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Mentor Teachers' Mentoring Practices in Science Teaching: Views of Pre-service Early Childhood Teachers

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Abstract

Practical experiences in teaching settings are an important component of pre-service teacher education programs. Pre-service teachers advance what they learn and improve their science teaching (ST) skills as well as other subjects in early childhood education for the period of teaching practices. In addition, teaching science in early childhood education requires more practices for improving teaching skills. Mentor teacher (classroom teacher) is valuable as well as professors in teacher education programs to pre-service teachers while teaching science. The purpose of this study is to reveal mentor teachers' mentoring practices in ST according to pre-service early childhood teachers' views. The method employed method was descriptive study. The sample is composed of 96 pre-service early childhood teachers and their mentors (N=41). Data were collecting within MEST survey. The results showed that most of the pre-service teachers reported their mentor teachers demonstrated less mentoring practices on the system requirement about ST. The pre-service teachers also pointed out that their mentor teachers mostly showed mentoring practices on personal attributes, pedagogical knowledge, modeling, and feedback factors. Knowing and understanding the mentoring skills of early childhood teachers in system requirement, pedagogical knowledge, modeling, giving feedback, and personal attributes would have an important growing on preservice early childhood teachers science teaching skills. That will be helpful for shaping new teaching practices and field experiences in different majors for improving teachers teaching skills.

Keywords: Mentoring, science teaching, teaching practices, early childhood education, pre-service teachers

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Introduction

Teachers face many challenges during the first years of teaching, such as planning and implementing curriculum, assessing, motivating, managing the classroom, and feeling overwhelmed (Roehrig, Pressley, & Talotta, 2002). In recent years, there has been a growth of support, guidance, and practice programs for preservice teachers to prepare them at the beginning of teaching career. However, they do not feel that they are prepared to deal with the reality of teaching and are scared to ask for help because they may feel as if they appear inadequate (Boss, 2001; Riedler & Eryaman, 2016). Some countries went through policy changes about mentoring preservice teachers during their school-based teaching experiences at the end of 1980s (Hobson, Harris, Buckner-Manley, & Smith; 2012). During this time, most countries, such as United States, Australia, China, and Turkey have spent more time and resources to develop mentoring programs and prepare preservice teachers. After excessive works in this area, researchers (Ginns, Tullip, Watters, & Lucas, 1995; Kazempour, 2014; Putman, 2012; Author, 2016) found that teachers' confidence and ability to teach science was the major issue in ST. In addition, researchers suggested that universities need to enhance programs to prepare preservice teachers who are new in the field for effective ST (Eryaman, 2007; Murphy, Neil, & Beggs, 2007).

Mentoring

In the field of teacher education programs, the mentor teachers play an important role in the development and training of future teachers (Hudson, Uşak, & Savran-Gencer, 2009; Ngoepe, 2014). Johnson (2008) described the mentor teacher as an experienced teacher who is skilled in understanding standards, has the ability to transmit effective teaching strategies, and can engage in open communication with beginning and/or preservice teachers. The mentor can provide systematic guidance to a mentee (preservice teacher) and help them tackle the problems that many beginning teachers face (Vonk, 1996). Likewise, the role of the mentor is described by Haigh and Ward (2004) as an encourager, role model, feedback giver, observer, and supporter. The importance of mentoring programs, due to the success in improving classroom practices, preservice teachers' mentor teachers were significant in the impact of their mentees (Murray, P. Hudson, & Hudson, 2011). In Turkey, the roles and responsibilities of mentor teachers during teaching practicum are guided by the Ministry of National Education (MoNE,1998). Based on that, mentor teachers are assessing their mentees' teaching, modeling classroom management strategies, and other skills.

Quality mentor programs support prepare preservice teachers in ways that enable them to become highly effective teachers in their professional careers (Murray, et al., 2011; Slick, 1995). Most of the studies ([Author, 2016]; Hudson & Skamp, 2002) identified quality indicators of effective mentors. For example, Hudson and Skamp (2002) stated effective mentorship focuses more on improving pedagogical knowledge of preservice teachers, modeling of teaching, the provision of productive feedback, and assisting preservice teachers in planning effective instruction in specific

areas of curriculum, such as science and mathematics. Hudson and Skamp (2002) evaluated five mentoring behaviors on ST as: (a) personal attributes, (b) system requirements, (c) pedagogical knowledge, (d) modelling, and (e) feedback based on the mentor teachers' mentoring.

Personal Attributes

Researchers stated that mentor teachers display their personal attributes as facilitating supportive learning environment (Ganser, 1991; Kennedy & Dorman, 2002; Rippon & Martin, 2006). Moreover, during ST, mentor teachers may show positive attitudes towards science when their mentees are in classroom. Similarly, they can also listen their preservice teachers' issues on teaching and assist them how they can improve their ST skills ([Author, 2016]; Hudson & Skamp, 2002)

System Requirements

System requirements of mentoring refers to curriculum documents, systemic aims, and school policies to regulate and demonstrate the quality of teaching practices for preservice teachers (Hudson, 2007; Hudson et al., 2009). Mentor teachers should also have adequate skills on system requirements while mentoring preservice early childhood teachers during ST (Simsar, 2016). Harlen and Holroyd (1997) stated that preservice teachers requested some help with regard to practical work on searching, collecting, checking and using science equipment within the classroom.

Pedagogical Knowledge

Mentor teachers should also have adequate pedagogical knowledge to facilitate effective mentoring (D. Hodson & Hodson, 1998; Zanting, Verloop, & Vermunt, 2003). The preservice teachers' development of pedagogical knowledge can be enhanced by a competent and experienced mentor (Allsop & Benson, 1996). With regards to subject-related pedagogical knowledge of teachers, researchers concluded that teachers need someone to show them how to do it (Harlen & Holroyd, 1997). Researchers stated that early childhood teachers have lack of science pedagogical knowledge and it was seen as a significant barrier to developing ST and learning in their classroom (Fleer, 2009; Kallery & Psillos, 2001; Nilsson, 2015; Shulman, 1986; Tu, 2006). That is why most of the early childhood teachers stated that science is the subject that they less enjoy teaching, because they afraid that they can't answer child's questions that are related with science and science contents (MacDonald & Sherman, 2007; Murphy & Beggs, 2003). To improve pedagogical knowledge in science contents, early childhood teachers requested first-hand experiences both in their teacher professional development and experiences during teaching practicum.

Modeling

Mentor teachers also provide systematic guidance to preservice teachers and help them solve the problems that many beginning teachers face when they start their career (Vong, 1996). Teachers also model teaching, show classroom management, and give constructivist feedback to their preservice

teachers (Simsar, 2016). Caroll (2005) stated when experienced teachers discuss and model his or her own teaching with preservice teachers, the mentees got the idea of teaching on certain subjects easily, such as science. Moreover, when preservice early childhood teachers and their mentors have concrete experiences to discuss within context it makes the relationships more powerful between mentors and mentees (Simsar, 2016).

Giving Feedback

Giving feedback, which is one of the important mentoring skills, in teaching will be more useful if it address the preservice teachers' needs within effective teaching (Jarvis, McKeon, Coates, & Vause, 2001). Outcomes that are linked to indicators of effective practices may provide clearer directions for both mentors and preservice teachers, which can lead towards offering evidence on the achievement of such outcomes (Hudson, 2004). For example, teachers who have been educated in mentoring for teaching are more confident in raising issues, expect specific learning outcomes, place greater emphasis on pedagogical knowledge, and aim to improve their own skills of observing teaching practices (Jarvis et al., 2001).

Teaching Experiences / Practica

Teaching experiences are critical elements of teacher education programs because preservice teachers observe their mentors, and interact with them, and in doing so, they receive important feedback information (Hudson, 2007; Hudson et al., 2009; Ngoepe, 2014; Slick, 1995). Slick (1995) highlighted the importance of teaching experiences as "… preservice teachers meld theory into practice through application of concepts, principles, and ideals gleaned from instructional specialists" (p.1). Moody (2009) identified four key elements that contribute toward quality teaching experiences: (a) support from supervising teacher, (b) freedom to develop own teaching style, (c) constructive feedback, and (d) approach to assessment. In addition, according to researcher preservice teachers usually want to observe their mentors' teaching so that they can determine how they can teach in accordance with their own teaching styles.

McIntyre, Bryd, and Foxx (1996) suggested that preservice teachers were very nervous about teaching and they were expecting their supervising teachers to be supportive during their teaching experiences. Similarly, Beck and Kosnik (2002) showed that emotional support provided a crucial benefit that preservice teachers gained from their teaching experiences. Likewise, in a large-scale study of 3,162 preservice teachers, researchers specified emotional and professional support to be important components that most preservice teachers hoped to receive during the teaching practicum (Hobson et al., 2006). In addition, it has been suggested that school-based teacher education requires mentor teachers who are expert in the related contents and show well modeling behavior for how to teach it to their student teachers (Nilsson & Driel, 2010). In sum, such conclusions illustrate why mentoring and related experiences can be considered influential factors in shaping preservice teachers' ST in early

childhood education. That is why the current study is important for developing preservice early childhood teachers' ST skills which the science content are shown as hardest topic for explaining and teaching by teachers early years (Fleer, 2009; Kallery & Psillos, 2001; Nilsson, 2015; Shulman, 1986; Tu, 2006).

Science in Early Years

Teaching science in early years has potential benefits and is important for helping children later learning and interest in science careers (Bredekamp & Copple, 1997; Kamay & Kaşker, 2006; National Science Teachers Association, 2014). Research in over past two decades showed that science helps children to engage in observations, inquiry, and experiments (Conezio & French, 2002; Greenfield et al., 2009). However, studies showed that, most of the Pre-K teachers spend less time on ST it is because of their confidence on ST skills (Tu, 2006; Yılmaz-Tuzun & Topçu, 2008). Therefore most of teachers in early care and education focused on children's social, emotional, and physical development and gave little time on scientific skills and experiences (Worth, 2010). Similarly, many teachers have invalid preconceptions about science (Lind, 2000) and they mislead their mentees who visit their classroom during teaching practice. Conezio and French (2002) stated that in early years, some teachers would like to use more science activities in education programs. However, most of the early childhood teachers don't know how they can do that. Researchers suggested that preservice teachers need to be given opportunities to practice student centered methods to improve their ST epistemological beliefs (Yılmaz-Tuzun & Topçu, 2008) Due to the spent little time on ST, feel unqualified to teach science, and lack ST skills, one possible way of doing this is by providing them with more teaching experiences and modeling how to teach science in early childhood classroom (Ginns et al., 1995; Kazempour, 2014; Putman, 2012).

The purpose of this study is to examine preservice early childhood teachers' views about their mentors' mentoring in ST based on mentoring practices. The study describes mentor teachers mentoring practices due to their mentoring on personal attributes, system requirements, pedagogical knowledge, modeling, and feedback which help their preservice teachers while teaching science. Based on the purpose of this study, the research question was: "What were the preservice early childhood teachers' views about their early childhood mentor teachers' mentoring in ST?"

Method

Research model/design

This study was a descriptive study which was designed to investigate the mentor teachers' mentoring in ST when their preservice early childhood teachers were in the classroom. The descriptive research approach is carried out to describe some phenomenon as it exists and get a detailed description about the situations (Creswell, 2012; Kerlinger & Lee, 2000; Slavin, 2007). In this study, preservice teachers completed the Mentoring for Effective ST (MEST) instrument by giving their

views about their mentor teachers mentoring behaviors during teaching practicum.

Research sample

The sample is composed of 96 (17 male and 79 female) senior Turkish preservice early childhood teachers. The participants in the current study included 81 (84.4%) who attended their field placement once a week and the remaining 15 (15.6%) were at their field placement 2-3 days a week. Each preservice teacher was mentored by one mentor teacher during their teaching practicum. However, some of the mentor teachers worked with more than one preservice teacher. A total of 32 (33.3%) had been placed in classrooms with 3 to 4-year-old children and 64 (66.7%) were placed in classrooms with 5 to 6-year-old children. In addition, the preservice early childhood teachers were asked to indicate the numbers of science classes they had taken during their teacher education programs. A small number of participants (3 or 3.1%) had taken no science courses as part of their undergraduate degree programs. In contrast, 90 (93.8%) of the participants had taken 1 or 2 science courses, and 3 (3.1%) had taken 3 or more science courses. A total of 30 (31.3%) of the participants believed that the science courses that they had taken were sufficient preparation for them to teach science in pre-K classrooms. However, most of the participants 66 (68.8%) believed that the science courses that they had taken were not sufficient preparation for them to teach science in pre-K classrooms. Moreover, preservice teachers shared their data about how long they observed their mentor teacher's ST and ST by themselves. Preservice teachers stated that their teaching time (M = 192.08, SD = 67.01) and observation time (M = 155.26, SD = 107.91). Preservice teachers also stated that in some classrooms they never observed any ST and they spend at least 75 minutes in ST.

The data also showed that 2 (4.9%) of the mentor teachers were males and 39 (95.1%) of the teachers were female (N = 41). There was a wide age range including 3 (7.3%) under 25 years, 28 (68.3%) between 26 and 35 years, and 10 (24.4%) from 36 to 45 years old. In addition, the mentor teachers were relatively experienced in that most had been teaching for 7 or more years (M = 3.95, SD = 1.04). Most of the mentor teachers had worked with preservice early childhood teachers for several years. However, a large proportion 23 (56.1%) had mentored preservice early childhood teachers for fewer than 4 years (M = 2.51, SD = .95).

The data also showed that 33 (80.5%) of the mentor teachers had a science corner/center in their classrooms, while only 8 (19.5%) mentor teachers did not have a science corner/center. In addition, the majority of the mentor teachers taught science 1-2 days a week (56.1%), and 12 of the mentors (29.3%) never taught any science activities in their early childhood classroom (M = 1.92, SD = .81). However, concerning about mentor teachers' mentoring when preservice early childhood teachers teach science, a majority of the mentor teachers, 37 teachers (90.2%), reported that they mentored their preservice teacher during classroom science activities, and only 4 (9.8%) indicated they did not provide any mentoring experiences.

Data collection

In the current study, the preservice early childhood teachers participated in their field experiences each week and observed their mentor teachers. During their student teaching, preservice early childhood teachers taught science and observed their mentor teachers' ST practices in classroom. It is because; one of the contexts of the curriculum in early childhood education is science. Each week, within their early childhood classrooms, mentor teachers gave time to their mentees on how they can manage a classroom, interact with children, and teach activities which included art, language, math, music, and science.

In order to estimate the views of preservice teachers about their mentors mentoring practices in ST based on personal attributes, system requirements, pedagogical knowledge, modelling, and feedback, preservice teachers completed the Mentoring for Effective ST (MEST) instrument. The MEST survey was adapted from the Mentoring for Effective Primary Science Teaching (MEPST) which was developed by Hudson (2007).Demographic information of preservice early childhood teachers also was collected by the MEST survey.

The survey consists of 34 items and it utilizes a 5 point Likert type scale (Strongly Agree, Agree, Uncertain, Disagree, and Strongly Disagree). Each factor includes its own set of items as follows: personal attributes items 1, 17, 22, 23, 26, 31 (total score=30), system requirements items 4, 11, 25 (total score = 15), pedagogical knowledge items 3, 6, 8, 10, 14, 18, 21, 24, 27, 30, 32 (total score = 55), modelling items 2, 5, 7, 9, 12, 15, 19, 29 (total score=40), and feedback items 13, 16, 20, 28, 33, 34 (total score=30).

The original survey (MEPST), designed for preservice primary science teachers, was adopted for the purposes of the Simsar's study (2016) by slightly modified it for early childhood preservice teachers. For example, the wording of item 7 was modified so that it referred to early childhood teachers: 'had a good rapport with the early childhood students doing science.' The reliability of the English version of the instrument was within an acceptable range with Cronbach alpha scores of each factor as follows: personal attributes α=.93, system requirements α=.76, pedagogical knowledge α=.94, modelling α=.95, and feedback α=.92 (Hudson, 2007). However, for the validity of the study, the three colleagues were checked its Turkish version. After the changes on the MEST items, its reliability was checked. For the reliability of the Turkish version of MEST, it is also stated that MEST survey's cronbach alpha scores were reported scores as follows: α=.89 for personal attributes, α=.82 for system requirements, α= .93 for pedagogical knowledge, α=.90 for modeling, and α=.80 for feedback. Furthermore, Cronbach's alpha for the Turkish version of the MEST was also within an acceptable range (α= .97). The data seems reliable for using in the current study due to the previous studies Cronbach alpha scores (Simsar, 2016).

Results

The descriptive analysis was run and results were shown at tables. Each factor is explored due to their related items and descriptive statistics were shown below. Preservice early childhood teachers' positive and negative views related to the factors were also shown via percentages pie charts. In the each factors, related items were coded such as PA3, F2, and SR1. For example, PA3 refers to items 3 of Personal Attributes. The results were also compared with previous studies which used same survey for the looking Australian preservice primary science teachers (Hudson, 2007) and Turkish preservice primary teachers (Hudson et al., 2009)

The Results of the Current Study

Table 1. Descriptive statistics of 'Personal Attributes' for mentoring in science teaching

Mentoring Practices 'Personal Attributes'	*N*					*M*	*SD*
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
PA1. My mentor was supportive of me for teaching science.	10	16	10	52	8	3.33	1.16
PA2. My mentor seemed comfortable in talking with me about science teaching.	5	12	15	47	17	3.62	1.08
PA3. My mentor instilled positive attitudes in me towards teaching science.	7	22	12	38	17	3.37	1.22
PA4. My mentor assisted me to reflect on improving my science teaching practices.	11	17	17	35	16	3.29	1.26
PA5. My mentor made me feel more confident as a science teacher.	8	16	30	29	13	3.23	1.14
PA6. My mentor listened to me attentively on science teaching matters.	7	17	20	28	24	3.46	1.24

Table 1 show that preservice teacher' views about their mentor teachers mentoring activities based on personal attributes. The descriptive statistics of personal attributes show that mentor teachers mostly mentoring in the practices of PA2 (M = 3.62, SD = 1.08). In addition, as shown by the data regarding statement PA5 in Table 1, preservice teachers' responses were more negative about their mentors' success at making them feel confident as science teachers (M = 3.23, SD = 1.14).

Table 2. Descriptive statistics of 'System Requirements' for mentoring in science teaching

Mentoring Practices 'System Requirements'	N					*M*	*SD*
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
SR1. My mentor discussed with me the school policies used for science teaching.	19	37	20	18	2	2.44	1.07
SR2. My mentor outlined state science curriculum documents to me.	19	46	13	13	5	2.36	1.10
SR3. My mentor discussed with me the aims of science teaching.	14	35	19	22	6	2.70	1.16

Preservice early childhood teachers also stated their views about mentor teachers' mentoring practices on the system requirements. As shown by the data regarding statement SR3 in Table 2, preservice teachers' responses were more positive about their mentors' success at making them feel more confident during ST (M = 2.70, SD = 1.16). However, preservice teachers' responses were negative about their mentors mentoring in the statement SR2 (M = 2, 36, SD = 1,10).

Table 3. Descriptive statistics of 'Pedagogical Knowledge' for mentoring in science teaching.

Mentoring Practices 'Pedagogical Knowledge'	N					*M*	*SD*
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
PK1. My mentor guided me with science lesson preparation.	8	26	11	42	9	3.17	1.17
PK2. My mentor assisted me with classroom management strategies for science teaching.	6	20	9	42	19	3.50	1.20
PK3. My mentor assisted me towards implementing science teaching strategies.	7	18	7	49	15	3.48	1.17
PK4. My mentor assisted me with timetabling my science lessons.	15	42	11	23	5	2.59	1.16
PK5. My mentor developed my strategies for teaching science.	9	31	21	29	6	2.91	1.12
PK6. My mentor discussed with me questioning skills for effective science teaching.	11	27	16	33	9	3.02	1.21
PK7. My mentor discussed with me the knowledge I needed for teaching science.	17	21	19	29	10	2.93	1.28
PK8. My mentor gave me clear guidance for planning to teach science.	10	26	25	27	8	2.96	1.14
PK9. My mentor provided strategies for me to solve my science teaching problems.	13	15	22	34	12	3.17	1.23
PK10. My mentor gave me new viewpoints on teaching science.	14	22	26	27	7	2.90	1.17
PK11. My mentor showed me how to assess the students' learning of science.	12	19	10	39	16	3.29	1.30

Pedagogical knowledge is another factor that mentor teachers' mentoring in ST. Table 3 shows the descriptive statistics of preservice early childhood teachers' views about mentor teachers' mentoring practices regarding pedagogical knowledge. As shown by the data regarding statement PK2

in Table 3, preservice teachers mostly had positive feelings about their mentor's success in the pedagogical knowledge section (M = 3.50, SD = 1.20). However, preservice teachers stated that their mentor teachers practiced less mentoring experiences concerning PK4 statement (M = 2.59, SD = 1.16).

Table 4. Descriptive statistics of 'Modeling' for mentoring in science teaching.

Mentoring Practices 'Modeling'	N					*M*	*SD*
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
M1. My mentor used science language from the current early childhood science syllabus.	7	20	28	32	9	3.16	1.09
M2. My mentor modelled science teaching.	12	25	25	23	11	2.95	1.21
M3. My mentor had a good rapport with the early childhood students doing science.	6	12	20	40	18	3.54	1.12
M4. My mentor displayed enthusiasm when teaching science.	12	16	28	30	10	3.10	1.18
M5. My mentor modelled effective classroom management when teaching science.	11	25	17	32	11	3.07	1.23
M6. My mentor was effective in teaching science.	8	20	17	41	10	3.26	1.15
M7. My mentor used hands-on materials for teaching science.	12	21	12	36	15	3.21	1.29
M8. My mentor had well-designed science activities for the students.	12	18	27	22	17	3.14	1.27

Preservice teachers also stated that their mentor teachers' mentoring in ST based on their modeling behavior on ST in classroom. Table 4 shows that preservice teachers stated that their mentor teachers mostly showed the mentoring practices regarding M3 statement (M = 3.54, SD = 1.12). However, regarding M2, preservice teachers specified that their mentor teachers practiced less mentoring skills on this sections (M = 2.95, SD = 1.21). It is probably about 29% of the mentor teachers were not spending time in science activities in their early childhood classrooms.

Table 5. Descriptive statistics of 'Feedback' for mentoring in science teaching.

Mentoring Practices 'Feedback'	N					*M*	*SD*
	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree		
F1. My mentor discussed evaluation of my science teaching.	12	25	13	30	16	3.13	1.31
F2. My mentor provided oral feedback on my science teaching.	6	20	19	39	11	3.30	1.11
F3. My mentor provided me with written feedback on my science teaching.	26	35	12	16	7	2.40	1.25
F4. My mentor reviewed my science lesson plans before teaching science.	8	15	13	27	33	3.64	1.32
F5. My mentor clearly articulated what I needed to do	11	21	10	31	23	3.35	1.36

to improve my science teaching.							
F6. My mentor observed me teach science before providing feedback.	11	9	12	28	36	3.71	1.35

Feedback is another factor of mentoring practices which mentor teachers mentoring in ST. As shown by the data regarding F6 in Table 5, most of the preservice teachers' mentor teachers had positive impacts on their ST self-efficacy beliefs (M = 3.71, SD = 1.35). Though, the data results showed that few of them concerned that their mentor teachers showed less success about F3 statements in the table (M = 2.40, SD = 1.25).

Current Study vs Previous Studies

The results of the current study were compared with the previous study conducted by Hudson (2007) and Hudson, et al., (2009) (see Table 6). Both of the studies were conducted with preservice primary science teachers. Hudson (2007) was conducted in Australia with 331 (284 female and 47 male) preservice primary science teachers. Hudson, et al., (2009) was conducted in Turkey with 304 Turkish primary science teachers. As shown by the data in Table 6, preservice early childhood teachers mostly stated that PA2 (M = 3.62, SD = 1.08) and few of them PA5 (M = 3.23, SD = 1.14) on the Personal Attributes in the current study. On the other hand, PA1 (M = 3.46, SD = 1.31; Hudson, 2007) and PA1(M = 4.43, SD = 0.79; Hudson, et al., 2009) was mostly selected by preservice primary teachers. In addition, few of the preservice teachers selected PA4 (M = 2.72, SD = 1.15; Hudson, 2007) and PA1 (M = 2.07, SD = 1.29) and PA6 (M = 2.08, SD = 1.29) on Hudson et al. (2009).

On the system requirement section of mentoring, preservice early childhood teachers in the current study and primary science teachers from Hudson (2007) mostly selected SR3 (M = 2.70, SD = 1.16) and SR3 (M = 2.40, SD = 1.11; Hudson, 2007). Additionally, SR2 (M = 4.65, SD = 0.82) was mostly selected by preservice teachers from Hudson et al. (2009). However, preservice teachers' responses were negative about their mentors' mentoring in the statement SR2 (M = 2.36, SD = 1.10) in the current study. SR1 (M = 2.40, SD = 1.11; Hudson, 2007) and (M = 2.68, SD=1.32; Hudson, et al., 2009) was chosen as less mentoring skills by preservice teachers from other studies (see Table 6).

Table 6 showed that preservice early childhood teachers mostly selected PK3 (M = 3.48, SD = 1.17) as their mentor teachers Pedagogical Knowledge skills. However, PK1 (M = 2.87, SD = 1.27; Hudson, 2007) and (M = 4.60, SD = 0.60; Hudson, et al., 2009) was selected by preservice primary teachers from other studies. Mentor teachers showed less mentoring experiences concerning PK4 statement (M = 2.59, SD = 1.16; current study) and (M = 1.58, SD = 1.00; Hudson, et al., 2009). Additionally, PK9 (M = 2.60, SD = 1.10) was selected as less mentoring skills by preservice primary teachers on the study of Hudson (2007).

Related with modeling preservice early childhood teachers in the current study and primary science teachers from Hudson (2007) were mostly selected M3 (M = 3.54, SD = 1.12) (current study)

and M3 (*M* = 3.36, *SD* = 1.24; Hudson, 2007). Additionally, M5 (*M* = 4.51, *SD* = 1.12) was mostly selected by preservice teachers from Hudson, et al., (2009). However, preservice teachers' responses were negative about their mentors mentoring in the statement M2 (*M* = 2.95, *SD* = 1.21) in the current study, M1 (*M* = 3.04, *SD* = 1.22) by Hudson (2007), and M8 (*M* = 2.52, *SD* = 1.31) by Hudson et al. (2009; see Table 6).

Preservice early childhood teachers in the current study and primary science teachers from Hudson (2007) were mostly selected F6 (*M* = 3.71, *SD* = 1.35; current study) and F6 (*M* = 3.72, *SD* = 1.37; Hudson, 2007) as feedback skills of mentor teachers. Moreover, F1 (*M* = 4.66, *SD* = 0.93) was mostly selected by preservice primary science teachers from Hudson et al. (2009). However, preservice teachers' responses were negative about their mentors mentoring in the statement F3 (*M* = 2.40, *SD* = 1.25) in the current study, F5 (*M* = 2.75, *SD* = 1.23) by Hudson (2007), and F3 (*M* = 3.95, *SD* = 0.93) and F4 (*M* = 3.95, *SD* = 0.93) by Hudson et al. (2009; see Table 6)

Table 6. The comparison of results by the Hudson (2007) and Hudson et al. (2009)

Mentoring Practices		Current Study			Hudson, 2007			Hudson, et al., 2009		
		%[a]	M	*SD*	%[a]	M	*SD*	%[a]	M	*SD*
Personal Attributes	PA2. My mentor seemed comfortable in talking with me about science teaching.	66.7*	3.62	1.08	56	3.30	1.22	53	3.62	0.96
	PA1. My mentor was supportive of me for teaching science.	62.5	3.33	1.16	64*	3.46	1.31	90*	4.43	0.79
	PA3. My mentor instilled positive attitudes in me towards teaching science.	57.3	3.37	1.22	45	3.07	1.23	69	4.05	1.09
	PA6. My mentor listened to me attentively on science teaching matters.	54.2	3.46	1.24	53	3.19	1.31	17**	2.08	1.29
	PA4. My mentor assisted me to reflect on improving my science teaching practices.	53.2	3.29	1.26	35**	2.72	1.25	17**	2.07	1.29
	PA5. My mentor made me feel more confident as a science teacher.	43.7**	3.23	1.14	46	3.10	1.28	67	3.91	1.00
System Requirements	SR3. My mentor discussed with me the aims of science teaching.	29.2*	2.70	1.16	23*	2.40	1.11	71	3.91	0.89
	SR1. My mentor discussed with me the school policies used for science teaching.	20.9	2.44	1.07	16**	2.27	1.11	26**	2.68	1.32
	SR2. My mentor outlined state science curriculum documents to me.	18.7**	2.36	1.10	18	2.22	1.07	92*	4.65	0.82
Pedagogical Knowledge	PK3. My mentor assisted me towards implementing science teaching strategies.	66.6*	3.48	1.17	35	2.70	1.19	37	2.91	1.37
	PK2. My mentor assisted me with classroom management strategies for science teaching.	63.6	3.50	1.20	44	2.85	1.32	48	3.03	1.29
	PK11. My mentor showed me how to assess the students' learning of science.	57.3	3.29	1.30	31	2.64	1.22	70	4.07	0.91
	PK9. My mentor provided strategies for me to solve my science teaching	53.9	3.17	1.23	25**	2.60	1.10	45	3.60	1.02

	problems.									
	PK1. My mentor guided me with science lesson preparation.	53.2	3.17	1.17	45*	2.87	1.27	96*	4.60	0.60
	PK6. My mentor discussed with me questioning skills for effective science teaching.	43.8	3.02	1.21	31	2.67	1.21	67	3.83	1.10
	PK7. My mentor discussed with me the knowledge I needed for teaching science.	40.6	2.93	1.28	35	2.73	1.19	25	2.55	1.30
	PK5. My mentor developed my strategies for teaching science.	36.5	2.91	1.12	41	2.86	1.23	57	3.79	1.16
	PK8. My mentor gave me clear guidance for planning to teach science.	36.4	2.96	1.14	37	2.72	1.23	76	4.07	0.91
	PK10. My mentor gave me new viewpoints on teaching science.	35.4	2.90	1.17	35	2.81	1.23	69	4.05	1.09
	PK4. My mentor assisted me with timetabling my science lessons.	29.2**	2.59	1.16	44	2.91	1.27	6**	1.58	1.00
Modelling	M3. My mentor had a good rapport with the early childhood students doing science.	60.5*	3.54	1.12	58*	3.36	1.24	66	3.92	1.33
	M6. My mentor was effective in teaching science.	53.1	3.26	1.15	42	3.11	1.22	54	3.50	1.12
	M7. My mentor used hands-on materials for teaching science.	53.1	3.21	1.29	41	3.01	1.26	45	3.60	1.01
	M5. My mentor modelled effective classroom management when teaching science.	44.8	3.07	1.23	43	2.96	1.30	88*	4.51	1.12
	M1. My mentor used science language from the current early childhood science syllabus.	42.7	3.16	1.09	40**	3.04	1.22	63	3.92	1.01
	M4. My mentor displayed enthusiasm when teaching science.	41.7	3.10	1.18	48	3.08	1.24	82	4.36	0.93
	M8. My mentor had well-designed science activities for the students.	40.6	3.14	1.27	44	3.09	1.26	25**	2.52	1.31
	M2. My mentor modelled science teaching.	35.5**	2.95	1.21	44	2.68	1.25	83	4.32	0.81
Feedback	F6. My mentor observed me teach science before providing feedback.	66.7*	3.71	1.35	74*	3.72	1.37	67	3.91	1.01
	F4. My mentor reviewed my science lesson plans before teaching science.	62.5	3.64	1.32	54	3.13	1.32	65**	3.95	0.93
	F5. My mentor clearly articulated what I needed to do to improve my science teaching.	56.3	3.35	1.36	33**	2.75	1.23	70	3.89	0.92
	F2. My mentor provided oral feedback on my science teaching.	52.1	3.30	1.12	62	3.32	1.28	84	4.32	0.90
	F1. My mentor discussed evaluation of my science teaching.	48.0	3.13	1.31	46	2.96	1.29	95*	4.66	0.67
	F3. My mentor provided me with written feedback on my science teaching.	24.0**	2.40	1.25	45	2.95	1.38	65**	3.95	0.93

Discussion, Conclusion and Recommendations

This study investigated preservice early childhood teachers' views of their mentors' mentoring practices in early childhood ST. Teaching experiences are critical elements of teacher education programs because preservice teachers may have opportunities to observe their mentors, interact with them, and in doing so, they receive important feedback (Hudson, 2007; Hudson et al., 2009; Ngoepe, 2014; Slick, 1995). However, in the current study, it was found that some of mentor teachers (29 %) did not give time to ST in their classrooms. This situation may negatively impact their mentees who would like to learn how science can be thought. It has been seen that when the current studies' results compared with Hudson (2007) and Hudson et al. (2009), preservice early childhood teachers conducted less modeling behavior on "*My mentor modeled science teaching."* However, preservice teachers conducted less mentoring skills on "*M8. My mentor had well-designed science activities for the students."* (Hudson et al., 2009). It is showed that, preservice primary science teachers from Hudson et al. (2009) may had compared their ST skills and their mentor by the having more science experiences (83%) during teaching practica. It is probably interesting results when primary science teachers and early childhood teachers.

During teaching practices, mentors need to display personal attributes that facilitate a supportive learning environment (Ganser, 1991; Kennedy & Dorman, 2002; Rippon & Martin, 2006). Similarly, regarding personal attributes, the current study also identified that preservice teachers stated that their mentor teachers may help them when they improve their confidence level during ST. Researchers stated that mentor teachers' personal attributes can be improved with positive attitudes and confidence in the preservice teachers (Beck, Czerniak, & Lumpe, 2000; Matters, 1994) and promoting classroom environment as constructively teaching practices for preservice teachers (Zachary, 2002). This shows the importance of improving personal attributes. In the current study, most of the preservice teachers stated that their mentors had practices related to the personal attributes more when it compared with other mentoring practices in ST. Similarly, Hudson et al. (2009) stated that preservice primary science teachers got more mentoring experiences from their mentors based on the personal attributes.

In addition, mentors' articulation of system requirements provides mentees with departmental directions for teaching (Lenton & Turner, 1999). In the current study, few of the preservice teachers were getting mentoring experiences on the system requirement about ST in early childhood education. Similarly, Hudson (2007) stated that mentor teachers were giving less mentoring practices when system requirement compared with modeling, pedagogical knowledge and feedback. This could be because of the mentor teachers' skills on ST. In the current study, the data results showed that mentor teachers were teaching science a few days per week. Due to this, they may have less knowledge about how they can show mentoring due to system requirements in ST in early childhood classrooms.

Pedagogical knowledge was another important factor that preservice teachers should improve their skills in ST. The current study showed that some of the preservice early childhood teachers stated that their mentors had mentoring practices on pedagogical knowledge in ST. A study conducted by Ekiz (2006) had investigated mentoring practices and experiences showed a lack of mentoring or poor mentoring practices in pedagogical knowledge. However, in this study, most of the preservice early childhood teachers stated they had chances to improve their pedagogical knowledge, which may be because of their mentor teachers' mentoring practices on pedagogical knowledge.

Although effective practices of modeling appears key to many successful mentoring programs (Barab & Hay, 2001), 'non-expert' mentors of primary subjects may not be able to model or discuss effective teaching practices in those subject areas (Moody, 2009). However, in the current study, preservice early childhood teachers stated their mentor teachers were relatively experienced and that most had been teaching for 7 or more years. Most of mentor teachers had worked with preservice early childhood teachers for several years. That is why most of the preservice teachers stated their mentor teachers were modeling ST when they were in the classrooms. This may be because most of the mentor teachers were teaching science one or two days a week. Mentors' modeling practices in ST are probably happening during preservice teachers' time in the classroom. However, it is found that, some of the mentor teachers don't spend time in science activities. It may be because they help their mentees in another area of mentoring practices such as system requirements, personal attributes, and feedback.

Moreover, in another study Hudson (2007) found that preservice primary science teachers stated that most of their mentor teachers gave feedback about their ST. Therefore, when classroom teachers demonstrate how science can be taught in early childhood classrooms, the preservice teachers who observe the lesson will most likely improve how they teach science (Hudson, 2007; Hudson et al., 2009). Similarly, in the current study, mentor teachers showed mostly mentoring practices in feedback. This may be because most of the mentor teachers were giving feedback with preservice teachers before and after the preservice early childhood teachers' teaching. This is rule of teaching practicum by the guided MoNE (1998) for mentor teachers. Mentor teachers also help while preservice teachers create lesson plans for teaching. During lesson planning time and also after teaching, it is likely that mentor teachers were giving feedback to their mentees on how they can teach better in science instruction. Surprisingly, some of mentor teachers (29%) never taught science in their early childhood classroom, but the results showed that they probably mentored to their mentees during lesson planning (62.5%) and teaching (66.7%) by giving feedback.

In conclusion, the current study explored several essential experiences about preservice early childhood teachers' teaching practicum and their mentor teachers mentoring on science. The results showed several important factors for mentor teachers' mentoring practices. These factors could bring new and vital ideas to build teacher education programs with regards to science in early childhood education. One of the significant findings in the current study was that there are less mentoring skills

on system requirement in ST. The current study explored how mentor teachers do lack helping their mentees on system requirements. However, they can share their experiences on system requirements on ST to improve their mentees ST skills in the future.

Furthermore, the results also highlighted the significance of giving feedback to mentees, improving pedagogical knowledge and personal attributes of preservice teachers. Murray et al. (2011) expressed their concerns about the quality and quantity of mentoring preservice teachers. In this study, it was found that, some of the teachers do not spend time in ST but, surprisingly, they still help their mentees on how they can teach science. As it is underlined by researchers, mentoring of preservice early childhood teachers is undertaken by classroom teachers who may not have the necessary skills to support preservice teachers in regard to ST (Murray et al., 2011). That is why, the findings of the current study suggested that mentoring and/or teaching practicum programs of preservice early childhood teachers could be modified based on the mentor teacher's important roles on preservice teachers' ST skills. Moreover, Murphy et al. (2007) suggested in their study that primary science teacher education programs need to develop new primary teachers' confidence and effective ST. Similarly, the findings of the current study suggested that early childhood teacher education programs could be redesigned in regards to their teaching practicum experiences and science classes regarding ST in early childhood classroom. In addition, modifications of teaching practices should address each mentoring practice of mentor teachers such as modeling, feedback, pedagogical knowledge, and system requirement.

This study focused on mentor teachers' mentoring practices in ST through the perspective of preservice early childhood teachers' views in early childhood classrooms. Future studies, could use similar mentoring practices for investigating other subjects which are taught in early childhood education (mathematics, language-arts, music, etc.). This could help to improve mentoring programs for preservice early childhood teachers'. In addition, mentor teachers may need training through in-service programs on how they can better give mentoring experiences based on the mentoring practices on the pedagogical knowledge, system requirement, personal attributes, modeling and feedback. This could be beneficial for preparing future early childhood teachers.

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