. Forecasts have shown that in a few years Denmark will be short of 13,500 highly qualified graduates and 44,000 skilled workers within the STEM areas (Danish Industries [DI], 2016).

Just as in Europe and Denmark in the US there has been much focus in recent years on the residual group of young people who either leave the educational system and/or do not complete a secondary education. Like the 2015 Eurostat survey, a 2014 survey from the American National Centre for Education Statistics (NCES, 2016) showed that the status dropout rate continued to be significantly higher in 2014 for young African-Americans and Hispanics relative to young white Americans. Status dropout rate is defined as "the percentage of 16-to-24-year-olds (…) who are not enrolled in school and have not earned a high school credential" (NCES, 2016, para. 1). In 2016, the NCES states, "in 2014 the Hispanic status dropout rate (10.6 percent) remained higher than the White (5.2 percent) and Black (7.4 percent) status dropout rates" (p. 1).

According to the *NCES* (2016), in addition to ethnic differences, these are often youths with low socioeconomic status. The American researcher Reardon (2011) demonstrated an increase in what is referred to internationally as 'the academic achievement gap' between the rich and poor in the US. In Scandinavia (i.e. in Norway and Denmark respectively), Kristiansen (2012) and Jensen (2016) have similarly identified a correlation between the socioeconomic status of children and their (lack of) opportunities with regard to educational attainment, health, and general living conditions. In the US as well as in Europe, this gap results in marginalization, low or no attachment to the labor market, isolation, etc., which can ultimately lead to violent behavior (Eurostat, 2015; NCES, 2016). Therefore, in recent years, backed amongst others by former President Obama, there has been strong focus on

establishing new, crosscutting educational initiatives in the US to address this issue. One of these initiatives is the so-called Pathway to Technology (P-Tech) schools (Barrett, Maclutsky & Wagonlander, 2015). In 2017, there were over 50 P-Tech schools throughout the US (Ptech.org 2017).

Could these schools serve as inspiration for the Danish and Scandinavian school system? Could their pedagogical values and didactical thinking inspire the teacher training programs of these countries? We think the answers to these questions could be positive.

In the fall 2016, the authors of this paper went on a study trip to the United States to learn more about the P-Tech schools and to examine the underlying pedagogical principles behind them (Andersen, 2015; Petersen, 2018).

The Objective of This Paper

Apparently, the P-Tech schools in the US have successfully addressed the residual group problem and have re-integrated youths from the most vulnerable areas in the US by creating a new type of school. But how? On the website we find this description:

> P-TECH 9-14 are public schools that offer students a new approach to learning, bringing together the best elements of high school, college, and career. (Ptech.org, 2017, homepage).

To clarify this description, P-Tech schools use the term 9-14; normally, the abbreviation K-12 is used in the American education system. This term includes schoolchildren from kindergarten to 12th grade. This corresponds to the European preschool class to the 3rd year of upper secondary school/vocational education and training programs and higher technical examination.

In a Danish and Scandinavian context, it is interesting that, contrary to the familiar European perception of the American school system and its focus on tests, P-Tech schools

have introduced a distinctly project-oriented and learner-centered approach. On one hand, the schools put high academic, social, and personal demands on students, and on the other hand, take considerable account of their individual and often very vulnerable prerequisites and situations.

Based on a brief introduction to European theory of "didactics", pedagogy, and pedagogical models, the objective of this paper is to introduce and discuss the so-called P-Tech school model. We have worked on a two-fold problem statement in our case studies and in this paper:

   a. What is the content of the pedagogical model used by the P-Tech schools?
   b. What is the purpose of the P-Tech schools regarding the residual group problem?

Based on our findings we will outline how teacher education and teacher educators might adopt and address these issues.

Research Methodology

The authors conducted two weeks of classroom observation in 12 different classes and talked with students, teachers, and heads of school in two P-Tech schools: one in Newburgh, New York and the other in Chicago. The research method comprised participant observation, combined with semi-structured interviews with 19 students, eight heads of school, and five consultants (Kristiansen & Krogstrup, 2005). To aid in the consistency of observable data between the researchers, the authors in advance had developed a research guide for the observations that both researchers would use. Similarly, the researchers had prepared an interview guide, which both researchers used for interviews. Observations and interviews during the first days were conducted by both researchers and compared (Kristiansen & Krogstrup, 2005; Kvale & Brinkmann, 2009). According to Kristiansen & Krogstrup (2005), observations are about observing people in their

natural environment - in this case students, teachers, and heads of school at the P-Tech schools visited. The observations helped provide insight into the life and different social contexts and situations that play out in and around these schools. Furthermore, the authors also had access to data of a non-verbal nature (Kristiansen & Krogstrup, 2005). The interviews with students, teachers, and heads of school were structured as semi-structured, informal interviews conducted on the basis of the interview guide prepared by the researchers. The interviews provided more insight into the lived experiences of the respondents (Kvale & Brinkmann, 2009). The combination of observations and interviews was chosen to obtain more complex data material and to have the opportunity to ask elaborative questions about the thoughts, motives, and sentiments of students, teachers, consultants, and heads of school.

In addition, the authors conducted a systematic search for material on P-Tech schools. The search identified many informative articles, course catalogues, websites, and research papers (An, 2013; Barnett, Kim, Zander, & Avilo, 2013; Barrett et al., 2015) to which references are made in this paper.

First, we will introduce the theoretical background of didactics, pedagogical models, and the pedagogical concept of engineering. This concept originates largely from the US, but has found its way to Denmark and Scandinavia in recent years (University College Via [UC VIA], 2017). Second, we will introduce the P-Tech schools, and the pedagogic approaches that characterize these schools, and finally, we will discuss the relevance in a Danish and Scandinavian context and for teacher educators.

Pedagogical Reflections and Engineering Learning as a Pedagogical Model

Historically, the theoretical field of teaching, learning, and education – in a European context

sometimes entitled as the theory of didactics – has developed various pedagogical models (Qvortrup & Wiberg, 2013). In a Scandinavian historical context, the pedagogical models by Jank and Meyer (2010) and Hiim and Hippe (2010) have been influential. Moreover, the German educational philosopher, Klafki's (2001) theories played an important role in a Danish pedagogical context in the 1970s and into the first decade of the 21st century (Rahbek Schou, 2013). The American philosopher of education John Dewey, known for his theory of 'learning by doing', has had a decisive influence on what the Danish researchers Keiding and Wiberg (2013) referred to as an action-oriented pedagogy, an approach that has also been influential in Scandinavia.

Thus, the European concept of didactics is often associated with wanting to achieve something with someone in an educational context (i.e. a concept of intention). However, who wants to achieve what and with whom? This is an extensively debated question: is focus on the concept of Bildung and on the development of the student or child as a whole person, or is focus primarily on curriculum and learning objectives? (Bengtsen & Qvortrup, 2013; Nepper Larsen, 2016). In other words, using Klafki's (2001) classical concepts are we talking about formal or material education theories? Advocates of the formal theories focus on the individual student and their overall development, while the representatives of material theories turn their attention to the object of the educational process (Klafki, 1983, quoted in Rahbek Schou, 2013, p. 317). Klafki suggested a synthesis of the two by introducing the notion of 'categorial' education as a main goal in all education including teacher education (Klafki, 2001).

In Europe the Dutch-British researcher and philosopher of education Biesta (2010) outlined his critical opinions regarding recent decades' tendency towards material education, focusing

on tests, measurement, and accountability. Furthermore, in the US many researchers are criticizing the "teaching to the test" focus in American schools, claiming that this contributes to narrowing of the curriculum and to social inequality in American schools (Berliner, 2014; Berliner & Nichols, 2005; Reardon, 2011).

From an overall perspective, the concept of didactics as pedagogical reflections is a notion embracing the concepts of intention, values, and ideals. We agree with Bengtsen & Qvortrup (2013) that all pedagogical reflections and actions are supported by a certain vision, mission, ambition, goal, or objectives. Because of the problems with increasingly unequal access to educational opportunities, the residual group challenge, and their pedagogical approaches and actions, the P-Tech schools have endeavored to incorporate elements from the engineering learning model.

Engineering Learning

Engineering as a pedagogical learning concept is closely related to Dewey's theory of learning by doing and to action-oriented pedagogy (Keiding & Wiberg, 2013). It is an inductive, problem-based, and project-oriented approach addressing specific problems and questions through an innovative and technology-focused approach. In an international context, researchers and teachers have worked with this approach, which is also referred to as 'the engineering design process' for many years (Ertas & Jones, 1997; Kaiser, 2014; Tayal, 2013; TeachEngineering, 2017). Figure 1 illustrates the didactic circle and teaching approach in an engineering design process.
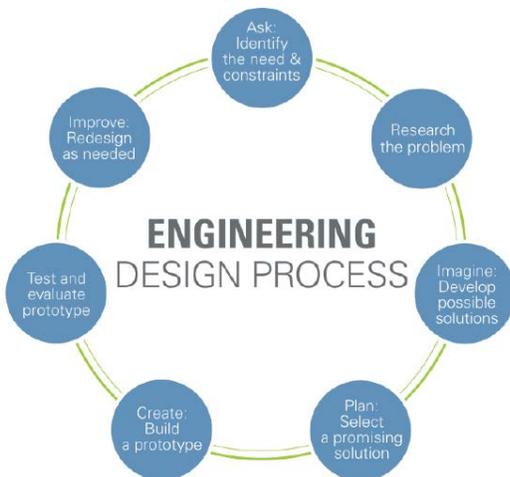
Figure 1. This figure shows the Engineering Design Process. © 2014 TeachEngineering.org. Used with permission.

The model illustrates various stages in the engineering learning process. In terms of the theoretical perspective, teaching starts by identifying problems and challenges, which students examine. The students develop and test ideas and hypotheses; they design and redesign specific solutions and prototypes, improve them, and develop further models. In collaboration, the students and teachers evaluate the work and refine any prototype. Tayal (2013) identified that teamwork and group processes in connection with creative development processes are crucial elements in the engineering design process, which he described as "The engineering design process is the set of steps that a designer takes to go from first, identifying a problem or need to, at the end, creating and developing a solution that solves the problem or meets the need" (Tayal, 2013, p. 2).

According to the American engineer and teaching expert Kaiser (2014), schoolchildren are brought up to think that there is only one correct answer. She proposed moving away from this approach, and instead, teaching them to consider all possibilities before choosing a solution. Schoolchildren need to be able to apply critical thinking, collaborate, and continuously assess their goals and challenges (Behrendt,

2015; Kaiser, 2014). Thus, Kaiser described what we could call a Bildung concept – and, in particular, what Klafki (2001) referred to as the synthesis of formal *and* material, namely the categorial education.

Findings and Discussion

P-Tech Newburgh

The first P-Tech school that we visited was in the city of Newburgh, 50 km north of New York City. It is a dismal area marred by high unemployment and crime rates. A few days before our arrival, two high school girls were murdered and several other young people wounded during shootings at a Halloween party. Our informants told that "Newburgh is famous for shootings" and "every other month someone is killed" and that such events are often related to drugs and crime.

The student body at the P-Tech school in Newburgh reflects the ethnic mix in the district, which is one of the most socially and economically disadvantaged in the state of New York. The population of the town comprises 50% Hispanics, 35% Blacks, and 15% Whites/Asian. The school has the same mix. The city is predominantly working class, but jobs in traditional industries have disappeared and unemployment is high. This is paradoxical, because there is a shortage of qualified labor within IT, management, accounting, and hi-tech. The many unemployed youths in the city, however, have no chance of getting these jobs, unless they first get a proper education. At the same time, there are young STEM talents who are not necessarily 'on the margins of society', but who are not being challenged and developed properly in the ordinary school system.

Pedagogical focus and approaches at P-Tech school. The city's new P-Tech school can play an important role in solving several of these issues. P-Tech schools are a groundbreaking pedagogical experiment stemming from

innovative thinking that breaks with the traditional division into distinct systems of primary and lower secondary school, upper secondary school, and post-secondary education. The combination of a number of coherent initiatives, which include social, socioeconomic and educational initiatives, characterizes the pedagogic basis at P-Tech schools.

Admissions criteria at P-Tech schools: Low socioeconomic status and break-out achievers. Students enter P-Tech schools directly from seventh grade not based on their grades and test results (if this were the case, many of them would never gain admission). Admission is based on applications, random selection, and a subsequent interview. We asked, "So, you don't accept the smartest kids?" and got the answer, "No, but those that we accept eventually become the smartest kids." Young people apply for admission to the school and get access to P-Tech primarily based on their (low) socioeconomic status. The student profiles in Newburgh are low socioeconomic status, Hispanics, African-Americans, and children of immigrants. Two girls in their third year, C. and L., confirmed that their grades were not the reason for them to get access to the Newburgh P-Tech school.

This means that for young people from marginalized areas, ethnic minority, and poverty backgrounds, etc., the P-Tech school is a chance to break out of their disadvantaged backgrounds. However, it is also a new chance for neglected STEM talents.

Dual enrollment. P-Tech schools offer 4-5-6-year programs, all of which are qualifying and involve so-called 'dual enrollment', i.e. the students are enrolled in high school and in college at the same time: the programs are a blend of lower secondary education, vocational, and/or upper secondary education and education at the bachelor's degree level. The students

come from backgrounds where studying is not the norm and where neither parent has a college background. The idea behind P-Tech schools is to break out of the cycle of disadvantage, partly by introducing young people to college life while they are in high school, and partly by providing them with a college degree. When they have completed the program, they have a guarantee to get a job and a good pay (around USD 4,000 a month for a young person aged 18-20). Companies support the school(s), which are entirely public.

Project-oriented, student-centered learning, and mentors from private businesses. In line with the engineering design processes, the P-Tech schools do not focus on tests or grades, but rather on teamwork, and on teachers who follow the students closely over several years. Coaching (by teachers who have completed a relevant course), problem-based and project-oriented teaching, on-the-job-training and workplace visits, group work and mentoring are core elements in the approach. The mentors usually come from the workplaces where the students will be completing several long on-the-job-training placements. Students get a mentor from the beginning of their program.

The pedagogical principles at work at the P-Tech schools are a student-driven and project-driven approach to teaching. Teachers, students, and the head of the school in Newburgh confirmed this. Our observations of teaching also confirmed this. All students (e.g. in science class in second year) were seated in groups around tables engaged in completing practical and technical tasks relating to making specific lights turn on and off by using advanced computer software. We asked them what they were making. They said, "a light system." They seemed very absorbed and the teacher walked around offering to assist. Also in first year, all teaching takes place in groups. We observed a mathematics class. The students got assignments to complete together in the groups. The teacher followed along from a distance. The teacher

explained that she is more a facilitator of student activities than delivering a teacher-controlled teaching as is usual in many American schools. When asked about the differences to their previous school, the students said, "We work more together in groups. It is much more exciting. We have to find out things on our own."

Time at school is spent on exercises, experiments, hands-on activities, projects, guidance, assignments, and discussions. Attendance is free of charge (i.e. financed publicly and by the business community) and all students receive free IT equipment. The students receive pay during on-the-job training periods.

Science, technology, engineering, mathematics (STEM) and other subjects. The series of subjects taught has considerable focus on technology and IT. For example, students learn to program, prepare accounts, establish cyber security and digital networks, as well as build robots and drones. However, they also learn subjects such as English, social science, and mathematics because the school is equivalent to the public school system. The students may either get a job in the companies and/or can transfer their education credits if they choose to return to college/university at a later stage. Thus, the P-Tech education program is a significant educational innovation.

As mentioned above, most of the students at P-Tech schools come from families characterized by crime, ill health, abuse, poor housing conditions, etc. As one of the students told us, "Boy, do my family have problems." Two students from third year emphasized that, under the P-Tech concept, they have the chance to attend college without payment, and this is an entirely new concept in the American school system. "We go to college for free," they told us, and none of their friends and acquaintances go to college. However, as mentioned, there is also another type of student: The neglected STEM

talents who see an opportunity at P-Tech schools to develop their potential.

Personal development and life skills. The diverse personal development of the students is an additional pedagogy element at P-Tech schools. One might think that everything is geared toward technology; however, that is not the case. The schools place great emphasis on supporting students in their development as human beings including their development of important life skills. Life skills and social resilience are exactly what we focused on during our observations at the P-Tech school in South Side Chicago. This is an area known for its high crime rates and a high percentage of Afro-Americans and Hispanics.

P-Tech Chicago

Compared with the P-Tech school in Newburgh, which is relatively small with only 110 students, the P-Tech school in the southern part of Chicago has around 900 students. The buildings were built in 2012. The buildings are very unusual for the area as one of the young African-American students explained, "The school looks more like one of the high schools you'd find in the White part of the city." The school has large, well-lit rooms, modern facilities, rooms for group work, general classrooms, and extensive technological equipment that the students can use in connection with classes.

The first person to approach us at the P-Tech school in Chicago was Mr. J. He is the school's 'all-round teacher'. He is the social worker, therapist, and guidance counselor, and he works full-time with the many problems faced by students. He went straight to the most important aspect of the school, "If you want to be successful with these students, you have to address their social-emotional problems straight away."

The district and issues are the same as we saw in Newburgh but on a larger scale. Mr. J explained

how, in 2015, there were 3,000 murders in the city, and that the area has experienced a considerable increase in crime in recent years. According to Mr. J. this is linked to the no-tolerance policy of most other schools in South Side Chicago, which has resulted in extensive use of suspension as a sanction. "They are suspended even for not having tucked their shirt inside their pants," he said. "The whole 'we-won't-take-any-bullshit-from-you' approach has gotten out of control," he continued. Young people from challenged families therefore get the impression that the school does not want them, and as soon as they are sent out on the streets, the gangs stand ready to take over. "The schools don't want them; the gangs give them status, money, and success!" said Mr. J. He pointed directly to this as the reason for the growing numbers joining gangs, or as he puts it, "no school, no chance," and "crime is going up because schools are failing."

The P-Tech school in South Side Chicago, however, has an entirely different approach to these youths who attend the same classes as a number of STEM talents with whom we also spoke. These are young people whose parents are schoolteachers or hold good jobs further towards the center of Chicago. With regard to disciplinary problems with boys in particular, Mr. J pointed out the school's alternatives to suspension, namely consultation and to a certain degree detention. If a student is behaving badly in class, the teacher can send him to see Mr. J (detention) who will then talk with the student (consultation). He will try to understand the underlying problems and find solutions. Typically, the bad behavior is due to problems at home or bullying.

Another important tool is the mentoring scheme, under which all students at the school have a mentor throughout the 4-6 years they go to the school. Good relations between mentors and students are crucial, according to Mr. J, who counsels both teachers and mentors on the problems he discovers. However, Mr. J did not underestimate the problems that teachers may experience in the classroom. "Many of these boys can be extremely disruptive and explosive in the classrooms, so the detention option is necessary," he explained, stressing that he spends lot of time on detention. When they first sit with him in his office, he has a long talk with them and that seems to help. In contrast to other schools in South Side, most of the boys eventually settle down. Mr. J. told us "the families are unable to help these boys. The police and prisons cannot help them either. The school is the only solution," or more precisely, the P-Tech South Side School is the solution.

As in Newburgh, teaching at this school is project-oriented. Compared with the P-Tech school in Newburgh, we observed more classroom teaching in the South Side School. However, in most classes that we observed, there was also focus on project-oriented teaching, group work, and on students carrying out work independently. Relationships with the students are important, and as in Newburgh, the students have their mentor from various businesses with the addition of Mr. J.

Educational Approaches of P-Tech Schools

Overall, the pedagogical approaches of the P-Tech schools can therefore be described as comprehensive, action-oriented pedagogical approaches in an expanded engineering learning model that includes many known teaching approaches, such as project-oriented, student-centered, and learning-by-doing methods with a special focus on natural science subjects (STEM), and that by using Klafki's (2001) previously mentioned concepts, concentrate on both formal and material educational aspects. Although the schools have a strong focus on developing the students' academic skills in natural science subjects, we observed how the Newburgh school does not base admissions on grades and tests.

Regarding the residual group challenge, the P-Tech schools stand out because they focus not only on the residual groups, but also, socioeconomically and ethnically disadvantaged students as their target groups. The free access to the education programs and the combining of different levels of education in the same type of school (basic education with higher education i.e. in an American context: high school with the first years of college) are one of the tools. Another tool is the creation of networks that academically and socially scaffold each individual student. Mentors and social problem solvers are further tools. The students get a useful education on which they can build. The educational approach of the P-Tech schools places the disadvantaged youths at center stage.

Because the P-Tech schools are a relatively new type of school, future research and studies must demonstrate the degree to which it will be possible, eventually to include more young people from the residual groups in education and on-the-job-training programs that make sense.

Conclusion and Perspectives: Can P-Tech Inspire Schools in Denmark and Teacher Educators?

In this paper, we have introduced the pedagogical approach of the P-Tech schools. We have outlined how the P-Tech schools address the challenges regarding disadvantaged, low socioeconomic students, and the so-called residual group.

The engineering design process is an important pedagogical approach in what allows P-Tech schools to help solve the residual group challenge. However, the P-Tech schools have adjusted and added aspects of the model to launch the new school model. Firstly, the type of school created resembles an ordinary school in that it follows the curricula, etc. determined for the various classes/years/educational levels. Secondly, as something new, the P-Tech schools

cut across known divisions in traditional education system, as we know them in the US and in Denmark. P-Tech schools have moved away from the traditional division between primary and lower secondary school, upper secondary school, and post-secondary education. Instead, P-Tech 7-14 schools combine into a single program lower and upper secondary education programs with the first years of post-secondary education programs. Students who complete this program earn a degree that is just slightly less than a full bachelor's degree and that will allow them to find skilled work. Thirdly, P-Tech schools are characterized by having particularly strong focus on IT, natural science subjects, etc. – the so-called STEM subjects – because the IT sector, among others, is expanding more than almost any other sector in the US and in the world. There is a clear understanding that this area will see an enormous need for qualified employees in the years to come and that there will be many new – and yet unknown – jobs to fill in the future. Fourthly, P-Tech schools have close links to the local community and local businesses including technology-based businesses. The businesses are actively involved in educating the young people (e.g. through mentor schemes, on-the-job-training programs, and in many cases, even job guarantees). Finally, P-Tech schools focus particularly on a project-oriented, hands-on, and student-centered personal approaches to their students. As described above, the students need close relationships with adults who can and will challenge them academically, socially, and as human beings. The P-Tech schools seem to have realized that if the intention of education is to develop independent, creative, and skilled young people, students must be treated with equity, to be taken seriously regarding their social and personal problems, and to be challenged with problem-based approaches so that they can contribute and develop new ideas.

The P-Tech schools have further developed the

problem-based and project-oriented approach to teaching, well known and applied for many years in Denmark and Scandinavia and have combined the approach with good framework conditions and relationships with important and academically skilled adults who are also working across traditional institutional borders. Maybe the P-Tech school model could be translated and adapted to a Danish and Scandinavian setting, and as it has in the US, establish good schools for the residual group and disadvantaged youths, while at the same time meeting society's needs for new jobs and new workplaces.

The P-Tech initiative is seen as a new, concrete, and much needed way of understanding aspects of "inclusion" in practice. New Scandinavian teacher education research points to increasing frustration with the top-down policy approach to inclusion that we have seen so far (Gidlund, 2018). The top-down approach describes the principles but not the solutions. At teacher training programs teacher- students are taught the principles of inclusion, indicating that teachers are supposed to include students with all kinds of difficulties and diagnoses in main stream classes without being directly pointed to concrete methods and didactics of how to do it. Up to 30% of newly educated Scandinavian teachers give up being teachers the first year of teaching practice after graduating, and the policy of inclusion is singled out as a major cause

(Gidlund, 2018).

In fact, the P-Tech school approach has already inspired a Danish developmental project aimed at changing the teaching habits and learning environments of teacher training in Africa towards a more student-centered, project-oriented, hands-on approach. We have already published about the P-Tech schools in Danish (Andersen, 2015, 2017), and one of the authors is also involved in the Danish-African project. The research connected to the African project so far shows very positive results of the program (Andersen, Larsen, & Klange, 2018).

The importance of initiatives such as P-Tech should not be underestimated by teacher educators and schools. As we have mentioned, Klafki's (2001) ideas about a synthesis of formal *and* material education in the notion of categorial education previously have been widely used in Danish and Scandinavian teacher education, while the focus now is more material education – on testing and learning goals. For teacher educators internationally and in Scandinavia, P-Tech is a reminder that primary and lower secondary education and teacher education should embrace the whole student in the education process focusing on categorial education as a sound approach to students and learning.

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SECOND ORDER TEACHING

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Abstract: *This conceptual paper presents the concept of second order teaching as developed by the authors. The concept was developed through system theoretical concepts as second order observation and context learning, and it relates to theories on metacognition – thinking about thinking. Implications for teaching and learning are described, and the paper presents a student evaluation from a thesis preparation course framed by the concept of second order teaching.*

Keywords: second order observation, context learning, metacognition, thesis preparation

Introduction

Second order teaching is a system theoretical concept developed by the authors through the concepts of second order observation and context learning. Second order teaching is defined as *classroom communication about classroom communication* and as such, it is related to theories of metacognition or thinking about thinking; however, second order teaching has a stronger focus on communication than cognition. This article presents the development of the concept of second order teaching and articulates the implications for teaching and learning as they emerge based on this concept. Furthermore, the article presents the findings from a course evaluation in which second order teaching was evaluated. The course was a generic thesis preparation course designed in the perspective of second order teaching and had a strong focus on context learning. Findings show that the students gained from this kind of teaching in the sense that they felt more confident in doing their master thesis and that they became conscious about their own barriers and potentials in academic research and writing.

Second Order Observation

According to Luhmann (2000, 2006, 2007), any observation is an interpretation or understanding of something. He distinguishes between first and second order of observation. First order observation is a spontaneous observation of something a person notices, and it describes *what* the person observed. Second order observation is an observation that observes the first observation and as such, the second order observation do not describe what was observed but *how* a person observed what was observed. Second order observation tells the observer how the person distinguished and denoted in the first observation. Second order observation interprets the first observation (Luhmann, 2007). An example could be the teacher observing the class and finding the students to be skillful (first observation). An observation of this observation explains how or why the teacher finds the students to be skillful. Does the teacher compare the class to another class? Has the class done a test well? Has the teacher known the class for a long time and seen progression in their learning? (second order observation). A second order observation gives the observer information about the first order of observation and has an immanent metaorientation because the second order observation helps the person to understand or interpret their understanding.

Inspired by this level of second order we apply it to the concept of teaching. Obviously, teaching is closely connected to learning, but in

a system theoretical perspective the two concepts, teaching and learning, are defined as two different systems. Teaching is a social system which is constituted and maintained by *communication*. Teaching is classroom communication and as such, it is a joint effort and social interaction between the teacher and the students. Learning is a psychological system, and it is constituted and maintained by *consciousness*. Learning or meaningful understanding happens in the mind of the students and is defined as mental operations (Luhmann, 2007). Defined like that, learning is an individual affair, but this does not mean that learning does not hold a social perspective. The learning process, or the development of meaningful understanding, is an individual affair, but it takes place in a social context or social interaction. This distinction of teaching being communication and learning being development of consciousness means that it is not possible for the teacher to *directly* observe the actual learning or mind of the students. The teacher can only *indirectly* observe the learning of the students as a communicative contribution (Luhmann, 2000). A communicative contribution can be expressed in various ways: talking to the students about their learning process, testing the students, listening to student presentations, or reading their assignments etc. Different kinds of communicative contributions provide some insight to the learning process of the students, but the teacher will never be able to fully observe or directly access the understanding of the students.

Applying the second order level to the concept of teaching or classroom communication, the concept of second order teaching emerges. Teaching of first order is, compared to first order observation, a matter of *what* to teach, it is *content* related. Teaching of second order is, compared to second order observation, a matter of *how* to teach. It is *context* related and concerns the learning process of the students because the overall purpose of teaching is

learning. No teachers teach for themselves, but always for helping students to create meaningful constructions in the discipline at hand. We, therefore, define second order teaching as classroom communication about classroom communication. This kind of second order communication communicates not only about the content but also about how the students approach and achieve the content. Study strategies and competences are addressed in the classroom and as such, the development of study competencies becomes a joint effort and not something for the students to figure out by themselves. In second order teaching teachers ask themselves: How do I teach this content so that the students learn to learn the content? While the students ask themselves: How do we study in order to learn this content? Second order teaching is taking place when both questions are addressed and discussed in the classroom. Obviously, addressing and discussing these questions are a common responsibility for teacher and students; it can neither be done by the teacher nor the students alone.

Context Learning

The concept of second order teaching also draws on Bateson's (2000) theory of logical categories of learning and communication. Bateson's premise was that a learner simultaneously learns about any given content *and* the context in which that content appears. He based this assumption on studies of learning, showing that test persons who repeatedly learn senseless memorization in form of rhymes, not only learn the rhymes but also learn *how to learn* rhymes (Bateson, 2000; Keiding & Laursen, 2005). Metalearning or second order learning is taking place. This metalearning is not about learning the content but concerns the context or the frame for learning the content. There is no value hierarchy in content learning or context learning. The concepts merely describe two different dimensions of the learning process:

learning about the topic and learning how to learn. It is, as Bateson stressed, merely a logical hierarchy. Related to education several themes are embodied in the context learning: learning about the type of a given task or assignment; learning about academic norms and values; learning about the school and class as a specific learning environment; learning to collaborate; and learning about one's self as a learner (Laursen, Keiding, & Johansen, 2003). Very often context learning takes place without the learner noticing that it happens, and as such, it can be described as an effect of socialization. Therefore, context learning is not fully accessible for systematic reflection. Context learning can, as seen from the educators' perspective, be intentional as well as non-intentional. Research often described the former as the implicit or tacit curriculum (Kelly, 2009) or the hidden curriculum (Bauer, Borg, & Broady, 1986). If we want students to acquire systematic knowledge about their own context learning – in order to improve the learning process – context learning must be addressed in class along with content learning.

An explicit focus on second order teaching is highly relevant in an educational setting because of the 'artificial nature' of teaching. In class, real life situations are often constructed and referred to, but it is not always self-evident to the students why something should be learned or how it should be learned. Why should something be learned by heart? What strategies can be used to learn something by heart? Second order teaching strives to expose the school practices of teaching and learning by making teaching about learning an explicit dimension of the interaction between teacher and students. The aim is to enable the students to understand and take control over their roles and actions as learners. The concept of second order teaching does not rely on the knowledge and skills that students develop through socialization or arbitrary context learning. Second order teaching is based on the premise that students must be *explicitly*

taught valuable methods and approaches to how they can learn about their own learning process in order to constructively develop and regulate their learning process. These ideas are also suggested in theories of self-regulated learning (e.g. Weinstein, Bråten, & Andreassen, 2013).

Metacognition in Teaching and Learning

Explicitly teaching how to study relate to theories about metacognition. Metacognition is a wide term but refers to thinking about thinking which in some way is comparable to classroom communication about classroom communication or metacommunication. The difference, though, is that metacognition is about cognition or consciousness and relates to a psychological system; whereas, metacommunication is about communication or dialogue and relates to a social system. Literature on metacognition divides the concept into three elements or levels: metacognitive knowledge, metacognitive control, and conditional knowledge. Metacognitive knowledge is declarative knowledge about *what* people know about the task they are engaged in. This kind of knowledge is comparable to content knowledge, or put in a system theoretical term: it is knowledge of first order. Metacognitive control is procedural knowledge about knowing *how* people might solve the task at hand, and conditional knowledge is knowing about *why* and *when* people have to do the task (Kuhn & Dean, 2004; Schraw, Crippen, & Hartley, 2006). Procedural and conditional knowledge is comparable to context knowledge and is knowledge of second order.

Developing teaching or any other social interaction cannot be done by mere thoughts or consciousness. Thoughts and consciousness are only accessible for others when they take form as a communicative contribution. Teaching is only possible by communicating or engaging in a dialogue and to do second order teaching requires that all dimensions in knowing are

addressed and discussed: what, how, why, and when.

The emphasis on metacognition exists in several corners of educational research: research in collaborative learning suggesting that metacognition is important for collective content learning; motivation research suggesting that metacognition is important for successful learning strategies; and literature on critical thinking suggesting that metacognition often is regarded as the basis for critical thinking (Harrison & Vallin, 2007). Studies show the importance of metacognition in several ways: the relationship of self-efficacy, metacognition, and performance; that students improve their learning when trained in metacognitive skills; that metacognition is an important predictor for academic achievement; and that students with weak academic skills benefit of metacognitive training (Coutinho, 2008). By using metacognitive skills, it becomes easier to apply one's knowledge in different contexts (Pintrich, 2002; Veenman, 2015) and to do creative problem solving (Hargrove & Nietfeld, 2015).

Implications for Teaching Practice

Second order teaching has a metacommunicative implication for teaching practice, and the concept divides teachers' didactical reflections into two perspectives. The first perspective concerns classical pedagogical questions and reflections about 'what-how-why' or content, methods, and purpose. This is first order teaching: *teaching of something*. The second perspective concerns the context and how it is possible to explore this. Hence, this perspective closely relates to the learning dimension; the focus is not on the content but on the process of learning (thinking and doing) or *learning about something*. In this perspective the 'what-how-why' questions are related to the learning process: What am I as a learner about to learn? How will I learn this content best? Why do I have to learn this content? Why is it

important to me? Consequently, the acquisition of relevant methods and approaches become more than just an effect of socialization or arbitrary context learning and something the students might or might not have acquired. The responsibility for systematically acquiring relevant methods and approaches moves from the individual student to the classroom communication when teachers 'do' second order teaching and include both perspectives.

Second order teaching takes the form of a joint dialogue on not just *what* knowledge and skills students need to learn but also a dialogue on *how* they could or should learn it. In other words, second order teaching is not only about supporting the students in cognitively understanding an academic content, but it also about supporting the students in understanding the cognitive processes and approaches used in order to understand the academic content: How to effectively acquire new knowledge and skills? How to organize preconceptions? How to plan study time? How to structure a written assignment and so on? Luhmann (2000) described three dimensions for communication: context, social, and time dimension (what, who and when). Clearly, second order teaching include these dimensions but the concept also holds strong metacognitive elements and therefore we add the procedural and conditional dimension. These dimensions relate to the questions of *how and why* knowledge and skills can and ought to be taught and learned (Keiding & Thingholm, 2017).

Purpose of Research: Second Order Teaching in Practice

Second order teaching is not a pedagogical method, but a way of understanding teaching as communication and underlining the importance of metacommunication in the teaching and learning process. Metacommunication is not a specific approach but can be designed and planned in various ways. To convert a

theoretical concept into teaching practice is not an easy task. At Aarhus University in the spring of 2016, we designed a generic thesis preparation course framed by the concept of second order teaching. The first course was held in the fall of 2016, and the course is still running twice a year. The overall purposes of the course were to make the students conscious about how they do academic research and writing, making them feel confident to complete the thesis the following semester, and being aware of possible study strategies to implement during their thesis writing process. They did not begin their thesis writing, but they started thinking about how they think about doing academic research and writing. This metaorientation emerged from our classroom communication about classroom communication. We designed the course to be cross-disciplinary with a strong focus on context learning. The goal was to prepare the students to write their final thesis, but the preparation was not based on their academic discipline but on their former and future learning processes. This was explained explicitly to the students in order to align their expectations. In order to align the course and the final examination, the students, at the end of the course, handed in a portfolio with activities relevant for thesis writing and reflections on how they solved the activities and how the activities supported their thesis writing. The portfolio made the students reflect on how they had been solving an activity, and how they will solve a similar activity when they start their thesis writing. In this way, their former and future learning processes were addressed explicitly.

During the course, we asked them to outline what they had learned during their four years of studying at the university, and we asked them to reflect and discuss how they would apply this knowledge and skills in the final thesis. We addressed different strategies and approaches in academic writing. They compared themes, theories, and methods. They planned how to structure the time for writing their thesis and so

on. All the activities included an element of metareflection on the *how* dimension: how the students apply theory and methods in their academic work; how they experience their work processes; how they like working; and how or when they feel creative in their academic work. At the end of the course, we did an oral evaluation and a short survey. Both came out with predominantly positive responses. The survey consisted of 10 questions:

Q1: To what extent did you participate in the course?
Q2: To what extent have the activities been relevant?
Q3: To what extent have you benefited from the literature?
Q4: To what extent do you feel better prepared for writing the thesis?
Q5: To what extent have you benefited from the teachers' presentations?
Q6: To what extent has there been a proper progression in the content?
Q7: To what extent has it been beneficial to work together in groups?
Q8: To what extent have you used group work outside the classroom?
Q9: To what extent do you prefer the portfolio as an alternative to traditional exam with written assignment and/or oral exam?
Q10: To what extent do you want to recommend the course to fellow students?

In the findings below we present the results of the course evaluations from fall 2016 (38 students) and spring 2017 (15 students). The purpose of this is to stress two points: (a) it is possible to design a course framed by the concept of second order teaching, and (b) it is meaningful to the students to engage explicitly in a dialogue with the teacher and each other on *how* they learn.

Findings

Thirty-eight of the students (N=38) from the two courses answered the ten questions on a linear

scale from 1-10. One being 'not at all'; five being 'to some extent'; and 10 being 'strongly'. The data on the table below show that apart from questions three and eight, the students' responses were very positive with a high mean and median. Question number three concerns the literature, which they felt they did not benefit much from, and question number eight concerns the group work outside class, which they did not maintain. Group work outside class was recommended by the teacher but not an obligation.

The mode shows that the students mostly answered in the higher levels of the scale and seemed (a) to feel better prepared for writing the thesis (Q4 – mode 9); (b) to benefit from working together in groups (Q7 – mode 10); (c) to prefer the portfolio as an alternative to traditional exam (Q9 – mode 10); and (d) to recommend the course to fellow students (Q10 – mode 10). The students had somewhat lower scores for participating in the course (Q1 – mode 8), for benefitting from the teachers' presentations (Q5 – mode 8), and for experiencing a proper progression in the content (Q6 – mode 8).

Table 1
Mean, Median, Mode and Range for Each of the Ten Questions

Question	Mean	Median	Mode	Range
1	8.11	8.00	8	4-10
2	7.55	7.50	7	3-10
3	5.79	6.00	6	1-10
4	7.79	8.00	9	4-10
5	7.00	7.00	8	3-10
6	7.16	7.00	8	3-10
7	8.03	8.00	10	3-10
8	2.68	2.00	1	1-10
9	9.11	10.00	10	3-10
10	8.37	9.00	10	2-10

Note. (N=38)

The results of the questionnaire were shown and discussed with the students and in the oral evaluation. They commented on their answers. This talk was a kind of second order observation of how they had observed in the first observation – their responses in the questionnaire. Among other things, they said that they did not maintain the group work outside class because they felt it was sufficient doing group work during the lessons, which was often facilitated as workshop. Moreover, they felt busy, and it was difficult for the four or five group members to find a time for all of them to meet. The reason they did not feel they benefitted much from the literature was because the content of the literature was also addressed in the teacher presentations and as such, the literature was not an independent part of the content. Furthermore, some of the students stated that they did not learn to write by reading a book about writing, but they learned to write by practicing writing.

They felt they benefitted from the group work and workshops because they learned from each other. They presented strategies they normally used for research and writing to each other and by doing so their repertoire of study strategies expanded. They were taught how to give constructive, friendly, and specific feedback on research designs and outlines, and they gained experience from receiving as well as giving peer feedback. The portfolio was more popular than

a traditional examination, but few students said it was popular because it was easy. Others agreed that handing in a portfolio was easier at the end of the course, but during the course, it was harder but beneficial, because the portfolio made them concentrate on all the activities during the semester instead of just concentrating on the activities for an assignment or oral presentation at the end of the course.

During the oral evaluation, the students said that because of the course, they were now more *conscious* of what it takes to write a master thesis, and they mentioned that they felt more *calm and confident* in relation to writing their thesis. Some students missed the academic content of their subject area (psychology, history etc.), but other students did not miss the academic content because they found that the course supported their academic content by presenting and discussing what is important for thesis writing. Like teachers have their own styles of teaching, the students have their own styles of studying, and they have different priorities in their education and discipline.

The findings support the two purposes mentioned above: (a) it is possible to design a course framed by the concept of second order teaching, and (b) it is meaningful to the students to engage explicitly in a dialogue with the teacher and each other on *how* they learn. Like any other courses, instructors have to discuss and adjust content and methods, but theoretically as well as practically, we find it important to have classroom communication about classroom communication when teaching.

Summary

In relation to the first exercise of the course, a brainstorm on *Me and My Education,* a student wrote in his portfolio that this was the first time he had been asked to 'draw the threads together' from his four years of studying. He stated,

In particular, I found the task of identifying what we learned during our years of study useful. Over the past 4 years and 6 months, we have relied on many different topics, working methods and types of material. Many have also been in internship, have been studying or working on exchanges. The academic gains from activities outside the university's walls have particularly not been dealt with during our years of study. Therefore, this exercise was the first occasion I have had during my study time to draw the threads together from many different places and see my education in one long perspective that could give me an awareness of the consistency there is despite the elective subjects I have had and the two different faculties I have been at during my study time. This task made me see the link between the different courses - when it comes to themes and working methods. Especially in the light of the fact that a thesis is the academic culmination of my education, it has been good to become aware of what I know and can, which will be a springboard for me when I am writing my thesis. Also on a personal level, the task clarified how my personality and my professional interests are involved in the choice of subjects and the work process.

We find that this quote from a student perspective summed up why teaching context learning is important. At the university, students are taught academic knowledge and skills, but it is also crucial to teach them *how* to acquire and apply their academic knowledge and skills. We need to make the students reflect on what they have learned, how they have learned it, and why they have learned it. As Luhmann (2006) indicated, "You cannot teach or learn either language or science, either history or mathematics on the assumption that it does not matter how the learner circumvent the content" (p. 89). In second order teaching, the teacher and students are explicit on this circumvention in order to communicate knowledge and skills that

are useful and meaningful for the present and future life of the students.

Through the concept of second order teaching, we suggest classroom communication about classroom communication in order for teacher and students to be explicit on how it is possible to achieve an academic content and develop as an academic with professional knowledge, skills, and personal confident within one's field.

Second order teaching is not a specific method, but a way to understand the relation of teaching and learning. Second order teaching can be implemented in various ways on all levels of education as long as the teacher reflects and discusses how students are taught to learn the discipline at hand, and as long as students reflect and discuss how they like to learn and how they learn best.

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FINDING ALTERNATIVES AND/OR FOLLOWING GLOBAL TRENDS FOR SCHOOL LEADERS?: REFLECTION OF EDUCATIONAL MANAGEMENT IN JAPAN

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Abstract: *As difficult situations around educational management increase, related research needs to be reflected upon. In this research, the actual nature of the school management process is examined by questioning "How is a headteacher able to impact and effect the school?" and "What kind of relationships are there among various people who are involved?" using the fieldwork at the R school alliance (consisting of four primary schools and one lower secondary school) since 2013 in Japan. As a result, it is shown that the following phases are needed to be considered—various intentions and people within/outside the school; rotation system as the personnel affairs; careful mutual-understanding with educational administration to overcome the "top-down" approach; and sharp insights into social changes. It implies that even under a uniform system the reality of school management is very diverse, and the possible ways for the corresponding school management are particularly context-dependent. So even the simple technical theories can become harmful. Therefore, dialogue between school leaders and researchers is essential to find alternatives and/or follow global trends while understanding the complexity of school management in relation with the meso/macro contexts such as community conditions and educational policies.*

Key words: school leader, reality of school management, educational reform, Japan

Introduction: Lack of Reality for "School Leader" Studies

Educational management is confronted with more complex contexts and environments in the rapidly changing society. So-called neo-liberal reforms that have a clear trend towards the decentralization of services within a framework of increasingly detailed target-setting and monitoring by central government have been implemented in different countries, and this implementation has schools thrown into more competitive situations with a lack of resources (Whitty, 2008; Whitty, Power, & Halpin, 1998). In such global trends, the nature of school management should be questioned again. University researchers are also involved in the field of educational management. However, as the trends of academic research, which strongly require effectiveness, have increased, it seems that the unreasonable technical approaches or standardised theories without consideration of diverse characteristics of schools are abundant.

The "apparent popularity of education management texts… is harmful because of the way it fails to challenge existing social inequalities and the way it chimes with managerialist policies that will only further intensify existing inequity" (Thrupp & Willmott, 2003, p. 3). As the difficulties around educational management increases, the way of related research used should be questioned. What role can university researchers play here?

Aims and Objectives

Raising Questions from Japan

There is a certain gap between what school leaders say and what they actually think and do. Under/against the political mainstream,

therefore, "grass-rooted" dialogue between school leaders and researchers are conducted to find alternatives and/or follow global trends.

In this research, the "school leader" is defined in a wider meaning than a headteacher (principal); it includes teachers and other staff who are trying to bring about positive movement to their school. The fieldwork targets mainly headteachers in Japan with different careers, and other voices are taken into consideration at the same time. Although it is often said that the feature of school reform process in Japan is characterised as policy-led and top-down, the reality is clarified to be much more complex and dynamic through this research.

The outcome of this research describes such actual situations through the continual dialogue between school leaders and researchers. Instead of suggesting how-to methods, the authors are focusing on the dialogue in order to understand the situation in detail. The authors are focusing on the continuous dialogue and have been doing the fieldwork from 2013 until 2017.

At the conclusion, what situations school leaders are facing and how they consider it in the local context of their schools is clarified. The meaning of the cases in a global context is also described at the same time. There is much more potential than people think for educational management if school leaders and researchers meet and reflect with each other.

Global Trends of School Leader Research

School management is now in a very complex context and environment and still has many problems that strongly remain a policy-led and top-down approach. However, school management is rarely democratic or sustainable if it does not have its autonomy and is not based on its local context. The process of school management should not be a top-down or policy-led approach but should face and consider the local context and how the stakeholders of the school think.

Therefore, in this research, to clarify and re-define the role of the school leader, the actual nature of school management process in such complicated and contradictory environments is examined by mainly focusing on headteachers with the question "How is a headteacher actually able to impact and affect the school?" For the approach to the reality of school management, "What kind of relationships are there among various voices that are involved in the actual process to improve the school?"

Theoretical Perspectives

Ambiguity of the school leader and its implications. Through questioning "Who are the school leaders?" the ambiguity of the concept of school leader has been pointed out (Tsujino & Suematsu, 2016) and is becoming very significant. As other researchers have pointed out, "There is no clearly defined, specific 'role' of school leadership, but at best a coloured patchwork of many different aspects" (Huber, 2004, p. 5), and "The terms educational leader, manager, and administrator are used quite differently from nation to nation" (Hallinger, 2003, p. 4). Though "leadership is a highly contested concept" (Lumby, Walker, Gryant, Bush, & Björk, 2009, p. 157), it implies not only just a complicated concept but also meaningful one to discuss. "Our view in relation to school leadership views the field of influence as wider, not just contributing to the effectiveness of the organization, but also directly interacting with and contributing to the community" (Lumby et al., 2009, p. 157).

While we cannot clearly define school leader, we need to think deliberately about who are the people able to make a good school. We could engage with these questions diversely and controversially.

As Bush (2011) argued, there are some types of models of leadership in education. Our research framework is rather applied to the political models of leadership because they "assume that organizations are political arenas whose members engage in political activity in pursuit of their interests. Analysis focuses on the distribution of power and influence in organizations and on the bargaining and negotiation between interest groups" (Bush, 2011, p. 99).

Importance of comparative perspective and governance structure. What is often overlooked is the question "What are the limitations that schools cannot improve as a single unit organisation?" One of the main themes of this research – "Is a headteacher a real school leader?" – implies the significance on focusing on the overall structure of the public education system beyond a school as a unit. However, the feature of the whole system surrounding the school is often overlooked, because the object 'school' is too familiar to people (Tsujino & Suematsu, 2016). In this research we are targeting Japan, but in the background, there is a foundation of international comparative research which the authors have done so far. It is said that through comparative education, we can not only make "strange patterns familiar" in foreign countries, but also make "familiar patterns strange" in one's own country (Bray, 1999).

Approach to the Reality of School Management – A Case of "R School Alliance"

Understanding School Management in a Real Way

What does it mean to understand school management in a real way? Not only headteachers and teachers, but also various others such as administrative staff, nursing teachers, and nutrition staff work at schools in Japan. In addition, there are some staff such as school counsellors, school social workers, community coordinators who are employed to work inside and outside schools. Also, in the case of Japan, there are the various relationships between a school and its local community which cannot be ignored. People on the outside of school play big roles (see Figure 1).
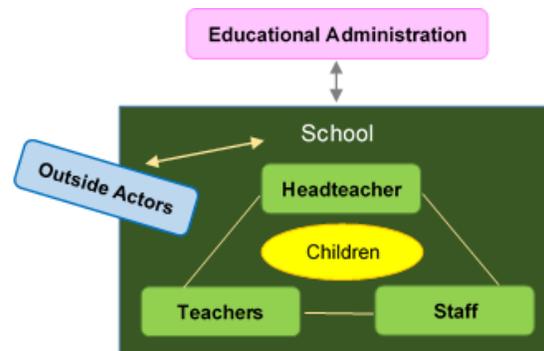

Figure 1. Graphic depicting the various actors inside & outside a school. Drawn by the authors.

That is why we are also targeting various players in education in relation with the macro policy and system: to understand school management in a real way. Furthermore, considering that a school does not have much authority, educational administrative institutions often influence the reality of school management in different ways (for further detail of preconditions for school management, see Tsujino & Suematsu, 2016, and Appendix 1 & 2).

In Japan, all school staff members, including the headteacher, move from one school to another school every few years and sometimes move into educational administration (the rotation system in the personnel affairs). It is probable that almost every Japanese headteacher takes over school management issues left by the predecessor at the time of her/his arrival at the new school. The prefectural education board which is located between the state and the municipality (cities) is authoritative about this rotation system.

Basic Information of R School Alliance

As follows, we are dealing with a case of the R school alliance in which the authors have been continuously taking part in since July 2013 until March 2017. The R school alliance consists of four primary schools and one lower secondary school. The school choice system does not exist in this city, and there are no competitive surroundings for these schools. Collaboration for management among the five schools has been done for ca. 10 years. R school alliance sets the school alliance management board consisting of representatives of committees from all five school management boards (see Figure 2).
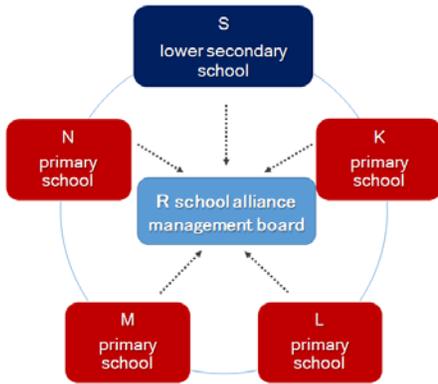

Figure 2. Graphic depicting the structure of R school alliance as drawn by the authors.

In general, the reality of school management is influenced from various factors: whether the school is small in scale or large; whether the school is in an urban area or a rural one; how much cooperation exists between the school and its local communities including the parents; whether the school's teachers and other staff are cooperative or not; and whether the municipal board of education which is responsible for the school is supportive or authoritative. The four primary schools that constitute the R school alliance vary from small schools of dozens of children to large-scale schools of more than 800, and the situation in each area are diverse from large residential areas to small traditional villages. By focusing on the R school alliance,

implications are to be obtained to approach the reality of school management from various angles.

Results

Key Issues that Symbolise the Reality of Each School

The method of this research is not a one-shot interview, but it is based on formal and informal continuous interviews and observations since 29 July 2013. All data were analysed depending on the authors' field notes, so the remarks were simplified. All job positions of the interviewees are those at the time of the interview.

Most children attending the primary schools in the R school alliance enroll into the S lower secondary school. The headteacher B of the S lower secondary school talked about the characteristics of this school: that the financial support from community members is extraordinary in comparison to other schools; that local people are friendly and cooperative towards the school; and that "children with difficulties" keep coming to school instead of leaving, etc. (10 October 2013 interview). Inside the Q city, S lower secondary school is rumoured as one of the most "difficult" schools; however, by observing the actual situation, it is obvious how such labelling is in contradiction to the reality.

In general, inside the so-called "difficult" school, top-down instruction is often seen as suppressive; however, the S lower secondary school has a relatively soft educational climate. As a result, the teachers who have arrived at this school from another school are sometimes confused about the differences. C teacher, who is in the second year at this school, said, "In the first year, I struggled because my way of instruction did not fit, so gradually I had to change my style. After communicating with the children, now little by little I feel some response from children" (31 July 2015 interview).

The headteacher A of the K primary school with over 800 children, which is the largest in scale in the R school alliance, critically referred to the former school management of K primary school soon after he arrived at this school (10 October 2013). His point of view about the former style of "academic achievement" was that it was often simplified by the test scores in Japanese language and mathematics. After his arrival he decided to change the emphasis to a rich and warm "mind" instead of academic achievement. Before working as a headteacher for K primary school, he worked at the Q City Board of Education as a supervisor mainly dealing with the "community school" policy of the city. Therefore, he is very familiar with the educational policy of the Q city, and what actions are necessary for a school to effectively cooperate with the board of education. On the contrary, the more a headteacher becomes familiar with the administration, the gap between the teachers without experience in administration arises further. It makes it harder for him when he manages the school as an organisation.

To know what various educators think about the schools and how their images are connected or divergent with each other, let us look at the school evaluation as a concrete example which has been discussed by various people at the school management board. A headteacher, a vice headteacher, teacher(s), community members, and parents participate in the school management board (see Figure 3). Many of the community members were/are parents who let their children go to schools in this area.
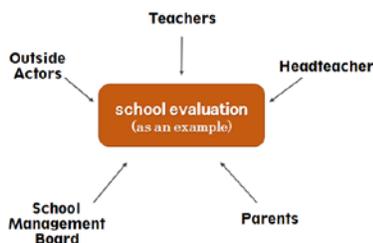

Figure 3. Graphic of the actors who influence the management of the school as drawn by the authors.

To begin with the school self-evaluation report, the present situation of the school education, and its improvements are argued together. However, there are not just a few problems for the school self-evaluation that is done by each school. Mr. G, the chairman of R school alliance and a local community member, pointed out "currently the school evaluation is 'forced' by the board of education" and "the school teachers tend to have a stereotypical image that the outcomes of children always have to become better." A school management board committee member, Mr. F, who is a company manager and child welfare volunteer, pointed out that "even though it is very challenging just to maintain the status quo, it is not included (in the school self-evaluation report: the authors' note) at all. Mr. E, executive director of the R school alliance and a company manager, referred to the problems of school evaluation as "even when the problem is on the part of the local community, there is a social structure that makes school suffer as if it is their own problem" (26 February 2014).

Regarding the school evaluation, there is often frustration between the school and the community members because a school cannot accurately depict its current situation in the self-evaluation report. Interestingly, however, the root of such argument seems to be from the attitude of the community members trying to positively catch the situation against self-critical schools. Mr. E said,

It is not shown in the self-evaluation report done by the school that there is a fact that more teachers are wanting to stay longer at this school. This is proof of school improvement. Moreover, although the school thinks that the Q city board of education will not accept the school evaluation report that does not follow the uniformed elements created by the city board, the board answered vice versa that they only gather all school evaluation reports but do not read through [them] because there is no time. (9 February 2016)

Conclusions

Reflection of Educational Management in Japan

In such complex school management conditions, if we focus on the headteacher among several school leaders, what choices can they make? As the headteacher tried to change the school management policy at the time of his arrival in the above case, the headteacher's authority is relatively strong in the Q city in general. Therefore, it is possible to some extent to eliminate the gap between the ideal and the reality by the competence of a headteacher. In the metropolitan area, on the contrary, headteachers sometimes become isolated. Headteacher V of the R district explained that she was marginalized from her school by the initiative of a teacher and was forced to get sick leave (24 March 2017). It indicates how different conditions exist from region to region, and the possible ways for the corresponding school management are particularly context-dependent. It indicates also that the simple technical theory or "how-to" books on school management become harmful.

Even if a headteacher can organise teachers and staff, the educational administration might intervene in her/his way instead of supporting. A board of education tends to be regarded as authoritative from a school's side. In this case, however, the schools' consciousness about school evaluation and the reality of educational administration were largely conflicting. If so, apart from the substance of educational administration and its policy, how a school perceives them considerably regulates the reality of school management. The work of a board of education sometimes, or often, surpasses a school's authority. Headteacher X who arrived at the S elementary school in April 2017 after completing his career at the J city board of education next to Q city said, "I would die if I

had to work there for over two years" (5 April 2017). If a school leader misunderstands without paying attention to various others' backgrounds and their situation, the problems of school multiply rather than get solved.

How Can We Approach to the Reality of School Management

The reality of school management is extremely complex. Even under a uniform system or top-down policy, the reality at a school level does not show the same aspect. What the case study above indicates is that it is almost impossible to approach the reality of school management without viewing at least from the following phases:

- Diverse intentions within the school organisation: The differences among headteacher, teachers, staff, parents, community members, and children do not appear automatically though they exist.
- Various contributors outside the school: Even though the influence on school management is extremely large, it does not become obvious unless there is no corresponding recognition or encouragement from both sides, inside/outside the school.
- Rotation system in the personnel affairs: All teachers and staff including a headteacher move from one school to another school every few years.
- Delicate balances of school management: Sustainability and innovations are always both required for the school management in the public education sector.
- Careful mutual-understanding with educational administration: To overcome the top-down approach stemming from school distrust as well as an apathetic control depending on ignorance of educational administration, professional autonomy for public education must be embodied.
- Sharp insights into social change including its unpredictable elements: Instead of confining education in a current predictable

narrow range, education itself is to be always questioned.

From this kind of a viewpoint with various human and cultural networks, it could be explained through the social capital theory. It might also be explained as the outcome of institutional reform or municipal educational policy. From this research, however, it is obvious that the collaboration inside and outside school and the tight relationship between school and local community have been built historically. Such a feature which is regarded as self-evident or non-characteristic for the cultural insiders is barely analysed with a single, specific theoretical frame because the reality of school management can be described as a highly complicated structure.

In Japan, the community school policy was introduced in 2004 as a school management reform. Under this new system, the participation of parents and local community members began to be strengthened. The participation by parents, however, has not been substantial yet. Furthermore, student participation is not assured institutionally. In this regard, it will be next issue for this research is to interview students and parents who do not always participate in the decision-making process substantially.

Finding Alternatives for School Leaders

Although the above is a consideration focusing on only the headteacher among the different school leaders, commonalities can be found for teachers and staff. Meanwhile, there is a certain limitation for teachers and staff to reflect on school management because they are engaging in daily classes or other tasks. Therefore, it is expected for a headteacher mainly to deal with school management. This structure can pose a risk, as the reflection of school management depends on the competence of the headteacher alone.

The reflection itself is not a self-contained activity but is a relationship-dependent concept including dialogue. In order for headteachers to recognise the complexity of school management and to reflect it in relation to the macro context such as educational policy, continuous dialogue with researchers who have information and an analytic perspective is indispensable. For this purpose, researchers are also required to take responsibility with their viewpoints.

Finally, no matter how realistically school management can be described, there remains the question of which direction the school should take. Even at a school management board where various people participate, discussions tend to be focused on only their schools or just a little more towards their local communities. As a result, even rapid global changes that affect society or children's lives will not appear spontaneously in the discussion there. If the reflection of school management will be professionalised, the discussion of such challenges should not be avoided.

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Appendix 1. Governance Structure in Japan
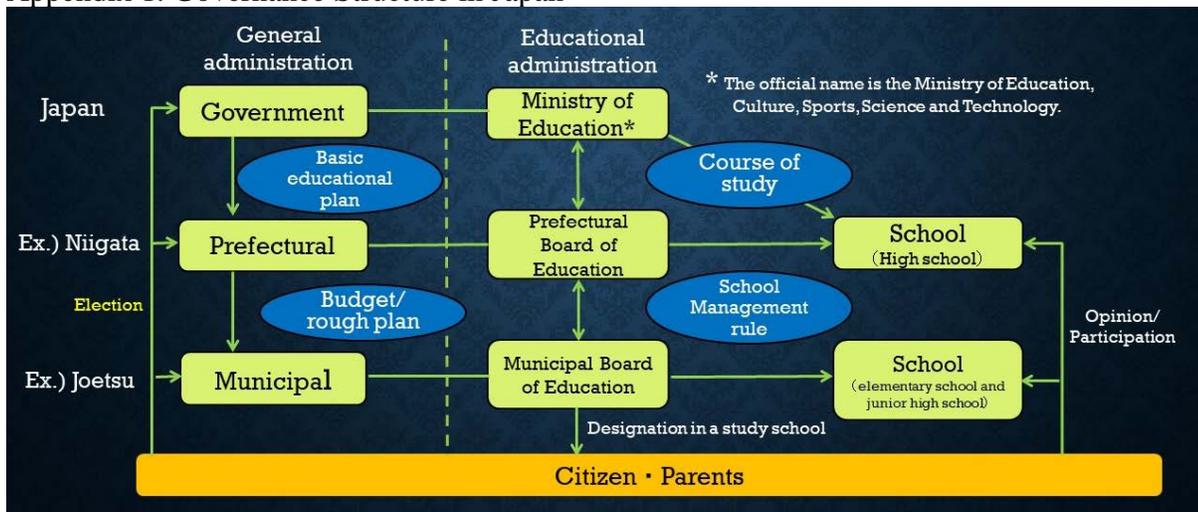
(Resource: Imoto et. al. 2015, partially modified by the authors.)

Appendix 2. School Administration and Management Structure in Japan (Resource: made by the authors)

		Japan
school administration	national level	Ministry of Education, Culture, Sports, Science and Technology (MEXT) has authority for educational contents (Ex.) Course of study, official approval of textbooks, nationwide achievement tests, basic plan for education promotion, etc.
	state level	Prefectural Board of Education (Ex.) Personnel affairs
	municipal level	Municipal Board of Education (Ex.) Authority for facilities and equipment
school management	decision-making	Supreme decision-making body = headteacher School staff meeting is chaired by headteacher PTA and student council has no legal participation right.
	headteacher's authority	Headteacher has supreme authority.
	teachers' authority	School staff meeting is a subsidiary organisation of the headteacher. The teacher is a local public official with lifelong employment. *Teacher has little authority for participation in school management legally. * In reality, school staff meeting has a certain influence.
	educational participation	Educational participation is partly legislated (school councilor system etc.) *When a school designated as a 'community school', parents and local residents also have the rights for participation and deliberation.

ADMINISTRATION ISSUES IN TEACHING AND LEARNING FOR THE FUTURE OF SECONDARY EDUCATION IN RIVERS STATE, NIGERIA

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Abstract: *Effective administration is a must in the dynamic centres of education: teaching and learning are required to effectively interpret and deploy the nation's education policy and execute curriculum realities that respond to the fatigues of the present and the challenges of the future. The paper, therefore, critically examined the administrative issues relevant in enhancing teaching and learning in terms of preliminary issues of school administration, teachers, and supervisory issues. To achieve this, the study used a descriptive survey research design. The sample of the study consisted of 250 participants (45 principals and 205 teachers) of private and public secondary schools randomly selected from nine local government areas of Rivers state. Three research questions and three research hypotheses guided the study that used a 19-item instrument to gather data from respondents. Descriptive statistics and independent sample t-test were the statistical tools used to analyze the data. The impact of preliminary administrative issues on teaching and learning in secondary school education was quite negative, teacher issues were not considered relevant, and the respondents had negative view of the relevance of supervisory issues of the curriculum to teaching and learning in secondary school education. However, the principals and teachers differed significantly on their mean rating of the impact of preliminary administrative issues, relevance of teacher issues, and the relevance of supervisory issues of the curriculum to teaching and learning in secondary school education respectively. It was recommended among others that secondary school owners—government and private individuals—ensure that administrative issues be given utmost attention for effective teaching and learning.*

Key words: administrative issues, teaching, learning, future education, secondary education

Introduction

The relevance of any educational system remains in its ability, competence, and tenacity in addressing reoccurring challenges in the society in the present and anticipating unforeseen contingencies in the future. Accepted as "instrument par excellence" for national development, goals of education in Nigeria are constantly aligned to the overall philosophy of country. The main national goals of Nigeria are emphatic of a country which should be (a) a free and democratic society; (b) a just and egalitarian society; (c) a great and dynamic economy; and (d) a land full of bright opportunities for all citizens (FRN, 2014)

The education system that is expected to achieve these lofty goals must be geared towards self-realization and effective citizenship through the inculcation of appropriate skills, social abilities, and mental competencies in congruence with realities of Nigerian society (FRN, 2014). In Nigeria today, just as in most parts of the world, the paradigms of national development are shifting and global phenomena are breaking down boundaries. Globalization and commercialization are causing massive mergers and reducing workforces. "Knowledge society" is growing massively beyond the forecast of

education systems and experts. Contents of curricula, in turn, are becoming inadequate, irrelevant, and incongruent with the demands and challenges of living in society today in the face of current global phenomena (Edem & Okon, 2008; Obanya, 2014). Unemployment is high; poverty is in the increase. It is pertinent at this juncture to examine the system of education of the country and recreate one that responds to the vagaries of time and anticipate the future (Fien & UNESCO, 2010). Thus, emphasis should be on what to teach and learn that engender creativity, skills, and capacities. In describing what should form education for sustainable future, UNESCO (2010a) emphasizes that the rationale behind any education that targets the future must consider the following: exploring global realities, futuristic curriculum, challenge based education and open boundary education that interrogates the present continually. What to teach and learn must now have interdisciplinary emphasis that addresses the following: the reduction of hunger and poverty; the impact of globalization on emerging democracies; food crisis; migration; and self-sufficiency to name a few.

Teaching for the future must focus on developing the learners' capacities, dispositions, and competencies to deal with new situations and environments. Learning should constitute knowing, doing, and being (Bolstad et al., 2012). Teaching and learning are not to be without school curriculums, but curriculum must be designed to focus on what makes the learner an owner and explorer. This thought is underlined by the 21st century emphasis and belief in a 'knowledge society' that responds to challenges (Bolstad et al., 2012; Obanya, 2004).

Strategies in Teaching and Learning for the Future

The need to turn education to address issues of survival and belonging has already been identified and underlined as critical. The direction the curriculum should take has also been identified as creativity-driven (Bolstad et al., 2012; FRN, 2014; Obanya, 2014). Fundamental to nature of curriculum is the issue of strategies mostly adopted by the teacher-leader. Some effective strategies to arouse and sustain creativity-driven learning include experimental learning, values education, enquiry learning, future problem-solving learning, learning outside the classroom, and community problem solving (Dodge, Colker, & Heroman, 2002; Friend & Cook, 2007; Inglar, 2014; UNESCO, 2010b). Effective strategies, easily identified goals of education, and relevant curriculum are essential in accomplishing the philosophy of a country's education plan for development, growth, and transformation to meet the challenges of a given time and beyond. Nigeria's bid for greatness in the community of nations must factor in an education system that relates learning to problem solving.

Much as the focus remains on how to achieve an education system that guarantees the survival and prosperity of the nation, it is imperative to consider the all-important role that school administration plays in bringing about goal achievement. School administration is responsible for mobilizing, arranging, and organizing the school space within the limited resources available for use (Hoy & Miskel, 2008). It is this critical role of school that then provides needed creativity to make learning respond to the direction that the society requires. In a related argument, Obanya (2004) pointed out that African education can only respond to 21st century challenges of "survival and belonging" when its curriculum is (a) culture rooted and African value loaded; (b) open to external influences, analytically borrowed and critically adapted to Africa's needs; (c) creativity-driven; and (d) integrated to bring together various forms of learning experiences (pp. 84–85).

Statement of the Problem

Dwindling economic fortunes, lack of employment, growing population, dependence on government paid jobs, globalization, commercialization, and such global issues have directly impacted negatively on the Nigerian people. Graduates of secondary school education are no exceptions. They are not able to achieve goals of secondary school education of living a meaningful life after graduation. They lack the skills, capacity, and creative ability to meet the demands of entrepreneurship or the industrial workplace of the 21st century global economy. Neither is a good percentage able to transit to tertiary level of education or get into choice courses due to being ill-equipped educationally. The fundamental question that teachers, school heads, supervisors, administrators, and even the critical public ask is about the adequacy of administration of secondary education in triggering development through the skills and creativity exuded by graduates.

Purpose of the Study

This study evaluated principals' and teachers' perceptions of administrative, teaching, and learning issues for the future of secondary school education in Nigeria. This study also tried to reveal if significant relationships exist in the relationship of respondents' demographic information (age, gender, principals and teachers, and their length of experience) and the perceived variables. This quantitative inquiry hopes to make significant contribution to researchers, policy and decision makers, planners, and administrators in education. Thus, this study was specifically aimed to
● Analyze the extent to which principals and teachers perceive administrative issues in relation to teaching and learning.
● Evaluate the extent to which principals and teachers perceive teaching issues in relation to teaching and learning.
● Evaluate the degree to which principals and teachers perceive supervisory issues of curriculum in relation to teaching and learning.

Literature Review

Theoretical Framework

The theoretical foundation of this work is derived from administrative management principles outlined by Henri Fayol, Lutehr Fulick, and Max Weber where the basic functions of management are planning, organizing, coordinating, controlling, and budgeting of organizational resources to achieve predetermined goals (Lunenburg & Ornstein, 2008). That is, educational administration takes on the function of deploying and using the resources of human, materials, funds, and programs available in school setting in achieving predetermined objectives of education. Educational administration, therefore, pursues the goal and objectives of teaching and learning efficiency and effectiveness through systematic and strategic planning, organizing, coordinating, and controlling of the technical core, processes, curricular materials, and related responsibilities within the school setting.

Administrative Issues

Administrative issues in teaching and learning are concerns for (a) facilities, infrastructure, students' characteristics, school characteristics, partnership issues; (b) teachers' preparation, professionalism, conditions of science, development, and training, and teacher motivation; the focus on the supervisory role of school administration on curriculum execution and implementation and curricular materials; and (d) administration of infrastructure and facilities and students' issues. Each is an important concern in achieving effective teaching and learning.

Studies have shown that availability of quality infrastructure in schooling has strong impact on teaching and students' learning. One study showed a contrast in satisfaction level between students attending school with quality infrastructure compared with those in school with poor infrastructure (Cuyvers, De Weerd, Dupont, Mols, & Nuytten, 2011). Serene classroom environment, building integrated with ICT, access to sources of research, laboratories, libraries, and halls were available and contribute to the well-being of students. Similarly, Asiabaka (2008) argued that quality of facilities of school is a determining factor in the achievement of the objectives of school.

Cohen and Bhatt (2012), however, observed that infrastructure by itself does not mean achievement of excellence until it is subjected to better organizational management. Effective infrastructure for achieving effective teaching and learning emanates from effective design, planning, mobilization, and deployment (Federal Ministry of Education [FME], 2009; Obanya, 2004). Facilities/infrastructure, equipment, and environment tailored to learners' needs to create and realize their potentials are necessary for 21st century Nigerian education system (FME, 2009). However, the *Roadmap for Nigerian Education Sector* (FRN, 2009) identified three issues: (a) the lack of conducive school environments; (b) an inadequate number of schools and classrooms; and (c) the lack of value for education by some communities. These are some of the major administrative issues affecting access to education for all and especially equity for female children in northern Nigeria. It is therefore pertinent to acknowledge the importance of preliminary issues of administration as fundamental in creating atmosphere germane for teaching and learning for the future.

Teacher Issues

The common saying in Nigeria about teachers is that they reflect the quality of the education system. Thus, it is a parlance that no education system may rise beyond the quality of its teachers. This idea makes the teacher a critical factor in the education process (FRN, 2014). The Nigerian teacher who can fit into the teaching profession in the 21st century is expected to be highly motivated, conscientious, and efficient in the classroom (Agi, 2002). They are further expected to exhibit spirit of inquiry and creativity, professionalism and commitment (FRN, 2014). The task of the teacher today has shifted significantly from context creators only. They are saddled with the responsibility of preparing learners to live worthful lives after school and also for tertiary education. Donaldson (2010) explained that "Life is filled with tests, many of which will not be put on paper…. Teachers of future will focus less on testing and more on teaching skills that place students on the trajectory to meet testing demands and beyond" (para. 1).

In any context of learning, the teacher trained to teach for the future is the one who has the skills of facilitating, enriching, mentoring, or collaborating and creating content in learning situations (Marquis, 2012). Teachers exhibiting these skills perceive learning as projects, problem-solving, and life challenges. The teacher's role becomes to assist learners define the scope of their problems and navigate the processes of reaching solutions. Here, the teachers design the curriculum to focus on students to give them ample opportunity to construct their own learning and knowledge and become inquisitive and self-motivated (Linde, n.d.; Malik, Murtaza & Khan, 2011).

In the learning situation, where the teachers are to perform their roles, the quality of the teacher needs to be ascertained. The qualifications and professional experience required to enter into

teaching vary from country to country. In Nigeria, the minimum qualification remains the *Nigeria Certificate in Education* for both basic and post basic education (FRN, 2014). These minimums, notwithstanding, the Roadmap for Nigerian Education Sector, specifies that teachers teaching in 21st century Nigeria:

- must undertake teacher education programs in the revised upgraded approved curricula by 2010.
- must attend teacher vocation courses reintroduced in 2009 to regular update their skills and pedagogy.
- must acquire ICT skills and modern education technology used for classroom instructions and learning (FME, 2009).

Obanya (2004) corroborated the need for high quality teachers in the post basic education system. His contention is that 21st century education in African will need to address the various challenges of survival and development.

For teachers to assume the role of teaching for the future, regular professional development and training in pedagogy is imperative. Managers of the education system in Nigeria are conscious of this. Quattlebaum (2012) believes that professional development of teachers must go beyond "simple in-service workshops" to become "a more robust system of continuing education" (picture caption, para. 1). Opportunities for engaging in active learning, development of content knowledge and pedagogy which help teachers to apply skills to learners' development are regarded as critical for professional development. Teacher professional development has been identified to positively impact student achievement (Marzano, 2003, as cited by Quattlebaum, 2012).

Teachers' motivation, remuneration, and perception of fairness at school are key factors in their performance and commitment at school. Work conditions such as autonomy, leadership, availability of curriculum materials and facilities, merit pay and comparative pricing of the job support teachers to face school task effectively (Hoy & Miskel, 2008; Lai & Cheung, 2015; Lunenburg & Ornstein, 2008). The International Institute for Educational Planning [IIEP] (2009) also reiterated the factors of teacher motivation, compensation and work conditions as essential to the well-being of schools and teachers' commitment. In a study in Rwanda by Gatsinzi, Role, & Makewa (2014), factors such as increasing teachers' responsibility and accountability in school matters, setting career paths, and improving service conditions were imperative to teachers' performance. Other factors in teacher motivation include location of school, challenges arising from school tasks, supportive school climate and culture, and support and access to professional development and growth. These conditions increase the teachers' understanding of workplace, acceptance of responsibility, and build sense of worth (Nwaeke & Agi, 2009; Richardson & Haman, 2000). In a nutshell, the administrative issues of teachers' roles, enthusiasm, commitment, effectiveness, and professional competencies should be considered against the backdrop of conditions at work, motivation, and perception of effort and reward (Ololube, 2009).

Supervisory Issues

Supervision at school is an administrative strategy employed both by school boards and school heads to assist the school and school teachers improve on delivery of instruction, improve classroom practices, and the professional competence of teachers to effectively guide the learning process. The impact of administration on supervision is to ensure proficiency and professionalism in classroom and out-of-classroom practices in the profession. The focus of supervision is to improve teaching and learning in the classroom (Dodge et al., 2002; Olawole, 2009; Ololube, 2009; Veloo, Komuji, & Kalid, 2013).

Research Questions and Hypotheses

The following research questions guided the study:

1. How do preliminary administrative issues impact on teaching and learning in secondary school education as perceived by teachers and principals?
2. How relevant are teacher issues to teaching and learning in secondary school education as perceived by teachers and principals?
3. What is the degree of relevance of supervisory issues of curriculum to teaching and learning in secondary school education as perceived by teachers and principals?

The following hypotheses were formulated and tested at 0.05 level of significance for the study.

H_{01}: There is no significant difference in the extent of perceived administrative issues in relation to teaching and learning between principals and teachers.

H_{02}: There is no significant difference in the extent of perceived teaching issues in relation to teaching and learning between principals and teachers.

H_{03}: There is no significant difference in the extent of perceived supervisory issues of curriculum in relation to teaching and learning between principals and teachers.

Methodology

Target population for this study comprised all principals and teachers of secondary schools selected in nine (9) of the twenty-three (23) local government areas of Rivers state, which have a total of 886 teachers. A sample size of 280 teachers were selected using a random sampling technique. The study used an author-developed instrument titled *Principals-Teachers-Administration Issues Questionnaire*. The survey included six demographic questions and 19 other questions to answer the three research questions. These 19 questions were given a Likert-scale of 1 to 4 with 1 being *strongly agree*, 2 being *agree*, 3 being *disagree*, and 4 being *strongly disagree*. Survey questions 1-7 answered research question 1; survey questions 8-14 answered research question 2; and survey questions 15-19 answered research question 3. The instrument was validated and its reliability determined. The research questions were answered using mean and standard deviation while the null hypotheses were tested with *t*-test statistics.

Results

The first set of data (Table 1) analyzed the frequencies and percentages distribution of respondents' demographic information. Firstly, the age distribution 30(12.0%) of the respondents were 20-30 years old, 81(32.4%) were 31-40, and 139(55.6%) were 41 years and over. Majority of the respondents were male, 169(67.6%), while 81(32.4%) were female. Meanwhile, based on the type of school, 11(4.4%) of respondents were from technical schools, while 218(87.2%) were of grammar schools, and 21(8.2%) were of science schools. Additionally, data on ownership of schools revealed that 166(66.4%) were of public schools, while 84(33.4%) were from private schools. The status of respondents revealed that principals and vice principals were 45(18.0%), while teachers were 205(82.0%). Data on respondents' years of experience revealed that 40(16.0%) had experience of 0-5 years; 114(45.6%) had experience of 6-10 years; 32(12.8%) had experience of 11-15 years; and 64(25.6%) had experience of more than 15 years.

Table 1

Frequency and Percentage Analyses of Respondents' Demographic Variables

Demographic Variables		Frequency	Percentages
Age	20-30 years	30	12.0
	31-40 years	81	32.4
	41-above years	139	55.6
Gender	Male	169	67.6
	Female	81	32.4
School Ownership	Public	166	66.4
	Private	84	33.6
School Type	Technical	11	4.4
	Grammar	218	87.2
	Science	21	8.4
Status	Principals/Vice Principals	45	18.0
	Teachers	205	82.0
Length of Experience	0-5 years	40	16.0
	6-10 years	114	45.6
	11-15 years	32	12.8
	16-above years	64	25.6

Note. N = 250; each category had 100% of respondents' answer.

To answer research question 1, Table 2 shows the descriptive statistics on the impact of preliminary administrative issues on teaching and learning in secondary school education as perceived by the teachers and principals. The grand mean rating of the teachers (2.44±0.65) and principals (2.06±0.74) were below the criterion mean rating of 2.5. The only item as agreed by the teachers (3.97±0.53) and the principals (3.36±0.59) was the fact that the population of the students in the school outweighs the recommended standard.

Table 2

Descriptive Statistics on the Impact of Preliminary Administrative Issues on Teaching/Learning

Teaching Issues	Teachers		Principals*	
	Mean	SD	Mean	SD
1. The population of the students in the school is greater than the available resources.	3.97	0.53	3.36	0.59
2. Class size of 25 students as prescribed by UNESCO is adopted in my school.	1.75	0.68	1.57	0.66
3. Classification of students is based on the principle of ability, interest and flair.	3.00	0.81	2.00	0.83
4. Infrastructure/facilities spaces for students, teachers and administrators, studious, sports complex, ICT Centre, libraries, laboratories, cafeterias, media centers, sports equipment and restroom adequate for students.	1.88	0.79	1.79	0.81
5. Neighborhood schools are as equipped as school in urban centers and cities.	2.40	0.68	1.42	0.59
6. School and community have partnership relationship that promotes school development.	2.01	0.99	2.15	0.98
7. Private citizens and business community invest in facilities and equipment in secondary school.	2.10	0.84	2.10	0.88
Grand mean score for survey questions 1-7	2.44	0.65	2.06	0.74

Note. N = 250, n = 205 teachers and n = 45 principals & *includes vice principals. Criterion mean cut off=2.5

Table 3 shows the descriptive statistics on the relevance of teacher issues to teaching and learning in secondary schools' education as perceived by the teachers and principals. It answers research question 2. The mean grand ratings of the teachers (2.31±0.91) and principals (1.70±0.92) over the relevance of teacher issues to teaching and learning in

secondary schools' education were below the criterion mean rating of 2.5. The only item rated above the criterion mean score of the fact that teacher perception of equity, fairness, and care is a factor in teacher performance (2.62±0.99); whereas, the other items were rated below the criterion mean.

Table 3

Descriptive Statistics on the Relevance of Teacher Issues to Teaching and Learning

Teaching Issues	Teachers		Principals*	
	Mean	SD	Mean	SD
8. All the teachers in the school undergo teacher education program.	2.11	0.92	2.06	0.94
9. Teachers are highly specialized in their teaching subjects.	2.40	0.91	2.37	0.89
10. Teacher's highest degree in education is first degree.	2.11	0.84	1.90	0.97
11. Teachers are satisfied with conditions of services.	2.30	0.75	1.10	0.78
12. Teacher's remuneration is adequate.	2.21	0.72	1.12	0.76
13. Teacher perception of equity, fairness and care is a factor in teacher performance.	2.62	0.99	1.34	0.98
14. Training, retraining, conferences, and workshops are available for teachers to update themselves regularly.	2.40	0.92	2.01	0.90
Grand mean score for survey questions 8-14	2.31	0.91	1.70	0.92

Note. N = 250, n = 205 teachers and n = 45 principals & *includes vice principals. Criterion mean cut off=2.5

Table 4 shows the descriptive statistics on the relevance of supervisory issues of the curriculum relevant to teaching and learning in secondary school education as perceived by the teachers and principals, thus, answering research question 3. It shows that the grand mean rating of the teachers (2.28±0.92) and the principals (1.86±0.82) were below average. The only item rated above average was done by the teachers on the fact that school administration insists that teaching and learning be student-centered (3.20±0.91), other items were rated below the average.

Table 4

Descriptive Statistics on the Relevance of Supervisory Issues of the Curriculum

Teaching Issues	Teachers		Principals	
	Mean	SD	Mean	SD
15. School administration directs that curriculum content is focused on problem solving, skill and capacity.	2.38	0.89	2.00	0.81
16. School administration insists that curriculum content is oriented towards knowledge storage to be used later.	2.18	0.81	2.20	0.89
17. School administration insists and approves only methodologies and teaching strategies designed to challenge learners' problem-solving skills, creativity, and capacity building.	2.11	0.85	2.01	0.84
18. School administration ensures that teaching technologies, instructional materials are available and adequate for learning.	1.53	0.82	1.73	0.88
19. School administration insists that teaching and learning be student-centered.	3.20	0.91	1.34	0.79
Grand mean score	2.28	0.92	1.86	0.82

Note. N = 250, n = 205 teachers and n = 45 principals & *includes vice principals. Criterion mean cut off=2.5

The results in Table 5 show the summary of independent sample *t*-test on the difference in the extent of perceived administrative issues in relation to teaching and learning between principals and teachers. It shows that the mean rating of the teachers was 2.44±0.65; whereas, that of the principals was 2.06±0.74 over the extent of perceived administrative issues in relation to teaching and learning between principals and teachers. The independent sample *t*-test shows that since the calculated *t*-value

(3.257) is greater than the critical *t*-value (1.960) at the degree of freedom of 248, it can be concluded that there is significant difference in the extent of perceived administrative issues in relation to teaching and learning between principals and teachers ($t=3.257$, $p<.05$). The null hypothesis one (H_{01}: there is no significant difference in the extent of perceived administrative issues in relation to teaching and learning between principals and teachers) was rejected at .05 alpha level.

Table 5
Summary of Independent Sample t-Test on the Difference in the Extent of Perceived Administrative Issues in Relation to Teaching and Learning Between Principals and Teachers

Designation	n	Mean	SD	df	t-cal	t-crit	p-value
Teacher	205	2.44	0.65	248	3.257	1.960	0.00
Principal	45	2.06	0.74				

The results in Table 6 show the summary of independent *t*-test on the difference in the perception of teaching issues with relation to teaching and learning between principals and teachers. It shows that the mean rating of the teachers was 2.31±0.91; whereas, that of the principals was 1.70±0.92 over the extent of perceived teaching issues in relation to teaching and learning. The independent sample *t*-test shows that since the calculated *t*-value (4.017) is greater than the critical *t*-value (1.960) at the

degree of freedom of 248, it can be concluded that there is significant difference in the extent of perceived teaching issues in relation to teaching and learning between principals and teachers ($t=4.017$, $p<.05$). The null hypothesis two (H_{02}: there is no significant difference in the extent of perceived teaching issues in relation to teaching and learning between principals and teachers) was rejected at .05 alpha level.

Table 6
Summary of Independent sample t-Test on the Difference in the Extent of Perceived Teaching Issues in Relation to Teaching and Learning Between Principals and Teachers

Designation	n	Mean	SD	df	t-cal	t-crit	p-value
Teacher	205	2.31	0.91	248	4.017	1.960	0.00
Principal	45	1.70	0.92				

The results in Table 7 show the summary of independent sample *t*-test on the difference in the degree of perceived supervisory issues of curriculum in relation to teaching and learning between principals and teachers. It shows that the mean rating of the teachers was 2.28±0.92; whereas, that of the principals was 1.86±0.82 over the extent of perceived teaching issues in

relation to teaching and learning. The independent sample t-test shows that since the calculated *t*-value (3.07) is greater than the critical *t*-value (1.960) at the degree of freedom of 248, it can be concluded that there is significant difference in the extent of perceived supervisory issues of curriculum in relation to teaching and learning between principals and

teachers (t=3.07, p<.05). The null hypothesis three (H_{03}: there is no significant difference in the extent of perceived supervisory issues of curriculum in relation to teaching and learning

between principals and teachers) was rejected at .05 alpha level.

Table 7

Summary of Independent Sample t-Test on the Difference in the Degree of Perceived Supervisory Issues of Curriculum in Relation to Teaching and Learning Between Principals and Teachers

Designation	n	Mean	*SD*	*df*	*t*-cal	*t*-crit	*p*-value
Teacher	205	2.28	0.92	248	3.070	1.960	0.0024
Principal	45	1.86	0.82				

Discussion

The Impact of Preliminary Administrative Issues

The results in Table 2 show that the grand mean rating of the teachers (2.44±0.65) and principals (2.06±0.74) were below the criterion mean of 2.5 indicating both teachers and principals do not agree with the items as a whole. The only item agreed upon by the teachers (3.97±0.53) and the principals (3.36±0.59) was that the population of the students in the school is greater than the available resources. This further suggested that the impact of preliminary administrative issues on teaching and learning in secondary school education as perceived by teachers and principals was not satisfactory. When put to statistical test, the result on Table 5 shows that a significant difference in the extent of perceived administrative issues in relation to teaching and learning between principals and teachers (t=3.257, p<.05); thus, the null hypothesis one was rejected at .05 alpha level. On administrative issues, ranging from UN standard of pupil-teacher ratio of 25 per class, infrastructure/facilities to cooperation between government and community, responses obtained showed clearly that these essential factors are nearly always not available to support effective teaching and learning.

Generally, the results presented above showed remarkable relationship between administrative issues and teaching and learning in secondary

schools. In Table 2, it is very noticeable that infrastructure and facilities are critical to teaching and learning, which impact positively on learners. These issues evidently become inadequate when the population of a given school is larger than the standard. The result of this study agreed with some previous studies on school facilities, infrastructure and population and which have relationships with effective and impactful teaching and learning that have responsibility for the future and of significant administrative concern (Limon, 2016; Obanya, 2004; Schneider, 2002). Their studies are also supported by Ford's (2015) position, which related availability of school facilities, infrastructure, conducive environment, healthy air quality, ventilation, and thermal comfort to students' achievements in the school. Ford specifically identified motivation of both teachers and learners as to what good facilities could cause. Availability of library resources, halls, well-equipped classrooms, well-equipped laboratory spaces, and media centres arouse interest in learners and teachers.

The Relevance of Teacher Issues

Teacher issues such as teacher qualifications, training and motivation, conditions of service, remuneration, professionalism, growth, equity, and fairness are fundamental issues which dominate teacher effectiveness literature. They are considered as being essential factors in curriculum task execution and learner's

development. The information in Table 3 showed the grand mean rating of the teachers (2.31±0.91) and principals (1.70±0.92) on the relevance of teacher issues to teaching and learning in secondary schools' education were below the criterion mean of 2.5. Consequently, the only item generally rated above the criterion mean was the teacher perception of equity, fairness, and care (2.62±0.99); whereas, the other items were rated below the mean mark. This indicated that the teachers' perception of the relevance of teacher issues to teaching and learning in secondary schools' education was unsatisfactory.

When put to statistical test the result, as shown in Table 6, indicates a significant difference in the perception of teaching issues in relation to teaching and learning between principals and teachers (t=4.017, p<.05). The null hypothesis two was rejected at .05 alpha level. The implication of the above is that effective teachers are the most important factor contributing to students' achievement. This is evidenced in teachers' role in guiding and helping students with use and adaptation to facilities and infrastructure, curricular materials, and personality development. The study corroborates with several other findings, which were related to the issue of teachers, issues of motivation, professional development, conditions of service, perception of fairness at workplace, and closely related to the findings in this study concerning teacher performance in the classroom (Hoy & Miskel, 2008; Lai & Cheung, 2015; Marzano, 2003; Quattlebaum (2012).

The Relevance of Supervisory Issues of the Curriculum

The results in Table 4 show that the grand mean rating of the teachers (2.28±0.92) and principals (1.86±0.82) were below average. This indicated that teachers and principals do not agree on the relevance of supervisory issues of the curriculum relevant to teaching and learning in

secondary school education. The only item rated above average was by the teachers that school administration insists that teaching and learning be student-centered (3.20±0.91); other items were rated below the average. However, the mean rating shows that the teachers and principals were not satisfied on the relevance of supervisory issues of the curriculum relevant to teaching and learning in secondary school education. When put to statistical tests, the results on Table 7 show a significant difference in the extent of perceived supervisory issues of curriculum in relation to teaching and learning between principals and teachers (t=3.07, p<.05). The null hypothesis two was rejected at .05 alpha level.

Supervision, whether in the school or industry, remains a critical tool that managers use in achieving compliance and quality control. In this study supervisory issues are seen as necessary for effective execution of teaching and learning in secondary education. The insistence on the availability and use of teaching/learning technologies, curriculum materials, and student-centered learning are only achieved by administration of school paying closer attention. Studies by others, revealed that supervisory issues, which focus on improving teaching and learning in the classroom, relate positively to the result of the study (Olawale, 2009; Veloo et al., 2013).

Conclusion

The impact of preliminary administrative issues on teaching and learning in secondary school education was quite negative, teachers' issues were not considered relevant, and the respondents had negative views of the relevance of supervisory issues of the curriculum to teaching and learning in secondary school education. However, the principals and teachers differed significantly on their perception over the impact of preliminary administrative issues, relevance of teacher issues, and the relevance of

supervisory issues of the curriculum to teaching and learning in secondary school education. Teaching and learning are the dynamic centre of any educational system. What takes place in the activities constitutes the net product that reflects and impacts where education product-learning is applied. The quality of education will then depend on several factors among which is management and administration.

Administration issues in teaching and learning in secondary schools which are identified as issues of facilities, infrastructure, teacher concern management, and supervisory function remain critical and central to the success of every given education system. Therefore, to think of a quality education system is not only to think of curricular content alone but also to lay a solid foundation for the management and administration of every facet of the educational system. The results of the study have shown that administrative issues are crucial, relevant, and primary to effective and successful teaching and learning for school.

Recommendations

Based on the findings, the following recommendations are made

1. Government agencies and bodies with responsibilities for schools should streamline school population sizes according to audited and available facilities/infrastructure, financial resources to any given school.
2. Policies on teacher hiring must address issues of conditions of service, professional growth, and development.
3. Regular retraining programmes designed to have teachers focus on teaching and learning linked to life and community be made compulsory.
4. Regular training and retraining programmes on the use of modern teaching and learning technologies should be compulsory for teachers.
5. Supervision of curriculum content and school facilities/infrastructure be scheduled as normal fixture of school programmes.
6. Supervision of teaching and learning activities be undertaken by internal administrators and by local education authority.
7. School administrators should create a quality assurance unit to deal with quality issues on curriculum materials, facilities, and access.

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LEADERSHIP AND GENDER: AN EXPLORATION OF TWO FEMALE ADMINISTRATORS' LEADERSHIP EXPERIENCES IN INDIA

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Abstract: *Administrative leadership, both within and outside educational contexts, remains a male-centric field. Female leaders often are evaluated based on male leadership characteristics, a practice particularly evident in India's education sector. In India, only 35% of academics are women and even fewer are represented in leadership positions. This paper explores the experiences of two women working in administrative leadership positions in two Indian high schools. Interviews and questionnaires provided insight into how they perceived their opportunities, experienced barriers, and understood the impact of gender discrimination on their lives. The findings of this study are anticipated to encourage and provide insights to women who may aspire to assume academic leadership positions in education.*

Keywords: educational leadership, societal discrimination, work culture, socio-cultural context

Conceptual Framework

Internationally, only 3% to 4% of women occupy Chief Executive Officer (CEO) positions (Sherwin, 2014). In 2012, women held just 3.8% of CEO positions in Fortune 500 companies (Bailey, 2014). Although a vast amount of scholarship documents women's underrepresentation in senior leadership positions (Bailey, 2014; Hoobler, Lemmon, & Wayne, 2011; PEW Research Center, 2015; Seo, Huang, & Han, 2017), researchers disagree about "whether there are fewer women leaders because they're less effective at the job, or because society expects them to be" (Bailey, 2014, para. 1). Despite dominant stereotypes that men are more effective leaders than women (Cueto, 2015; Prime, Carter, & Welbourne, 2009), women have increased their leadership presence in administration and in business ownership (Antonaros, 2010). While improved opportunities and changing perceptions suggest that women will secure more leadership positions in the future (Antonaros, 2010), they currently continue to experience systemic discrimination, educational inequity, and everyday harassment (Douglas, 2012; Prime et al., 2009; Sharma, 2016).

In 1993, UNESCO reported that women held less than 50% of academic and administrative posts in higher education institutions and were mostly represented in lower level academic and middle management positions (Dines, 1993). More than two decades later, statistics show minimal improvement, particularly in leadership positions where women remain globally underrepresented. Although the number of female students has grown internationally from 10.8 to 77.4 million between 1970 and 2008 (UNESCO, 2010) "the dramatic increase in the number of women students has not been matched by growth in the number of women in senior leadership roles in universities" (Morley, 2013, p. 1). More women than men enter the teaching profession, but in most countries, women occupy few senior leadership and management positions in education (Coleman, 2007). This disparity is particularly evident in India where females frequently are treated as subordinate to males and receive fewer educational opportunities than their male counterparts (Haque, Palacios, & Tavares, 2017). In the Indian context, research highlights that women who enter administrative positions consistently face harassment, discrimination,

and exclusion (Agarwal, 2011; Kumari, 2014; United Nations, 2003).

Women's underrepresentation in educational administrative positions limits knowledge about women's leadership characteristics, practices, and effectiveness as administrative leaders. Dunn, Gerlach, and Hyle (2014) explained that "[u]ntil recently, most of the scholarly work on leadership, both inside and outside the academy, was conducted by men and focused on male leaders" (p. 9). Masculine norms and leadership practices serve to exclude women. The persistence of "male-centric leadership models and norms have served to limit women's aspirations regarding leadership, as well as their access to leadership roles" (Dunn et al., 2014, p. 9). Despite women's potential to be effective and transformative leaders, their administrative talent and leadership capabilities remain underutilized (Morley, Berma, & Hamid, 2016).

> The underrepresentation of women in senior administrative positions in academe… is problematic, in that it results in the waste of administrative talent at a time when higher education faces serious challenges that will be met only with strong, effective leadership. The challenges call for new ways of viewing the core mission, how higher education will be funded, how instruction will be delivered, and how findings from research will be disseminated and applied. Women possess great potential to be transformative leaders in the academy at a time when their talents are much needed. Because they have not been socialized in accordance with the male-centric leadership model, they are relative outsiders who must forge new ways of leading. (Dunn et al., 2014, p. 9)

The difficulty women experience attaining leadership roles in educational institutions is a recurring problem in India where women occupy only 3% of vice chancellor positions. In India, such a problem is complicated by the cultural perception of gender-appropriate behaviour where hegemonic masculinity dictates assumptions about who should hold positions of authority and leadership. Women remain associated with the domestic sphere, which affects their chances of entering positions of power (Morley & Crossouard, 2015).

Effective leadership remains a key theme in administrative management literature and is regarded as a critical factor in the performance of secondary and tertiary level educational institutions. This paper focuses on the experiences of women administrative leaders in senior high schools in India. The following research question guided the study: What are the major challenges faced by women in educational leadership in India? The paper argues for a paradigm shift within educational institutions and society to create opportunities for women in leadership positions.

Research Method, Participants, and Data Collection

A qualitative approach was used in this study. Qualitative methods help researchers seek answers to specific questions, systematically make use of predefined procedures to answer research questions, gather evidence, and produce findings that can be applied beyond the immediate boundaries of a study (Merriam, 2009).

The study was delimited to two female principals from senior secondary schools in the Rewari district of Haryana. Both participants were older than 45 years, worked in positions of leadership in the Indian education system, and were employed in senior secondary schools. At the time of the study, both had been employed as principals for less than 5 years.

Data were collected using semi-structured questionnaires and interviews. The

questionnaire collected demographic data and information about women's experiences, challenges, and perceptions of equity and gender-based administrative leadership in India's high schools (Appendix A). Interviews provided respondents the opportunity to elaborate on themes that emerged from the questionnaire.

Data Analysis

Grounded theory method was used to analyse and interpret data. In a grounded theory approach, data is collected, indexed, and explored again as new topics and questions relevant to the study surface. The method is particularly useful for uncovering underlying assumptions, contexts, and experiences of those involved in a phenomenon (Glaser & Strauss, 1999). The goal of grounded theory is to provide theoretical explanations as they emerge from the empirical data.

Findings and Discussion

Minimal Opportunities for Women in Administrative Leadership

Participant responses highlight the limited opportunities available to women pursuing educational leadership positions where men still dominate. They saw this challenge as due partly to the underrepresentation of females in the field. For example, one respondent referred to the *All India Survey of Higher Education* (Government of India, 2013) to highlight the impact of this disparity. The survey provided a disaggregated analysis of gender in India's education system. It revealed that in 2013, women accounted for only 35% of academics in the country while only 25% were professors or occupied professional positions (Government of India, 2013; Morley & Crossouard, 2015). Both respondents explained that their inability to obtain administrative positions until they were in their forties speaks to the minimal

opportunities available to women in the field. Although some opportunities for women in administrative leadership positions may exist in India, women must demonstrate considerable drive, ability, and tenacity if they are to challenge barriers, develop their professional skills, and achieve success.

Participants explained that their early career achievements, which included roles such as education centre director, committee chair, senior teacher, student leadership program director, and assistant principal, accelerated their opportunities. Participants recognized that in India their achievements are atypical, as few women obtain the minimum qualifications needed to move through the ranks and obtain administrative leadership positions. They also acknowledged that they were fortunate to have been raised by families that encouraged women's educational and professional development – an experience they did not take for granted at a time when India is only slowly moving away from traditional practices that encourage boys to seek education more than girls, and where gendered stereotypes continue to relegate women to household chores and domestic duties.

Both respondents claimed to know women in their respective institutions who received lower ranking positions because of their gender. They also explained that many of their male counterparts do not approve of women holding senior leadership positions, including their positions as principals. They described their schools as spaces where women are consistently treated less favourably than men on performance appraisals and receive fewer opportunities for promotion, leadership training, and career development. As one respondent clarified, "It is not that women are unwilling to apply for these positions...but rather, it is the Indian culture that has programmed people's mind to believe that the only place for a woman is at home tending to the needs of their man." For these participants,

the school and societal culture impede women's opportunities and limit their ability to successfully discharge their duties.

Barriers to Successful Female Administrative Leadership

When asked whether they had personally experienced harassment, one respondent explained that she received abusive messages from a male teacher after she had rejected his curriculum change proposal.

> He told me it was not in my place to speak against his wishes [since he was] a senior teacher in the school, and my position in the institution did not mean that I am in any way better than him. He really made my work difficult and he was always in opposition of my proposals and suggestions during school board meetings.

This experience highlights how opposition and harassment can compromise how women in leadership positions discharge their duties.

The paths to successful administrative leadership for the respondents were quite divergent. One respondent desired an administrative career very early in her life and worked to build a credible resume that would eventually secure her such a position. The other respondent did not have a clear roadmap of her career, but made the most out of the opportunities that she was presented with. Both respondents agreed that they had to work extra hard in order to be noticed – work they also perceived as necessary to improve their reputations and encourage more women to seek leadership positions. As leaders, they demonstrated great passion for and commitment to their craft, were self-aware of their positions in relation to being women, and demonstrated the self-confidence to stand out in a male dominated society. Both expressed concerns about the disparity between the number of male and female teachers, even though this was not the case in their institutions. They acknowledged

that gender equity is an essential element of successful leadership, something they hoped to achieve as they moved through their careers.

Both respondents alluded to the fact that their success as administrative leaders depended on showcasing specific achievements in the education sector. For example, one respondent successfully launched new units and academic programs, while the other increased enrolment in her school and obtained accreditation for the subjects taught in her institution. While each of these examples are valuable achievements that can help advance one's career in educational leadership, participants also recognized that their success and promotion required more than strong performance and achievement. They also felt pressured to present their personal and professional identities in ways that challenged the gendered expectations held by their male colleagues and subordinates. Expectations that leaders be authoritative, committed, unemotional, and unburdened with primary caregiving responsibilities shaped and defined their leadership styles.

Impact of Societal Gender Discrimination

Both respondents agreed that gender discrimination in India remains a major issue of concern. Irrespective of how much they contribute to their household income or to the country's economy, they felt they were rarely treated with the same respect as men. Although they were both relatively successful, respondents experienced regular opposition from male co-workers and struggled to garner support from colleagues. Given these ongoing difficulties, they understood why many women would not seek administrative leadership positions. For example, one respondent explained that a female staff member turned down a promotion to be a subject head because she was the only woman in her department and did not believe she would be supported by her male colleagues. Participants felt that the sense

of entitlement among their male counterparts presented challenges that were difficult for many women to overcome. During an interview, a respondent claimed that compared to her male colleagues who were awarded leadership opportunities based solely on their performance and their potential for success, she was analyzed based on various additional factors including whether or not she had children, whether she could work for long hours, how people reacted to her, and whether or not she was authoritative.

Conclusion

For those who achieve success and enter leadership positions, gendered barriers do not disappear. Although participants pursued and managed to secure administrative leadership positions and claimed to have received more equitable treatment than many women in India (e.g., in recruitment, selection, and wages), they routinely faced and witnessed opposition from their male counterparts that impacted their performance appraisals and promotional opportunities. Participants explained that they were harassed, discriminated against, and doubted by male colleagues, which at times compromised their ability to execute their duties. The findings highlight the ongoing challenges and discrimination women face in educational leadership positions in India (Agarwal, 2011; Morley & Crossouard, 2015). They also underline the effects of gendered and cultural stereotyping on women's ability and choice to obtain additional educational qualifications, seek professional development, and pursue administrative leadership positions.

Gendered discrimination is a limiting factor when it comes to assigning women to administrative positions because it subjects women to more scrutiny than their male colleagues. The challenges women face likely will persist until society becomes more receptive towards gender equality, affords women equal opportunities, and models success for girls and young women to follow. Moreover, increasing women's presence and impact in administrative leadership also requires reforms in the education system so females have access to educational opportunities that allow them to compete and pursue these positions in the first place.

This study emphasizes the need for female teachers to appreciate and believe in their ability as administrative leaders, for the teaching fraternity to re-evaluate how it awards administrative leadership positions and addresses gender disparity, and for the field of education to recognize the impact of cultural and gendered bias on the educational and occupational experiences and aspirations of women in India. We call for further research that includes larger sample sizes to explore the gendered experiences of women in administrative leadership positions in India.

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- Paragraphs should be indented using the "tab" key on the keyboard. No extra spacing should be between paragraphs.
- Tables, Figures, and Charts should be kept to a minimum (no more than 4 per article) and sized to fit between 5.5 x 8.5 inches or 14 x 20 cm.
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Future Issues and Submission Deadlines

2018 (Volume 22, Number 2)
Open issue. We invite members of ISfTE to submit articles for this issue. Members are encouraged to co-author articles with their students or colleagues who may not be members of ISfTE. Authors who are not members of ISfTE may submit articles for this open issue. In case their articles are accepted for publication, the authors must pay membership fee ($75USD) to ISfTE. Book reviews and reflection papers are also invited.
Deadline for submission: August 1, 2018 – Publication by December 2018

2019 (Volume 23, Number 1)
Theme – *Teacher Education in the Post Nation Era* is the theme chosen by the conveners of the 38th seminar for ISfTE held at Joetsu University of Education, Japan, May 2018. For JISTE publication, participants are invited to revise their seminar papers, attending carefully to the manuscript and publication guidelines, and submit them to the journal for consideration. Book reviews on the theme are also invited.
Deadline for submission: November 1, 2018: Publication by June 2019

Sponsoring Institutions – Front Cover

These institutions' logos appear on the front cover of this issue: University of Aarhus University, Denmark sponsored the ISfTE seminar in 2017. The other institutions – Weber State University and Brock University – support JISTE with their on-going sponsorship and/or the support of the work of the editors, officials of ISFTE. If other institutions would like to participate, please contact the journal's editor, Karen Berg Petersen.

Aarhus University is the second oldest university in Denmark. It is also the largest university in the country with over 43,000 students. It offers programmes in both undergraduate and graduate studies. Although the main campus is in the city of Aarhus, Denmark, the university has small campuses in Copenhagen and Herning.

Weber State University in Ogden, Utah, United States, was founded in 1889. It is a coeducational, publicly supported university offering professional, liberal arts, and technical certificates, as well as associate, bachelor's, and master's degrees. Currently, over 26,000 students attend the university.

Brock University is a public research university in St. Catharines, Ontario, Canada. Brock offers a wide range of programs at the undergraduate and graduate levels, including professional degrees. Brock was ranked third among Canadian universities in the undergraduate category for research publication output and impact indicators in 2008.