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Student Teachers' Experiences of Constructivism in a Theoretical Course Built on Inquiry-based Learning*

Öğretmen Adaylarının Araştırma-temelli Öğrenme ile Yürütülen Kuramsal Bir Derste Yapılandırmacı Kurama İlişkin Deneyimleri

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Abstract. This study aimed to examine what student teachers at a teacher education program, in a theoretical course built on inquiry-based learning, learned as a result of inquiring the extent of implementation of constructivist theory in instructional processes in secondary schools. The participants involved all student teachers (28) taking 'Teaching-Learning Theories and Approaches' course. Qualitative data were gathered via interviews and reflective reports, while quantitative data were collected by evaluating student teachers' reports using project evaluation rubric. The trustworthiness of the findings was ensured via triangulation, peer debriefing, and multiple coding. The findings showed that, as a result of student teachers' engagement in inquiry, they gained theoretical awareness and understanding of the instructional processes through linking theory and practice of constructivism, became aware of the factors limiting the implementation of constructivist theory, and developed their knowledge and skills related to conducting inquiry.

Keywords: Inquiry-based learning, teacher education program, student teachers, professional development, theory-practice link

Öz. Bu çalışma, bir öğretmen eğitimi programında kuramsal bir dersin bir parçası olarak öğretmen adaylarının ortaöğretim okullarında öğretim süreçlerinde yapılandırmacı kuramın ne kadar uygulandığını araştırmaları sonucunda neler öğrendiklerini incelemeyi amaçlamıştır. Çalışmanın katılımcılarını 'Öğretme-Öğrenme Kuram ve Yaklaşımları' dersini alan 28 öğretmen adayı oluşturmuştur. Nitel veriler görüşmeler ve yansıtıcı raporlarla, nicel veriler ise öğretmen adaylarının yazdığı raporların dereceli puanlama anahtarıyla değerlendirilmesi sonucu toplanmıştır. Bulguların güvenilirliği çeşitleme, uzman incelemesi ve çoklu kodlama yoluyla sağlanmıştır. Bulgular, öğretmen adaylarının araştırma-temelli öğrenmeye katılmaları sonucunda, yapılandırmacı kuram ve uygulamayı birbirine bağlayarak öğretim süreçleri ile ilgili kuramsal farkındalık ve anlayış kazandıklarını, yapılandırmacı kuramın uygulanmasını engelleyen etmenlerin farkına vardıklarını ve araştırma yapmaya ilişkin bilgi ve becerilerini geliştirdiklerini göstermiştir.

Anahtar Kelimeler: Araştırma-temelli öğrenme, öğretmen eğitimi programı, öğretmen adayları, mesleki gelişim, kuram-uygulama bağlantısı

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Introduction

Teacher education programs (TEPs) play a pivotal role in providing essential curricular and instructional means that would equip future teachers with the knowledge, skills and attributes to embark on a professional and instructional journey in order to be a 'change agent' both inside and outside of classroom context. For a teacher, without change, growth is an illusion.

Teachers' change and growth, the sine qua non of the teaching profession, is critical to be promoted through engaging future teachers into contextual and situational processes during TEPs (Kaasila & Lauriala, 2010). The substantial role of teachers in fulfilling learning and developmental processes necessitates considering the integration of inquiry-based orientations into teacher education to promote professional quality of prospective teachers which is deemed to be a long-term investment on their professionalism and, therefore, student learning. This long-range journey requires structuring programs in a way to facilitate prospective teachers' learning through inquires in their own practical experiences (Korthagen, Loughran, & Russell, 2006) starting from the very beginning of the program (Niemi & Nevgi, 2014). As far as curriculum is concerned, 21st century skills require all professions to consider how TEPs can integrate inquiry and research agenda for teacher practice (Niemi & Nevgi, 2014). Inquiry-based TEPs help develop self-directed teachers possessing the dispositions to make sound, theory-based judgements as well as to utilize and generate research (Munthe & Rogne, 2015). Further, they help foster reflective and pedagogically-thinking teachers employing inquiry in instructional processes and conducting observations in classes through the competences and knowledge gained (Toom et al., 2010). Thus, equipping prospective teachers with the inquiry skills would facilitate their own keeping pace with the constantly changing and evolving world and contribute to their ongoing professional and, as a result, learner development.

Contextualizing Inquiry-based Learning

Prospective teachers' inquiry, as a fuzzy concept in teacher education, has taken its place in numerous seminal works embracing a plethora of contested labels to mean engagement of future teachers in systematic investigations for professional development. On one hand, a number of researchers acknowledged concepts like 'student teacher inquiry' (Rich & Hannafin, 2008), 'teacher inquiry' (Cochran-Smith & Lytle, 1999), 'teacher research' (Cochran-Smith & Lytle, 1999; Dobber, Akkerman, Verloop, & Vermunt, 2012), and 'action research' (Faikhamta & Clarke, 2013; Hatch, Greer, & Bailey, 2006; Moran, 2007; Ulvik, 2014). However termed, inquiry aims to develop prospective teachers' life-long learning skills so that they can question and continually develop in teaching through research and reflection throughout their professional lives (Cochran-Smith, Barnatt, Friedman, & Pine, 2009), promote contextual changes and improve the lives of students (Cochran-Smith & Lytle, 1999). On the other hand, numerous authors used 'inquiry-based learning' (Levy & Petrulis, 2012; Spronken-Smith, Bullard, Ray, Roberts, & Keiffer, 2008; Spronken-Smith & Walker, 2010), 'undergraduate research', 'research-based teaching', 'guided inquiry', inductive teaching and learning' for the process of student inquiry in higher education (Spronken-Smith, 2012; Spronken-Smith & Walker, 2010). Inquiry is acknowledged "across the full spectrum of disciplines at all levels from within-class activities, through to inquiry courses and even inquiry degree programmes." (Spronken-Smith,

2012, p. 1). The concepts - 'inquiry' and 'research' - will be used interchangeably throughout the paper to refer to student teachers' systematic inquiries.

Literature embraces a wealth of definitions of inquiry-based learning (IBL), yet it is a concept that is challenging to define (Spronken-Smith et al., 2008). Prince and Felder (2006) define it as an inductive approach in which "instruction begins with specifics – a set of observations or experimental data to interpret, a case study to analyse, or a complex real-world problem to solve" (p. 123). It is delineated as a question-driven philosophical approach to instruction embracing active, student-centered learning through engaging students in problems in real settings (Spronken-Smith et al., 2008) and a pedagogy both assisting student teachers experience the means of constructing knowledge through their active involvement in thinking processes (Spronken-Smith & Walker, 2010) and helping them examine cases in a systematic and reflective manner and construct their own praxis as qualified practitioners (Eklund, 2014). Eick and Reed (2002) define it as project-based instructional process grounded on constructivist and socio-constructivist theories of instruction. In their definition, Levy, Little, Mckinney, Nibbs, and Wood (2010) underline the student-centered nature of IBL to instructional processes powered through either research or inquiry. All these definitions denote that a program based on IBL can possess active learning, collaboration, learner-centeredness, inductive approach, real world problems (Prince & Felder, 2006; Spronken-Smith et al., 2008, 2012), teacher scaffolding, question-driven or research-focused nature, constructivism, field-based activity (Spronken-Smith et al., 2008, 2012), higher order thinking, active control of learning, reflection (Justice et al., 2002). Further, such program is reported to bring certain benefits such as providing chances for the student teachers to improve knowledge and skills for research using various data collection devices (Munthe & Rogne, 2015), improving their beliefs and competences as dynamic contributors in meaning and knowledge making process (Levy & Petrulis, 2012) and assisting them to link theory and practice, to take constructive actions to better their instructional practices, and to take active roles in curriculum development, reflective practice and inquiry in practice (Kitchen & Stevens, 2008). It is also deemed to support student teachers' understandings of various aspects of their practice and contribute to their improved instruction in classrooms (Borg, 2010) and increase their pedagogical knowledge and instructional repertoires (Hatch et al., 2006).

This review of the literature provided the foundational elements of redesigning a theoretical course –that is to say 'Teaching-Learning Theories and Approaches' - on the premises of IBL to involve student teachers in a systematic inquiry into examining the implementation of constructivist theory in secondary school classrooms under the supervision of instructor. The ultimate aim was, since it was a theoretical course, to help students to go beyond the theoretical and knowledge level and to experience the extent of implementation of constructivism in authentic instructional settings through inquiry. As Le Cornu and Peters (2005) stated, teachers are expected to adopt reform-minded instruction - constructivist theory - and be involved in continuous development. Škugor and Sablić (2018) also stress the need to support content of TEPs as well as lifelong learning programs with the constructivist learner-centred paradigm. This would enable prospective teachers to develop higher order thinking and inquiry processes besides critical-openness as a result of which their knowledge and reasoning skills will be promoted (Kumar, 2006) and create their own meanings through continually reconstructing and reorganizing their own experiences (Dewey, 1916/2001). Thus, TEPs are accountable for exposing prospective teachers to experiential and hands-on instructional processes that assist learning for students (Buchanan & Michael Smith, 1998). One of the means to facilitate this is through reflective and inquiry stances which are considered critical for constructivist process of

learning in that "Teaching is reflective work that requires active and systematic inquiry for learning throughout the teacher's career" (Kroll, 2004, p. 202).

Research Studies

Inquiry, considered as an indispensable component for TEPs, is integrated in various courses and levels of the programs. Internships aim to promote student teachers' inquiry and reflection skills so as to improve their teaching practices (Faikhamta & Clarke, 2013). Involving student teachers in action research in internship in a pre-service early childhood program revealed that this process promoted their pedagogical knowledge, understanding of systematic data collection, and ability to use scientific literature and equipped them with the means to analyse teaching practice and resolve instructional problems (Hatch et al., 2006). Also, engaging them in action research in practicum in a science program promoted their understanding of inquiry process and the role of systematic inquiry in pursuing paths to advance teaching practice and helped them see the factors inhibiting inquiry process (Faikhamta & Clarke, 2013). It was also revealed that as long as "a proper framework, necessary resources and adequate support" are provided, student teachers' professional growth in inquiry process in practicum is cultivated (Ulvik, 2014, p. 532) and that inquiry processes contribute to student teachers' development of classroom practice and understanding of larger educational milieu (Schulz & Mandzuk, 2005).

Further, through research methodology courses, prospective teachers are involved in inquiries. In an early childhood program, student teachers' collaborative inquiry projects with children facilitated their construction of meaning and knowledge through applying theory into practice and promoted changes in their development regarding sharing accountability with peers in taking curricular decisions and managing instructional acts through self-reflection (Moran, 2007). Also, student teachers considered research studies positive concerning the contribution on their personal and future career development and negative regarding the role of the teachers, the affective factors they create, the structure and placement of research (Eklund, 2014).

Besides, considering student teachers' involvement in IBL in various subject-matter courses in degree programs, the research conducted by Spronken-Smith et al. (2008) in a geography program revealed that student teachers' active involvement in inquiry brings certain benefits like improved understanding, enjoyable learning, better performance, strengthening teaching-research nexus, attaining higher-order thinking skills, and useful inquiry skills. Another study conducted at a primary education program reported student teachers' development of attitudes, inquiry skills and knowledge in teacher research (Van der Linden, Bakx, Ros, Beijaard, & Vermeulen, 2012). Student teachers' development of insights into the phases of research within the Teaching with Insects course was also uncovered in a study in an elementary program (Haefner & Zembal-Saul, 2004). Involving student teachers in IBL through 5E model in a science program promoted their inquiry skills and conceptual knowledge and understanding of the topic investigated (Song & Schwenz, 2013). Another study in primary and secondary programs revealed the contributions of authentic research experiences on student teachers' development of professional learning and competences (Niemi & Nevgi, 2014).

Another means for student teachers' involvement in inquiry is through collaboration (Kuter, 2013). Engagement of student teachers in a collaborative classroom inquiry to develop handwriting skills of children helped them develop their reflection and inquiry skills (Medwell & Wray, 2014). The findings on examining student teachers' collaborative inquiry practices in a

program also demonstrated how difficult research process is and the importance of making explanations and joint decisions during that process (Dobber et al., 2012).

Examination of IBL in different subject-matter courses at undergraduate level showed that it supports the teaching-research link, especially when it is structured on the basis of open inquiry mode (Spronken-Smith & Walker, 2010). Another study demonstrated that senior student teachers did not consider their engagement in inquiry so welcoming, productive and satisfying (Zamorski, 2002). In a research, the freshman students studying in arts, humanities and social sciences disciplines described research as "gathering information or exploring others' ideas… evidencing and developing students' own ideas or making discoveries… gathering information… evidencing and developing students ideas" (Levy & Petrulis, 2012, p. 91).

To this end, the review demonstrated the abundance of the studies on inquiry conducted in internship, methodology courses and degree programs, yet it displayed the scarcity of studies focusing on IBL in theoretical courses in TEPs. This lack was also underlined by Spronken-Smith (2012). A meta-analysis on the phases of IBL also displayed the scarcity of studies on IBL in teacher education (Pedaste et al., 2015). Further, Yıldırım (2013) reports the dearth of research studies in TEP and highlights the necessity of investigating how the reflection of theories on student teachers' practical knowledge affects their learning. Bearing in mind that the continuous and rapid changes in the world entail prospective teachers to possess the competences to conduct research in the 21st century classrooms (Hansen & Wasson, 2016), then it is imperative to explore these future teachers' understandings and practices of inquiry at TEPs.

Aim of the Study

The ultimate aim of the study was to comprehensively explore what student teachers - in a theoretical course titled 'Teaching-Learning Theories and Approaches' built on inquiry-based learning – gained through inquiring the extent of implementation of constructivism in instructional processes in secondary schools.

Significance of the Study

There are certain reasons triggering the implementation of this study in a theoretical course in the faculty of education in one of the biggest universities in North Cyprus (NC). Development of student teachers' inquiry skills is one of the required teaching professional generic competences at tertiary level (Ministry of National Education, 2008). As far as almost all programs in this faculty are concerned, the highest attention for the development of inquiry skills is only given in Scientific Research Methods course, which fail to provide sufficient opportunities for developing prospective teachers' inquiry skills due to insufficiently scheduled contact hours (only 2 hrs). Almost all subject-matter and pedagogical courses are also grounded on theoretical premises and provide limited research opportunities in real contexts to facilitate student teachers' rationalization of theoretical stances. Therefore, what student teachers acquire by the time they reach final year is mainly at theoretical level and, therefore, they not only have difficulties in linking theoretical knowledge and practical situations but also face difficulties in planning and conducting research assignments. Second, with a reform in educational system in 2005 in NC, primary and secondary school curricula were reconceptualised within constructivist paradigm aiming to promote student-centered education (TRNC Ministry of National Education

and Culture, 2005). The heart of reform movement is to provide meaningful experiences for students' active construction of knowledge and to help them develop on their own terms (Larry, 1996). This can only be shaped in the hands of teachers, who are aware of both the principles of constructivist theory and possess the skills to inquire into the matters inhibiting students' learning. However, there is a disparity between future teachers' theoretical growth and their practical experiences in schools (Waghorn & Stevens, 1996). Thus, it is believed that exposing student teachers to real instructional contexts with an opportunity to inquire into instructional processes could help them question their prior conceptions and beliefs related to the effectiveness of instructional processes and contribute to their development of own theories. Further, their inquiries could provide invaluable insights into the factors affecting or impeding implementation of constructivist learning environments. Finally, it is believed that the findings would allow curriculum designers and course instructors in TEPs to design programs in a way to stimulate future teachers' inquiry skills and equip them with the knowledge and skills to create change and growth both personally and professionally.

Methodology

Design of the Study

In this study, action research was employed by adopting four-staged inquiry framework - orientation, conceptualization, investigation, and conclusion - proposed by Pedaste et al. (2015). Action research is a rigorous practice to explore lived experiences in natural settings to improve practice (Mills, 2003). This systematic inquiry organized by teacher practitioners in an instructional setting not only examines how a particular educational intervention operates and effects students' learning but also improves instruction and practice (Mills, 2003). It is also a participatory, reflective, social and practice-oriented process (Kemmis, 2009; Mills, 2003) targeting to alter "practitioners' practices, their understandings of their practices, and the conditions in which they practise" (Kemmis, 2009, p. 463). The applied and contextualized nature of action research, when incorporated in initial TEPs, supports continuous professional and educational transformation regarding program development and instructional processes (Mills, 2003). In this regard, this action research was thought to provide invaluable experiences for the student teachers to inquire into constructivist theory and gain insights into how theory is practiced in reality and what they can learn from these experiences.

Context and Participants

The study was conducted in Teaching-Learning Theories and Approaches - a 13-week, three-credit, mandatory course - which fundamentally aims to develop student teachers' basic knowledge and understandings of teaching and learning theories and approaches. This course is organized around behaviourist, cognitive and constructivist theories as well as teaching and learning strategies. This theory-based course, offered in the 3rd year, was taken by the student teachers who were enrolled in two teacher training programs and a teaching certificate program for secondary schools in the faculty of education.

The sample and population in an action research is identical since it targets only a specific group of participants (Fraenkel, Wallen & Hyun, 2012). The participants of the study covered all

student teachers taking the Teaching-Learning Theories and Approaches course. Of twenty-eight of the participants, eleven of them were enrolled in Turkish Language and Literature Teacher Education Program, seven in Mathematics Teacher Education Program, and ten in Teaching Certificate Program - one of whom had a master's degree and, thus, research experience in Biology. While nine of the participants were male, nineteen of them were female. Besides, sixteen student teachers were from Turkey, while twelve of them were from NC.

Design and Procedures

To equip the student teachers' with the skills to inquire into constructivist theory at secondary schools, the Teaching-Learning Theories and Approaches course was systematically organized around the IBL framework developed by Pedaste et al. (2015) which included four steps: orientation, conceptualization, investigation, and conclusion.

Orientation

After having completed the teaching and learning theories in the first seven week of the syllabus, student teachers were involved in group discussions to discuss their educational experiences in their educational systems in light of the theories they learnt. Related to the aim of the study, it was critical to stimulate their curiosity and promote their understanding of the importance and principles of constructivist theory; thus, major consideration was given to discuss the roles of the teacher and students, instructional process and evaluation about the implementation of constructivist theory in their previous learning experiences at secondary schools. Since almost all student teachers - except one - had no experience in planning and conducting research and writing a scientific report, the researchers gave them a two-hour tutorial on these issues, which was followed by another tutorial given by a librarian on how to search peer-reviewed articles using online databases. Student teachers, on a voluntary basis, formed their groups and a total of eight groups were organized whose members varied from two to four.

Conceptualization

After making sure that student teachers were clear with the principles of constructivist theory, they were required to read an article on the development of a scale for measuring teacher candidates' competency on constructivist learning (Yeşilyurt, 2012) and come up with a question to conduct an inquiry in secondary schools. Since almost all did not conduct any studies before, the researchers guided them to come up with the research question for investigation, which was 'To what extent do teachers employ constructivist theory in their classes?'

Investigation

Before starting inquiry, first, student teachers were assigned some articles to read and given project guidelines covering details on the content, format, presentation and style of the report, and ethical principles. They, as groups, were also asked to do a preliminary research using online databases, plan an inquiry through observation, and see the researchers. Through liaising with the researchers, the groups developed a structured three-level observation form (*Yes, No,* and *Partially*) which included statements related to the role of teacher and students and teaching and learning processes in constructivist theory with also open-ended sections for further remarks. They were provided expert help for the objectivity and credibility of the observation form and guided to plan, develop, and implement their study. After getting the consent for the research

from the Ministry of Education (MoE), the groups were placed in four different secondary schools - 9th, 10th, and 11th grades - to conduct two hours of observations. A total of eight different classroom observations were conducted by each group. Though MoE is strict in allowing student teachers to do extended observations, some teachers allowed some of them to conduct more than two observations. As a result, a total of 24 hours of observation was conducted by the groups. Throughout six weeks, student teachers did labour division for the whole process and continually worked with their peers in groups during conducting their observations and analysing the data. After collecting data, they analysed the data quantitatively and cross-checked the analysis among the group members to ensure consistency of findings. During this process, they also started writing the draft of the report.

Conclusion

After analysing the data, groups reached certain conclusions concerning the extent of implementation of constructivist theory in secondary classrooms. The revision of the drafts by groups was followed with the submission to the instructor.

Throughout this process, discussion phase, as stated by Pedaste et al. (2015), took place through continuous communication and reflection that helped groups "receive feedback about their learning process by sharing their domain related outcomes and process-related ideas" (p. 57) with the peers and researchers. Also, the dual role of the course instructor, as an instructor and researcher, helped to create an instructional environment where student teachers not only planned and conducted their inquiries in a systematic and ethical way but also wrote their reports obeying research writing principles as a part of the course. As for Lotfin, Campanella, and Gilbert (2011), the dual-role researcher is critical to obey to ethical procedures; thus, vulnerability of student teachers participating in inquiry was decreased through being informed about the aim of the research, the significance of research on their development, their role within the research, confidentiality of their participation and anonymity of their identity.

Data Collection Instruments

For the comprehensive examination of the issue, various data collection instruments were employed. *Semi-structured interviews* aimed to uncover student teachers' views and reflections on whether or not constructivist theory is implemented in instructional processes and how IBL contributed to their development. In light of this, based on student teachers' observations, interviews focused on what they observed in relation to the principles of constructivist theory, what they gained through IBL and, as a result of involvement in both theoretical and practical sides of learning, what they thought about the importance of inquiry in a teacher's instructional journey. Previously prepared ten interview questions were administered to eleven volunteer student teachers in a relaxed atmosphere where they reflected on their actual opinions and feelings related to their experiences during the inquiry process.

The major aim of *the post-lesson reflection reports* was to involve student teachers in retrospective and introspective evaluation of the overall IBL process implemented. They were requested to reflect upon the findings of their studies and the effect of this process on their growth along with their suggestions. The points considered in the report were as follows:

- Considering the topic of your study, discuss the conclusions you have drawn from your research study.
- Considering the findings of your study, discuss what recommendations you can make to educational programs.
- Discuss the contributions of your involvement in the development and implementation of an inquiry on your academic and personal development.
- List and discuss the most three influential factors on your development.

The final data collection instrument was *the project evaluation rubric* which was used to evaluate student teachers' group projects they planned and developed throughout the course. In this process, the ultimate aim was to equip them with the skills so that they can employ systematic inquiry into constructivism and gain awareness about how theory is enacted. This would help the student teachers to move beyond theoretical knowledge and construct their own knowledge and skills through inquiry. Since they, except one, had not been involved in scientific inquiry, their projects would provide evidence about their development of inquiry skills. The whole data collection process was done as a result of receiving informed consent from the participants.

Data Analysis

The data analysis process, subjected to cross-checking throughout the whole course of action, went through certain steps. First, the names of all participants were coded as ST1, ST2 … ST28 to disguise their identity and interviews were transcribed in a way to facilitate coding processes. Next, the transcribed interviews and post-lesson reflection reports were subjected to content analysis that revealed certain themes, related to the aspects of constructivist principles - the role of the teacher and students, pupils' construction of knowledge, instructional strategies used, applying constructivism, developing inquiry skills and so forth - which were later grouped under certain categories - gaining awareness of theories or inquiry skills, teachers' strengths and weaknesses in applying constructivism and so forth. For each category, a separate matrix was created to generate the picture holistically regarding the issue analysed. During this analysis process, the themes determined before and the themes emerged facilitated the generation of the thematic categories. The next step was to merge the qualitative data to see where the data converged and diverged.

Groups' inquiry projects were evaluated on the basis of a three-point rubric - *Good*, *Fair* and *Poor* - with regard to introduction, methodology, findings and discussion, references, appendices sections, as well as language, organization, and quotations. The rubric had already been used for evaluating projects in research courses; thus, its reliability had been ensured. The ultimate aim was to see the extent to which student teachers gained knowledge and skills in inquiring the topic and writing their reports.

To enhance trustworthiness of the study, several actions were taken. Primarily both researchers were involved throughout the whole coding process. According to Patton (2002), multiple coders during data analysis stage help corroboration of the validity and reliability of the thematic analysis. Next, data from multiple sources were collected for the in-depth investigation of the problem. In this way, triangulation of the data sources help to see the convergences and divergences which contribute to the objectivity and trustworthiness of the study (Lincoln & Guba 1985; Miles & Huberman 1994). Besides, the whole data collection and analysis process

were subjected to external examination. Confirmability and dependability of the study are ensured through an audit trail that inspects the whole research process and provides intensive examination of the accuracy of the analysis of the findings and the interpretations made (Lincoln & Guba 1985; Miles & Huberman 1994).

Findings and Discussion

In this study, it was aimed to find out what student teachers learned through inquiring the extent of implementation of constructivist theory in instructional processes in secondary schools. Depending on this aim of the study, the analysis of multiple data revealed significant findings related to what student teachers gained as regards the theoretical dimension dominating in actual classrooms, the reasons inhibiting the implementation of constructivist theory in instructional processes, and the contribution of IBL processes on their growth.

Student Teachers' Gains related to Constructivism in Practice

The qualitative findings exhibited what student teachers found out related to the implementation of constructivist theory in secondary schools and the challenges limiting its implementation.

Dominance of traditional instruction in classrooms

Student teachers' making sense of practical implementation of the theories in actual settings is one of the primary findings. The analysis revealed that traditional instruction dominates in secondary school classrooms. Most of the student teachers reported that instructional processes are teacher-centered and lack learner-centeredness. The findings also displayed that some teachers, despite few in number, integrate constructivism into instructional processes and novice teachers have awareness of constructivism. Very few remarked that teachers managed to make their students active through adopting the role of the facilitator. It was highlighted that "the students, in the classes where constructivism was employed, worked with greater enthusiasm and they were more successful since they enjoyed the lesson" (ST18). Another one (ST2) underlined that in a class based on constructivist approach students' learning styles, points of view and most importantly the uniqueness of each student were considered. She also reported, "Students were active and involved in the process, thus they, instead of taking ready-made knowledge, constructed their own learning and, therefore, got motivated, enjoyed the learning process." Some also expressed that teachers incorporated both product and process oriented assessment into instructional processes and supported students' learning.

Thus, the findings showed that although the secondary school curriculum was grounded on constructivist philosophy and aimed to promote learner-centeredness, it is difficult to state that it thoroughly achieved this aim. That constructivism is not employed in classes was also articulated by most of the school teachers in a recent study conducted in this context (Onurkan Aliusta, Özer, & Kan, 2015). That novice teachers were found to be more aware regarding constructivism was not supported by Işıkoğlu, Baştürk, and Karaca (2009), since the findings of their study revealed that "The number of years in teaching was related to the teachers' student-centered beliefs. Specifically, the most experienced teachers demonstrated more student-centered beliefs than less experienced teachers" (p. 355).

Student Teachers' Gains related to the Factors Inhibiting the Implementation of Constructivist Theory

That sufficient emphasis is not placed on the implementation of constructivism due to the factors originating from teacher-centeredness and the structure of educational system is another significant finding.

Lack of teachers' personal and professional characteristics. While most of the student teachers underlined that teachers demonstrated low motivation, enthusiasm and signs of burn-out, few stressed that teachers are prejudiced and fail to take risks and set high expectations for their students. Some of them reported that some teachers fail to consider individual differences in the class and address only hardworking students. ST6 reported:

> "The teacher asks questions generally to the students sitting in the front rows and being interested. If the teacher calls on another student, that student doesn't know or cannot follow. In such circumstance, the teacher never gives a voice to that student again."

Few remarked that teachers, due to their worries related to not being able to catch up the lesson, "prefer using behaviourist approach rather than constructivist approach" (ST1). That some teachers have poor communication skills with the students was also highlighted by one of them.

Considering the professional traits a teacher should possess, a great majority of the student teachers emphasized that teachers conducted instructional processes based upon direct instruction and teacher-centered principles. ST1 reported:

> "We used to criticize the teacher in … school. S/he used to come to class and directly start writing on the board with her/his back to the students. S/he used to teach using direct instruction. Students in no way were actively involved. The teacher almost never asked questions."

Describing the situation she observed, ST6 said, "The situation was the classical teaching style, using direct instruction. We used to have the same style and after so many years we still observed the same style." Some of the student teachers conveyed that teachers had poor awareness of constructivism and contemporary teaching-learning approaches. In this respect, some reported that learning-by-doing opportunities were not provided, students' active learning was not supported, and learner-centered tasks were not implemented. Further, that some teachers failed to integrate materials and educational technologies to support learning into instructional processes and only benefitted from the course book and board as instructional materials was highlighted. In addition, some stressed that teachers asked low-level questions and failed to give emphasis on asking high-level questions to stimulate students' thinking skills. Some other also underlined that lessons were delivered mostly at knowledge level, which shows that higher order thinking skills were not given consideration for development. ST11 said, "Students only know the subject matter. They have weaknesses in analysing or relating one topic to another. I don't know if they can apply what they learn when a different question is asked." Further, that teacher resorted to punishment and failed to employ various materials and, therefore, failed to draw students' attention was highlighted by some of the student teachers. ST6 said, "As Gagne remarked, taking attention at the first step is critical. Lesson was totally based on direct instruction ... no visual support, only board, this is insufficient." Very few underlined that the instructional process was based on question-answer technique. While one student teacher stressed that learning was not personalized, another highlighted that learning strategies were not integrated into the instruction to facilitate learning.

The traditional structure of educational system. One of the primary points highlighted was that educational system is based on memorization and behaviourist approach. ST8 remarked, "We all had education through rote-learning. What was instructed was the knowledge of life. Our education is mainly based on behaviourism." Also, teaching-learning processes were reported to be grounded on summative evaluation. ST1 remarked, "Evaluation aiming judgement creates lots of pressure on students and affects their performance negatively. Assessing students' performance with only one exam grade is judgement and it promotes failure."

Therefore, the findings showed that, rather than constructivist theory, traditional instruction dominates in secondary classrooms. As main problems, that student active involvement is not supported and teacher centeredness is at the heart of the instructional process were underlined. The traditional structure of the educational system was deemed to be the source of the problems since most of the teachers are still the dominant figure in the classrooms. This finding corroborates a recent study in that instruction in secondary schools in NC lacks student-centered strategies (Onurkan Aliusta, Özer, & Kan, 2015). Further, that student teachers gained awareness of the factors debilitating the implementation of the constructivist theory in actual classes was revealed. Lack of teachers' affective, personal and professional characteristics and communication skills, lack of their awareness of contemporary instructional approaches along with product-oriented nature of educational system were reported as limiting factors. Thus, the findings showed that student teachers' engagement in inquiry helped them gain awareness and understanding of the theory - behaviourism - employed in actual classrooms and the aspects inhibiting implementation of constructivist theory. Engagement in inquiry is considered very powerful in facilitating student teachers' knowledge creation through authentic experiences (Spronken-Smith, 2012) and enhancing their understanding of the theme examined (Song & Schwens, 2013).

Student Teachers' Gains related to Inquiry Processes

The analysis of qualitative and quantitative data revealed the aspects student teachers developed during inquiry process.

Student teachers' developing inquiry and collaboration skills

Almost all student teachers reported their development of awareness related to inquiry process. One student teacher (ST2), despite his previous experiences in research, underlined the contributions of the research process on his development. He remarked:

> "Before this project, I wasn't aware of what it meant to be a research design, participants, data collection instruments, analysis, validity and reliability. I didn't also have ideas about ethics and findings…. Now I have sound knowledge about these in real sense."

Besides, some reported that reviewing literature and having the chance to read empirical studies contributed to their consolidation of not only research process but also constructivist philosophy.

The evaluation of the research reports also displayed student teachers' progress in the sections of inquiry report. Considering the overall achievement level of the groups, five of them got 'good', two 'fair', and two 'poor' in the reports. The achievement levels related to the sections of the group reports are as follows: Introduction (3.6/5), methodology (4.3/5), findings and discussion

(3.7/5), conclusion and recommendation (2.4/3), references and appendices (1.7/2), language and organization (1.7/2), quotations (1.5/3).

This process also helped them develop certain inquiry skills like reviewing literature, conducting observations, research objectivity, ethics and so forth. Taking active roles during research process can contribute to student teachers' development from various angles. While the study of Spronken-Smith et al. (2008) confirms that engaging student teachers in IBL in subject-matter courses enhances their inquiry skills and achievement, the study conducted by Haefner and Zembal-Saul (2004) supports that student teachers' involvement in inquiry process stimulate their comprehensive understanding of the phases of inquiry process.

Further, almost half of them reported that their in-class observations during inquiry process provided them with knowledge concerning how to conduct observations and "helped them observe incidents and events in class more objectively from teacher and students angles" (ST15). Conducting observations was considered to contribute to student teachers' development and to encourage their reflections and judgements (ST5). That being involved in inquiry process will make learning long-lasting and meaningful and contribute to the development of instructional process was emphasized by one student teacher, respectively. Schulz and Mandzuk (2005) reported the contribution of inquiry to student teachers' development of instructional process, learning and growth, as prospective teachers.

Almost all student teachers reported their increased awareness related to the significance of team work during research process. Team work is considered to be powerful in linking theory and practice in TEPs (Ünver, 2014). While few reported that team work developed their communication and time management skills, ST18 highlighted that "the output produced as a result of patience and care" contributed to his improvement. He also underlined, "Students working efficiently in unity grow step by step, by gaining awareness of the importance of sharing and becoming more prudent towards the future." In relation to the afore-mentioned findings, Newell (1996) highlights the necessity of university courses to be grounded on both collaboration and reflection to promote student teachers' awareness of "the interaction between their classroom experiences and research-based theoretical knowledge" (p. 576), while Jin, Wei, Duan, Guo, and Wang (2016) emphasize the importance of social aspect of inquiry on student teachers' development.

Raising student teachers' awareness of theories in practice

Multiple qualitative findings revealed that almost all student teachers gained awareness and understanding related to how constructivist theories are implemented in practice. ST2 reported:

> "We only had awareness of the names of the theories before, yet after the inquiry process and comparing and contrasting them in the lectures, we gained awareness how they are implemented in the education system and what roles both traditional and contemporary teachers adopt in classes."

Further, student teachers' involvement in inquiry process promoted their awareness regarding theoretical grounds on which teachers based their instruction. This inquiry process facilitated their noticing and understanding of the theories they studied and being implemented in actual milieu. Related to this, it was revealed that they gained awareness that actual instructional processes are based upon traditional teaching approaches and that constructivism is barely implemented in classes, and that the ones who are implementing constructivism are novice teachers. In this respect, gaining awareness of theories was considered significant, as ST1 stated,

"It provides the possibility of results and the underlying basis of practice." ST8 underlined, "theories are vital for gaining consciousness. We don't learn by heart …without practice we approach to teaching with prejudices … as if constructivism is implemented in all schools … theory helps practice to be long-lasting."

Raising student teachers' awareness of instructional processes towards future direction

Engagement in inquiry helped some of the student teachers to be mindful of the qualities an effective teacher should possess. ST2 reported:

> "I found beneficial to observe the theories we studied … This process facilitated my development in understanding the difference between traditional and contemporary stances in our educational system … I developed certain values to use in my prospective life. Therefore, I will be able to help my students in real sense to be active and reveal their unique ideas and creativity in future."

Besides, ST13 reported that she gained awareness of the importance of teacher role and how to approach students and organize learning environment. She remarked that when learning environment is supported with audio-visual materials, learning is promoted. Based on her observations in a teacher- centered class, ST3 became aware of the importance of student-centered classes and stated, "I became conscious as to how to make learning environment conducive to learning, how to consider students' needs and expectations, how to give feedback and motivate learners and act as a facilitator."

Some reported their increased awareness as a result of their involvement in self-evaluation. While ST1 realized that it is the student who would be in the centre of the class not himself, ST15 reported how she empathized by asking 'how could I teach better?' and putting herself in place of student. ST7 highlighted how she questioned and reflected on what education level she could better employ theories, and remarked:

> "It is better to use behaviourism with students aged between 0-6 since critical questioning starts at certain age and students learn through role models. However, at secondary schools, teachers should be in the background as guide, so constructivism can be employed more."

One of the student teachers (ST1) reported his enhanced awareness as to the point that students need to be the centre of the instruction rather than the teacher, while ST21 underlined that she gained consciousness of conducting inquiry by bringing the student to the fore. ST23 also emphasized what she gained related to the importance of teacher's self-awareness in class, stating, "I gained insight into the fact that teacher awareness of what is going on in class is critical for successful instruction and it is critical for a teacher to raise own awareness by observing herself/himself and the context s/he is within."

Based on the findings, student teachers' engagement in inquiring constructivist theory also promoted their consciousness of the professional skills and instructional processes towards future directions. The findings of the study correspond with the literature in that inquiry-based instruction contributes to the student teachers linking theory and practice (Goodnough, Falkenberg, & MacDonald, 2016). Also, student teachers' observing teachers at schools were found helpful in their transferring theory to practice (Ünver, 2014). Taking part in IBL helps prospective teachers develop inquiry skills which, as a result, contribute to the development of quality of life in future generations. Learning is realized when meaning is generated and constructed socially and collaboratively through employing tools and signs (Moran, 2007). As for Aulls, Tabatabai and Shore (2016), "Focusing on student-teachers' understanding and

instructional use of their own inquiry experiences might be an important early step toward being able to conceptualize rich inquiry experiences for their own future students." (p. 9). This is critical for the provision of effective instruction since a teacher is expected to reconstruct own theories and grow professionally through conducting research.

Employing various pedagogical approaches like case studies, collaborative works, individual reflection, inquiry and so forth nurture theory-practice connection (Goodnough et al., 2016). The inquiry process helped student teachers gain awareness of the understanding of constructivist theory and its implementation in practice and, therefore, almost all underlined that they acquired knowledge and gained awareness of how to employ constructivist approach. ST1 reported, "Having awareness of theoretical knowledge is critical since it provides the possibility of results and is the underlying basis of practice." Besides, while most stressed their increased awareness of various theories, some mentioned that linking theory and practice increased their awareness and made their learning meaningful. They especially gained consciousness of effective teachers' attributes, which are what role the teacher should adopt and how s/he should organize the learning environment and promote student centeredness in order to promote learning. ST2 stressed:

> "I had studied constructivism before in our education classes, yet it was at the knowledge level till we applied it. Particularly we observed its application through in-class observations; this helped me to gain awareness of what I am supposed to do concerning this theory when I become a teacher."

Finally, inquiry process helped student teachers develop self-reflection skills and question student learning from the perspective of theories and practice. Few reported the role of theories in promoting their questioning during instructional processes. ST7 stated:

> "I questioned some of the things I do, particularly the things in my school and life. I realized that I can communicate with different age groups by using various theories and that I shouldn't behave students in the same way. It is difficult to employ behaviourism at lycee level. No way to stimulus response … it is critical to approach differently at lycee levels. I can say this for sure."

One of the ultimate aims of inquiry process is to promote student teachers' reflection and facilitate their development of own constructs and theories through moving from practice to theory (Korthagen & Kessels, 1999). Research findings also displayed the contribution of inquiry on student teachers' personal and future professional growth (Eklund, 2014). Thus, engagement of student teachers in inquiring into constructivist theory in authentic instructional settings helped them develop their own understanding and knowledge of the theories for future pedagogical practices.

Limitations of the Study

It is acknowledged that the study embraces certain limitations originating from the nature of the research design. This study employed an action research which, rather than generalization of the findings, intended to comprehensively investigate what student teachers enrolled in a theoretical course acquired from IBL processes. Action research studies are considered vulnerable in external validity (generalization); therefore, they need to be replicated (Fraenkel, Wallen, & Hyun, 2012). Also, the dual role of the researcher as both instructor and researcher can create a threat during data analysis process. To guard against the biasing influences of subjectivity, member checks were employed to increase the credibility of the findings. Further, during the process of IBL, though some groups were highly motivated and eager to conduct inquiries, very

few of them seemed to be slow in going through the steps of inquiry. In this respect, the researchers continually worked together with the student teachers to solve problems of mutual concern (Fraenkel, Wallen, & Hyun, 2012).

Conclusion

Based on the results, it can be concluded that engagement of student teachers in IBL processes in a theoretical course in a TEP contributed to their development of awareness concerning a) the instructional and structural factors inhibiting the implementation of constructivism; b) the process and skills they can use in conducting an inquiry; c) and the ways how they can better employ constructivist theory towards future directions.

As for Škugor and Sablić (2018), TEPs and education are accountable for developing student teachers who can employ student-centered instruction. Yeşilyurt (2011) also states that student teachers are expected not only to be trained according to the principles of constructivism but also to employ those principles in their professional life. As long as teachers employ constructivist principles and student teachers are trained in light of these principles, effectiveness in using constructivism is to be promoted (Yeşilyurt, 2012).

Student teacher inquiry in TEP are adopted in a number of programs for the purpose "to encourage teacher candidates to engage in critical reflection, develop a questioning stance, understand school culture, construct new curriculum and pedagogy, modify instruction to meet students' needs, and become socialized into teaching by participating in learning communities" (Cochran-Smith et al., 2009, p. 19). IBL can help prospective teachers develop their understanding of not only subject-matter teaching and learning but also pedagogical content knowledge (Haefner & Zembal-Saul, 2004); gain both theoretical and pedagogical knowledge and understanding of practice and inquiry; and develop through reflecting on practice on the basis of theoretical knowledge, which helps them expand their own understanding of instruction (Korthagen & Kessel, 1999). It is research-based programs that would encourage student teachers' development of pedagogically-thinking and inquiry-oriented skills and promote their continual professional development (Toom et al., 2010).

That IBL processes helped student teachers develop inquiry and collaboration skills was also derived from the findings. Collaborative inquiry was found to provide chances for student teachers to get a good understanding about own self as teacher, their students, the program, instruction, and their positions and liabilities as teachers (Rock & Levin, 2002). TEPs are suggested to provide inquiry processes and help student teachers communicate with each other and express their own views for their development (Jin et al., 2016).

In this regard, the IBL process provided the future teachers with the opportunities to look into the theoretical practice in-depth and link instruction and curriculum to not only teacher and instructional context but also wider context (Cochran-Smith & Lytle, 1999). Before these future teachers step into their profession, they get the actual picture of the instructional and curricular issues that await consideration and resolution when they are involved in inquiry in authentic settings. "To develop practice through the inquiry of one's own practice should be of interest for educational institutions, their student teachers and future workplaces, as well as for teachers"

(Hansen & Wasson, 2016, p. 46). Thus, implementation of IBL in a theoretical course proved itself valuable in promoting student teachers' linking theory and practice.

To this end, the findings of this study might offer insights into conceptualizing initial TEPs around inquiry-based instruction starting from early years so that student teachers can gradually build up awareness as regards how to conduct systematic inquiry. This could be realized through the integration of IBL in foundation and methodology courses and the provision of observational feedback (Levy, Thomas, Dragon, & Rex, 2013).

In light of the findings, it can be recommended that theory-based courses in TEPs can incorporate IBL to assist student teachers not only to develop the knowledge and skills to inquire into the instructional problems but also to link theory and practice and make learning more meaningful and long lasting. Besides, since this study is limited to a group of students in a TEP, further research integrating a larger sample at various levels and programs can be suggested to thoroughly investigate the contribution of inquiry-based instruction on student teachers' development.

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