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A Mixed-Method Examination of Early Childhood Teachers' Pedagogical Competency Profile

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Abstract

Teacher competency is a key research area because of the strong link between child development and the quality of early childhood education. This study aims to examine early childhood teachers' self-reported pedagogical competency profiles and to determine the factors affecting their profiles. To reach that aim, a mixed-method study was designed as an explanatory sequential design. The participants comprised 290 early childhood teachers for the quantitative portion and 15 for the qualitative. The Early Childhood Teachers Competencies Assessment Rubric and an interview form, both developed and proved valid and reliable by researchers, were used. Two-step cluster analysis and inductive content analysis approaches were used to analyze the data. Some important findings are as follows: the teachers were grouped into high-, mid-, and low-competence clusters based mainly on the differences in the areas of instructional technology and educational planning competency. As the teachers indicated, social and individual factors determine their competency profiles. Furthermore, the teachers explained about their ongoing professional development endeavors to improve their competency profiles. The results of the study are discussed in detail, and suggestions are presented for planners/practitioners of teacher professional development programs, curriculum developers and faculty members at higher education institutions, and policymakers at the national and international levels in the hard way to reach out to more qualified early childhood education.

Keywords: Early childhood education, teacher competency, competency assessment, competency profile, analytical rubric

Introduction

An extensive number of studies have been dedicated to exploring the benefits and importance of early childhood education (ECE) for young children's development. The results of these long-term and cross-sectional studies have emphasized that high-quality ECE results in long-term benefits for children (Bakken et al., 2017; Morris et al., 2014; Ramey & Ramey, 2004). Due to the critical importance of ECE, international initiatives have emphasized access to ECE services (European Commission [EC], 2011; United Nations, 2015). However, in addition to obtaining ECE services, the quality of such services is critical in achieving ECE's goals. Teachers obviously play an important role in child development, and one of the most important

aspects of providing high-quality ECE is teachers' pedagogical competency (Sheridan et al., 2011). In this sense, the belief that high-quality ECE depends on teachers' competency is increasingly accepted by policymakers, scholars, and international organizations (Nasiopoulou et al., 2021; Organization for Economic Co-operation and Development [OECD], 2005a, 2017, 2018; Sheridan, 2007; Urban et al., 2011).

Early Childhood Teachers' Pedagogical Competencies

The crucial importance of ECE has resulted in the establishment of predetermined sets of competencies for early childhood teachers (ECTs), including stricter standards for their training and education (EC, 2014; Hu et al., 2018; Sheridan, 2007; Sheridan et al., 2011). Competency is described as the ability one has to do a job successfully, function well, or undertake any given role or position by using knowledge, skills, abilities, behaviors, and individual traits (OECD, 2005a). Crick (2008) provides a more comprehensive description: a comprehensive fusion of knowledge, skills, comprehension, beliefs, attitudes, and motivations that result in efficient, embodied human behavior in the environment, in a specific domain (p. 313). Also, teacher competency can be defined as "an integrated combination of human traits, knowledge, skills, and attitudes that are needed for effective performance in various educational contexts" (Stoof et al., 2002). Furthermore, some researchers emphasize that teachers should possess competencies including a comprehensive knowledge base; the capacity for building strong bonds with others; verbal skills; and a variety of classroom management, evaluation, teaching, and collaboration skills (Brown et al., 2008; Looney, 2011; Nasiopoulou et al., 2021; O'Flaherty & Beal, 2018; Yoshikawa et al., 2015). According to Harbin et al. (2005), competencies are also acknowledged as a standard or guide for certification or licensure and typically reflect "the qualifications and credentials needed" to perform a certain position, such as the tasks of teachers in early childhood education.

As these definitions demonstrate, competencies can be perceived differently; for that reason, some national and international attempts have been made to determine the scope of teacher competency. For instance, in the United States, the National Board for Professional Teaching Standards was established to reach consistency among the states (NBPTS, 2019) by setting some competency standards among different teacher training programs. For European countries, European Commission made a series of studies on teacher competency to set the European Competence Framework (EC, 2021) and to determine teachers' general and field specific competencies separated for eight disciplines (Tuning Project). OECD has undertaken another international effort examining teachers' competencies resulting in determining competencies under four levels: students, class, school, and parents and society (Schleicher, 2016, pp. 17–18). In the Turkish context, the Turkish Ministry of National Education (2017a, 2017b) has conducted comprehensive national studies on determining teachers' competencies.

There is a broad consensus on the need for professionalization; however, there is much less literature or consensus on the profile or the content of this profession (Bellm, 2008). Determining competencies properly contributes to establishing such a consensus. Therefore, both international reports and research can be cited as evidence of the need for more giving attention to teachers' competencies. For example, using data from the 2015 Programme for International Student Assessment (PISA), OECD (2018) presented some insights for effective teacher policy development. This report emphasized that teacher evaluation and pre- or in-service teacher education need to improve teachers' pedagogical quality for high-quality instruction (OECD, 2018). In addition, the European Commission (2021) and some in-depth studies (Nasiopoulou et al. 2021; Sheridan, 2007; Urban et al., 2011) highlight that teacher

competency is an important part of ECE quality. Some of these studies also indicate that teacher competencies are crucial for the effective use of curriculum and the proper implementation of educational innovations (Nasiopoulou et al. 2021; Sheridan, 2007). Although ECE documents repeatedly emphasize the importance of competencies, no wide consensus exists on pedagogical competency for teachers in international contexts. There is also widespread concern for the presence of staff with poor competency in ECE field (EC, 2014; OECD, 2005b). At this point, one of the crucial questions is what competencies an ECT should have. As a result of efforts to clarify this question, the core competencies for teachers have generally been determined as knowledge or/and skills, and they are categorized as curricular, pedagogical, and instrumental competencies referring to teaching practices (Lillvist et al., 2014; Sheridan, 2007; Vuorinen et al., 2014; Zaragoza et al., 2021). Moreover, the National Association for the Education of Young Children (NAEYC, 2019) released competencies including child development and learning in context, family partnership, child observation, documentation and assessment, developmentally/linguistically/culturally appropriate teaching practices, knowledge, implementation, and integration of academic discipline content in the early childhood curriculum. Similarly, OECD (2009) proposed some teacher competencies regarding their instruction, planning and preparation, classroom environment, and professional responsibilities. These efforts have resulted in determining competencies and competency areas and making some basic explanations. However, there is still a need to determine the levels of teachers' competency because there is a limited number of studies on the competency profiles of ECTs and the factors shaping them.

Measurement Issues

The need to determine ECTs' competency profiles requires the development of appropriate measurement tools. As Bergsmann et al. (2015) assert, existing evaluation instruments are not appropriate for assessing competency, which is more than simply an aggregate of knowledge, skills, and attitudes. Multidimensional features of competencies require a multifaceted approach to the assessment of their development and maintenance (Bashook, 2005). The literature review indicates that teachers' competency profiles have been evaluated via mostly numerous Likert-type scales and questionnaires (Arnon & Reichel, 2007; Aktas Turkec, 2012; Zaragoza et al., 2021). On the other hand, rubrics are conceived of as an innovative method for gathering evidence of competency development (Baryla et al., 2012; Reddya & Andradre, 2010). Such key reasons as legitimacy, affordability, and accountability make rubrics proper to be applied to assess competencies (Broad, 2003). There are also other specific reasons for rubrics to be used to determine teachers' competency profiles. For example, they provide a useful tool to assist teachers in becoming more qualified and create needs-based data to organize professional development programs (Schwartz et al., 2008) by giving diagnostic feedback for professional development (Song, 2006). Furthermore, rubrics can be used for self- or peer assessment as well as observational assessment (Jonsson & Svingby, 2007; Reddya & Andrade, 2010). Despite these benefits, a review of the literature revealed that no published rubrics addressed the determination of the competency profiles of ECTs. Several studies focus on the competency levels of teachers, but most of them are limited only to determining the competencies and emphasizing their importance (Lillvist et al., 2014; Lobman et al., 2005).

Aim of This Study

Various studies focusing on ECE quality show that there is a close relationship between teacher competency and child development (Brown et al. 2008; Pianta et al. 2005; Taylor et al., 2010). Hence, one recent focus area has been on teacher competency and its components. In particular,

teacher competency for pedagogical quality has been discussed in both reports and research papers so far. These discussions mostly focus on teacher competency, its importance, and what competencies are necessary for the quality of ECE. However, the need to determine the ECTs' competency profiles properly and to deeply analyze their opinions about developing their competency levels is still not satisfied. This study aims to examine ECTs' self-reported pedagogical competency profiles and to determine the factors affecting their profiles.

Method

Study Design

This study is a mixed-method study, which both generates more comprehensive knowledge needed to inform practice and boosts the study results' potential for generalization (Johnson & Onwuegbuzie, 2004). Among the mixed method designs, an explanatory sequential design was applied. In this design, quantitative and qualitative data are collected sequentially so that the qualitative process presents in-depth knowledge of quantitative findings (Creswell & Plano Clark, 2011).

Study Context

This study was conducted in Turkey, where the number of children enrolled in ECE has risen dramatically in recent years (OECD, 2017). In Turkey, there are two types of ECE institutions under the Turkish Ministry of National Education. First, there are independent preschools providing ECE to children aged from 36 to 72 months. Second, pre-primary classes for children aged from 48 to 72 months serve as preparatory classes within a primary school. In addition, preschool education for young children aged 0–3 months is carried out by daycare centers under the Ministry of Family and Social Policies (Göl-Güven, 2018). Independent preschools and the pre-primary classes implement the national preschool education curriculum, which has been in practice since 2013 (Turkish Ministry of National Education, 2013). The ECTs in Turkey are mostly graduates of educational faculties of universities. The undergraduate teacher training programs in Turkish universities have three types of knowledge categories: major area knowledge, professional teaching knowledge, and general culture (Hayırsever & Kalaycı, 2017). Major area knowledge and professional teaching knowledge focus on pedagogical knowledge and skills. These two knowledge categories specifically include applied and theoretical courses in the field of ECE, while the courses in the general culture category present contemporary and interdisciplinary perspectives for pre-service teachers.

Participants

For the **quantitative** part, the participants consisted of 290 ECTs working in various preschool education institutions in Turkey selected via simple random sampling. The participants were 89.7% female and 10.3% male. Their age ranged from 22 to 51 (M = 29.7, SD = 6.24). The teachers were working in two types of schools: independent preschools (45.9%) and pre-primary classes of elementary schools (54.1%). Almost all of the teachers have a bachelor's degree (97.7%), while a few have an associate or master's degree (2.3%). Their teaching experience also ranged from 1 to 30 years (M = 6.26, SD = 6.11).

For the **qualitative** part, the study group included 15 ECTs selected using a maximum variation, which is one of the purposeful sampling methods. The maximum variation sampling method was used to determine a study group by determining key dimensions of variations

(Patton, 2014). These teachers were selected based on the quantitative analysis so that they represented each cluster. The teachers were told about the qualitative part of the study in advance via the quantitative data collection instrument, and they were kindly asked to send their email addresses if they were willing to conduct interviews. An email was issued to the teachers who had volunteered for the interview after the cluster-based analysis indicated three clusters among the 290 ECTs in the quantitative section. Only 24 teachers accepted the invitation to participate in the interviews. Among them, 18 teachers, 6 from each cluster, were determined based on the cluster-based analysis findings. After completing all of the necessary preparations for the interviews, two of them decided not to participate. As a result, the researchers opted to eliminate one additional teacher from the interview procedure and conducted interviews with five teachers from each cluster. Online interviews with 15 teachers, 5 from each cluster, were conducted at the conclusion of the procedure. Three of the interviewed teachers were male, and the rest were female. They were working in two types of schools: independent preschools (seven participants) and pre-primary classes of elementary schools (eight participants). All have a bachelor's degree with experience ranging from 2 to 21 years.

Data Collection Method, Tools, and Process

In this mixed-method study, for the quantitative part, the data collection method was online survey. Furthermore, the qualitative data was collected via online interviews conducted synchronously (in real time) involving audio and video exchanges (James & Busher, 2009). For both parts, online research methods were preferred because their use in social science research has enabled researchers to communicate with geographically dispersed teachers (James & Busher, 2009) to collect large amounts of data efficiently, economically, and within relatively short time frames (Regmi et al., 2016). In this data collection process, the researchers developed and applied two different data collection tools.

Tool 1: The Early Childhood Teacher Competencies Assessment Rubric (ECTCAR)
ECTCAR is an analytic rubric designed for determining ECTs' competency profiles (see Appendix A). The rubric includes nine competency areas: A. Developmental Domains, B. Educational Planning, C. Academic Content Areas, D. Instruction, E. Instructional Technology, F. Learning Environments, G. Classroom Management, H. Assessment and Evaluation, and I. Family Involvement. There are seven competencies in Competency Area C, five in Competency Areas A and D, four in Competency Area B, and three in Competency Area D, for a total of 36 competencies that are accepted as performance criteria (PC). There are five levels of performance descriptions (PD) for each performance criteria, indicating the levels of competency as illustrated in Table 1.

The rubric was developed in a step-by-step process based on various sources (Airasian, 2001; Mertler, 2001; Montgomery, 2000; Nitko, 2001; Popham, 1997). The six steps for developing the measurement tool are explained in detail below.

Step 1. *Deciding the type of rubric:* In our study, the analytic rubric type was preferred for the following reasons. First, we aimed to assess the teachers' competency levels separately and determine summed total scores for each competency area to analyze the multidimensional levels of teachers' competencies. Second, there are more than one acceptable response for each competency area in our study, and we wanted to get a focused type of response (Mertler, 2001; Nitko, 2001).

Step 2. *Identifying competencies as performance criteria and competency areas:* We examined the literature on the competencies of ECTs (Lillvist et al. 2014; Sheridan, 2007; Vuorinen et. al. 2014; Zaragoza et. al. 2021) and some of the related whitepapers prepared by the Turkish Ministry of National Education (MoNE) (2017b), the Early Childhood Advisory Group of West Virginia (ECAG) (2016), OECD (2009), NAEYC (2019), and the National Board of Professional Teaching Standards (NBPTS) (2020) and listed all the competencies mentioned there. After that, we grouped the common/related competencies into themes, namely, the competency areas. For example, the competencies such as *communicating with families and providing family involvement* (MoNE), *establishing and implementing policies and practices that engage families in meaningful decision-making opportunities for their child and the program* (ECAG), and *maintaining confidentiality between the program and the child's family regarding each child's observation and assessment* (NBPTS) were listed under the **family involvement** competency area. After determining the competency areas, we examined each competency again to prepare Performance Criteria. In this second examination of the competency area list, the overlapping competencies, the nation-specific ones, and the repeated ones were dismissed. Finally, the rest of the competencies were included in the rubric.

Step 3. *Structuring competencies as performance criteria:* After determining competency areas and deciding which competencies would be included in the rubric, we examined and rewrote them in terms suitable with competency writing models like SMART (Doran, 1981) and POWER (Day & Tosey, 2011). To make the competencies SMART (**S**pecific, **M**easurable, **A**ttainable, **R**ealistic and **T**ime-bound) and POWERful (**P**ositive outcome, **O**wn role, **W**hat task (with dates), **E**vidence of accomplishment, and **R**elationships related), all the criteria except for criteria related to time/date were accomplished for each competency.

Step 4. *Setting performance levels:* In determining the performance levels, we examined the related literature on taxonomies of learning, such as Bloom (1956), Gagné (1985), and some other frameworks constructed by international agencies (BIM Framework, EU Customs Competency Framework, UNESCO Competency Framework). After that, we determined five competency levels, which is among the appropriate levels described as three to six by Wolf and Stevens (2007). If the teachers indicate a total lack of related competency, they are coded as *not competent*, and the performance levels are coded as *novice, developing, accomplished,* and *advanced*. These levels of competency are *knowledge, comprehension, implementation,* and *analysis-reflection*, respectively. Based on these levels, we determined the performance levels of teachers, and it is expected for teachers to be at the *accomplished* level or above because teaching is an implementation-oriented profession.

Each level of performance description covers the performances of the previous grade(s). For example, choosing PL-C means that the teacher shows PL-A and PL-B of the same competencies but does not yet display PL-D. In other words, to regard a teacher as an accomplished teacher in terms of the related competency, that teacher should perform at the previous level(s) of performance. The performance levels are explained in detail in Table 1.

Table 1. *Performance Levels, Codes, and Their Meanings*

Performance Levels	Codes	Meanings
PL-0	Not competent	I am not able to perform that performance criterion.
PL-A	Novice	I have only knowledge related to competency.
PL-B	Developing	I am able to design plans/programs to implement knowledge related to competency.
PL-C	Accomplished	I am able to implement the plans/programs I have designed to put the knowledge related to competency into practice.
PL-D	Advanced	I am able to evaluate the plans/programs that designed and implemented in order to put the knowledge related to the competency into practice and I am able to consider the evaluation results while designing the next plans/programs.

Step 5. *Creating performance descriptions:* The more parallel the descriptions are in form and content, the more dependable and efficient the rubric scoring will be (Wolf & Stevens, 2007). To reach parallelism and consistency and hence improve the efficiency of scoring in our study, we created all the performance descriptions in a cautious process based on the SMART (Doran, 1981) and POWER (Day & Tosey, 2011) models, as in the structuring competencies process. Because the performance descriptions are prepared as different levels of competencies, it is important for them to be in the same line with the competencies, which are included as performance criteria in the rubric.

Step 6. *Taking care to support the validity and reliability levels of the rubric:* To ensure reliability, validity, and usability of rubrics, Banerjee et al. (2015) recommend regular monitoring and modification of rubrics . In our study, as explained above in detail, believing that the rubric development process is never over but always evolving (Balch et al., 2016), it has taken more than 10 months. During that period, we have tried to ensure validity and reliability for the analytic rubric as described in detail below.

Validity and Reliability of the Early Childhood Teachers Competencies Assessment Rubric

Validity of the Rubric
We carried out six steps to ensure the face, construct, and content validity of the rubric in this study. Ensuring the validity contributes to the comprehensibility of the measuring tool by the target audience, the generalizability of the results, and the relevance of the content (Gearhart et al., 1995; Gehlbach & Brinkworth, 2011; Hardesty & Bearden, 2004; Messick, 1996).

In the *first* step, we conducted the in-depth literature review, as explained in detail in the data collection tool section. As the *second* step, we presented the rubric online to three experts who have doctoral degrees in early childhood education and made changes in line with their feedback. Then, we held a two-hour face-to-face interview about the rubric with one expert who is a professor in curriculum and instruction and studying teacher competencies. Regarding the modifications proposed in this interview, the two researchers came together to discuss and made the necessary adjustments. In the *third* step, we held three different sessions of focus group interviews with pre-service teachers of ECE. Eighteen pre-service teachers in total participated in these focus group interviews. The questions in these interviews were about the

content and face validity. This also provided a detailed examination of the rubric by the pre-service teachers. During the *fourth* step, after modifications to increase validity, we held a one-and-a-half-hour face-to-face interview with another expert who is a professor in ECE. Following these steps, the two researchers came together again to make the necessary adjustments and to construct the final version of the rubric.

In the *fifth* step, the final version of the rubric was presented in an expert panel conducted with field experts and experienced teachers (n = 14). Three field experts have doctoral degrees in early childhood education, and four field experts have doctoral degrees in curriculum and instruction working in the field of teacher competencies. The teachers attending the expert panel have teaching experience between 15 and 27 years. The field experts' and teachers' opinions at this last stage were obtained through the expert opinion form shaping around content and face validity. With the expert opinion form, we aimed to determine "the item level content validity" (I-LCV) with certain criteria (Polit & Beck, 2006). These criteria are as follows: (i) clarity of the item, (ii) its suitability for the related competency area, (iii) its importance for the related competency area, (iv) its comprehensibility for in- or pre-service teachers, (v) its importance for in- or pre-service teachers, and (vi) the suitability of the whole rubric for the purpose it wants to measure. In addition, the expert panel evaluated the clarity of the indicator levels of the competencies and whether they are suitable for the competency item. We conducted Fleiss kappa analysis to determine the consistency between both field experts' and teachers' opinions. According to Landis and Koch's (1977) interpretation of kappa values, both teachers (k = 0.93) and experts (k = 0.85) have almost perfect agreement on I-LCV. We also assumed that this step is important for utility of rubric.

In the *last* step, to ensure construct validity, we examined the *utility for informing instruction* of our rubric like in the study by Gearhart et al. (1995) focusing on developing a rubric. In their study, Gearhart et al. (1995) assumed that it should be sensitive to competency development, so they tested whether their rubric could reflect the changes across grade levels. The studies on teacher competencies have already shown that pre- and in-service teacher education efforts positively affect teachers' competency development (Barenthien et al., 2020; Lindmeier et al., 2020; Tondeur et al., 2018). These studies support the view that as the grades of pre-service teachers increase, their competency will increase, too. Based on these explanations, we assumed that our rubric was sensitive to competency development. Therefore, we tested whether the rubric could manage to reveal the development in competency levels of the pre-service teachers in different grades. To accomplish this, we decided to perform analysis of variance. For this analysis, the rubric was first completed by sophomores, juniors, and seniors enrolled in the early childhood education program of an educational department. We then ran the analysis of variance to understand competency development. As seen in Table 2 below, the results revealed that the levels of competency increased in parallel with the grade level.

Table 2. *Descriptive Statistics and Analysis of Variance Results for Competency Differences in Grade Levels*

Competency areas	Sophomores (n=45)		Juniors (n=58)		Seniors (n=38)		p	Alpha
	M	Ss	M	Ss	M	Ss		
Developmental domains	3.52	0.88	3.74	0.85	4.46	0.62	0.000***	0.91
Educational planning	2.81	0.90	2.85	1.00	3.80	0.83	0.000***	0.80
Academic content areas	3.51	0.85	3.77	0.80	4.41	0.63	0.000***	0.91
Instruction	3.62	0.89	3.83	0.86	4.30	0.63	0.001**	0.87
Instructional technology	3.17	1.04	3.12	1.05	3.57	1.09	0.111*	0.76
Learning environment	3.68	0.98	3.78	0.98	4.50	0.58	0.000***	0.81
Classroom management	3.69	1.03	3.87	0.88	4.56	0.59	0.000***	0.87
Assessment & evaluation	3.85	0.96	3.85	0.85	4.48	0.50	0.000***	0.80
Family involvement	3.57	1.08	3.73	0.92	4.35	0.73	0.001***	0.86

*p > .05, **p < .05, ***p < .001

The analysis of variance results for all the competency areas are as follows: $F(2, 141) = 15.281$, $p < 0.001$, $\eta^2 = 0.18$ for developmental domains; $F(2, 141) = 14.928$, $p < 0.001$, $\eta^2 = 0.17$ for educational planning; $F(2, 141) = 14.586$, $p < 0.001$, $\eta^2 = 0.18$ for academic content areas; $F(2, 141) = 7.362$, $p < 0.05$, $\eta^2 = 0.09$ for instruction; $F(2, 141) = 2.233$, $p > 0.05$, $\eta^2 = 0.03$ for instructional technology; $F(2, 141) = 10.039$, $p < 0.001$, $\eta^2 = 0.12$ for learning environment; $F(2,141) = 11.195$, $p < 0.001$, $\eta^2 = 0.14$ for classroom management; $F(2, 141) = 8.250$, $p < 0.001$, $\eta^2 = 0.10$ for assessment & evaluation; and $F(2, 141) = 7.805$, $p < 0.05$, $\eta^2 = 0.10$ for family involvement. The results showed that the rubric manages to reveal the progress in competency areas, proving the generalizability aspect of construct validity (Jonsson & Svingby, 2007).

Reliability of the Rubric

One "major threat to rubric reliability is the lack of consistency of an individual marker" (Brown et al., 1997, p. 235). For that reason, we examined reliability in our study via the consensus agreement and consistency estimates. The independent rater scoring system provides data to be used in some of the most common ways for rubric reliability tests like the exact agreement percentage, Cohen's Kappa, and correlation (Jonsson & Svingby, 2007). In the current study, similarly, we conducted the independent rater scoring system, and school principals (n = 5) and assistant principals (n = 5) were determined as the raters who assessed the teachers' competency via the rubric. The assessed teachers were ones whom the raters had worked with for a long time. This was crucial because otherwise, the evaluators' scores for the teachers would not be realistic due to performance evaluations containing long-term information rather than instant information. We gave information to the raters about the main idea of the rubric by showing how to use this rubric with a trial form. These raters independently assessed the teachers in terms of their competencies. The independent raters assessed 49 teachers in total (Table 3).

Reliability results indicated that the percentage of exact agreement between two independent raters ranged from excellent (97.11%) to moderate (68.06%). Besides, the kappa values ranged from weak (k = .47 for P-3) to almost perfect agreement (k = .94 for P-5) between raters. For the consistency estimates, the alpha coefficients ranged from .51 to .99, with most values above acceptable level (α = .70).

Table 3. *Inter-Rater Reliability Scores for the ECTECAR*

Pairs	Assessed Teachers (n)	% of Exact Agreement	Kappa	Alpha
P-1	14	71.69	0.65	0.51
P-2	4	68.06	0.60	0.75
P-3	12	61.11	0.47	0.76
P-4	9	74.19	0.60	0.90
P-5	10	97.11	0.94	0.99

Tool 2: Early Childhood Teachers Competencies Interview Form
The Early Childhood Teachers Competencies Interview Form (ECTCIF), the second data collection tool, was designed as a semi-structured interview form to allow for in-depth probing and expansion of the questioned teachers' responses (Rubin & Rubin, 2005, p. 88). The primary aim of this tool was to learn more about the factors that influence teachers' competency profiles. To reach this aim, the interview form is preceded by a demographics section, which collects information such as gender, age, educational background, experience (in years), and school types they work in. Following the demographics section, there are five questions and several probe questions or suggestions to guide or lead the interviewer to provide further details. The interview begins with a series of "easy" questions designed to make the interviewee feel more comfortable and familiarize them with the topic of the interview (McGrath et al., 2019). In our study, such questions assisted teachers in recalling their replies in the ECTCAR rubric. After the interviewer listed all the competency areas to remind the interviewed teachers, he asked them, "In which competency area do you feel high/mid/low competent? Could you explain the reasons of your thoughts?" Then, he followed the process via other specific interview questions like, "What are the factors that you feel more or less competent in such areas as … ?", and, "When you think you are less competent in some areas, what do you do to improve yourself in this specific area?"

The following precautions were taken to increase the content and face validity of the interview form. These interview questions were produced using items from the ECTCAR, the first data collection tool, which was developed through a prolonged and comprehensive process and confirmed to be valid and reliable using proper methods. Three experts' opinions on the instruments were sought once the first draft question list was completed. They were the same scholars, two of the experts in the field of ECE and one expert in the field of curriculum, who assessed the ECTCAR in terms of validity. Therefore, they were able to compare the rubric with the form and give feedback and suggestions to help improve the instruments' overall design (Yıldırım & Şimşek, 2016). Thanks to the expert opinion process, some questions were expanded, including the reminder information about ECTCAR and one more question related to motivation of teachers to improve their competency levels was included.

Data Collection Process

After the measurement tool was ready, we prepared an online rubric form and then sent a link to the teachers, so that the quantitative data were collected from January to March 2021. After the quantitative data were analyzed, online interviews were held with the 15 volunteer teachers. One of the researchers conducted the interviews in the last two weeks of March 2021. Each interview of the teachers lasted 30–50 minutes. Because all of the interviewees volunteered to be involved in the interview, they permitted recording the interviews.

To use the measurement tool, namely the rubric, and to conduct interviews, necessary permission was obtained from the Ministry of National Education of Turkey. Then, the ethics committee approval was obtained from a state university.

Data Analysis

In the quantitative data analysis of the competency profiles of ECTs, we tried to reveal how many natural clusters were in the sample in terms of their competencies. To accomplish this, we used a two-step cluster analysis procedure due to its robustness for dividing a sample into natural clusters. With the two-step clustering procedure, individuals with similar characteristics in analytical samples are placed within the same cluster that would otherwise not be apparent. Two-step cluster analysis creates clusters for common individuals with the Log-likelihood distance measure. In addition, since it is not known how many clusters the data set is divided into as preliminary information, the two-step clustering method was preferred. The Bayesian Information Criterion (BIC) was used to determine how many subsets the participants should ideally be divided into. Case of order is a factor that may be effective in cluster analysis (Hair et al., 2014). To control ordering effects and to provide the stability of the final solution, the analysis was repeated by randomly ordering in different ways such as ascending and descending. The analysis was carried out with teachers' levels of competency in nine competency areas in the rubric, and then the clusters' competencies were examined more specifically by using the cluster membership information. Last, we performed the chi-square analysis to determine if there is any relationship between teachers' demographic characteristics and their cluster membership.

In the qualitative data analysis carried out to determine the factors shaping the competency profiles of ECTs, we applied the inductive content analysis technique (Patton, 2014). In inductive content analysis, the meaning units are created based on the statements of the participants and then codes or themes are determined (Zhang & Wildemuth, 2009). In the current study, first, the interviews were transcribed directly. Then, the teachers' opinions in each data set were discussed in detail, and the researchers created the codes and themes in consensus. The findings were deduced based on the study's aim and illustrated in tables.

To support validity and reliability, data collection and analysis processes were elaborated, and the findings were supported via direct quotations. The recordings were sent back to three randomly selected participants so that member check was ensured. To ensure confirmability, two researchers first coded 25% of the data separately. Then, the meeting with the focus of inter-coder reliability revealed there was minor variation of codes and themes determined by the researchers, so consensus was reached. After one of the researchers coded the rest of the data, in a second meeting, they analyzed and reached consensus for all the qualitative findings. Additionally, all data was stored in order to maintain confirmability.

Findings

Quantitative Analysis

Descriptive Analysis
Table 4 shows the findings of the descriptive analysis.

Table 4. *Percentages of Teachers' Competency Levels in the Competency Areas*

Competency Areas	Competency Levels (%)				
	Not competent	Novice	Developing	Accomplished	Advanced
Developmental domains	-	1.4	10	31.1	57.4
Educational planning	1.0	9.3	24.2	25.3	40.1
Academic content areas	-	2.4	6.6	31.1	59.9
Instruction	-	0.7	6.6	37.7	55
Instructional technology	1.4	5.5	18.7	28.4	46.0
Learning environment	-	1.7	12.1	21.8	64.4
Classroom management	-	0.7	7.3	18.3	73.7
Assessment & evaluation	-	0.3	6.6	26.6	66.4
Family involvement	-	2.8	6.9	28	62.3

Table 4 shows that in all competency areas, most of the teachers rated themselves advanced, while only a few of them regarded themselves novice in all areas and not competent in only two areas. The highest rate was in the classroom management competency area, in which 73.7% of the teachers rated themselves as advanced. On the other hand, 37.7% of the teachers rated themselves as accomplished in the instruction competency area, which is the highest rate for that level. For the developing and novice levels, the highest numbers (24.2% and 9.3%) belong to educational planning. Although the novice level in all competency areas was low for all participants, the educational planning and instructional technology competency areas were slightly higher than other areas. The very small percentage of not competent for the educational planning and instructional technology competency areas are notable, while no teachers rated themselves as not competent in the other competency areas. In summary, Table 4 shows that teachers rated themselves mostly as accomplished and advanced levels as expected, while the not competent and novice levels were least rated by the teachers.

Two-Step Cluster Analysis
To form natural clusters according to the similarity of the participants, two-step clustering analysis was performed. Before the analysis, the total participants were randomly divided into two equal parts, two-step cluster analysis was applied to both halves, and the number of clusters obtained from the total sample was obtained. Further, the viability of a similar result in a full sample was examined. The Mann-Whitney U test showed that there was no significant difference between subsets on cluster variables (p > .01). The two-step cluster analysis process

automatically revealed three clusters for teachers, namely, high-competent, mid-competent, and low-competent. To explain the competency profiles of the clusters, we first gave information about the percentage of teachers' performance levels in each competency area and then emphasized the significant differences in performance levels of some specific competencies in the competency areas.

Table 5. *Cluster Distribution*

Clusters	Number N	Percentage %
High-competence	137	47.4
Mid-competence	99	33.9
Low-competence	54	18.7
Total	290	100

The high-competence cluster. This cluster included 47.4% of the total participants, who regarded themselves as advanced in each competency area. As Figure 1 shows, almost all of the teachers in this cluster assessed themselves at the advanced level in terms of classroom management (94.2%), assessment and evaluation (92.7%), and learning environment (92.7%). None of the members of this cluster assessed themselves as novice or developing in any competency areas, including developmental domains, academic content areas, instruction, and assessment and evaluation. In this cluster, the rate of teachers who assessed themselves at the advanced level decreased only in the educational planning (75.2%) and instructional technology (79.6%) competency areas. Very few teachers in these competency areas rated themselves as novice or developing. However, this rate is still not at a significant level.
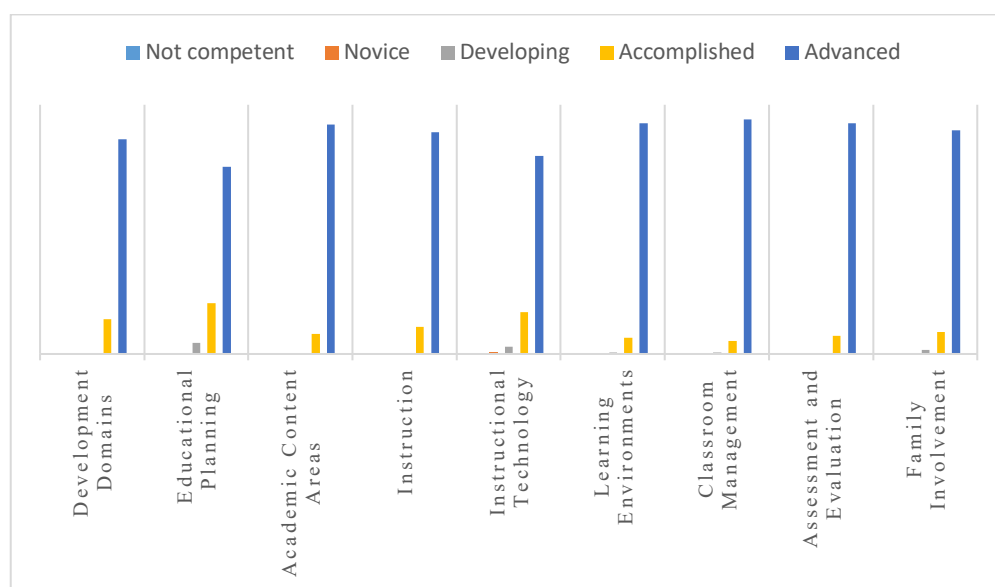

Figure 1. *The performance levels of the high-competence cluster in the competency areas*

The mid-competence cluster. This cluster included 33.9% of the total participants. Figure 2 shows that the rate of teachers who assessed themselves as advanced decreased in this cluster compared to the high-competent cluster. Figure 2 also shows that nearly four-fifths (81.6%) of the teachers in this cluster rated themselves as advanced in the classroom management competency area. These rates decreased for competency areas including developmental domains, educational planning, academic content areas, instruction, learning environment,

assessment and evaluation, and family involvement, and there was generally an increase in the rates of the accomplished level. Moreover, the rate of teachers who rated themselves at the levels of novice and developing in educational planning and instructional technology competency areas increased. Examining the findings of the educational planning competency area were examined in detail revealed that the teachers in this cluster considered themselves low-competent in such competencies as implementing individualized education programs for children with disabilities and including these children in the education process. The rate of teachers assessing themselves at the level of *not competent* (31.6%) in implementing individualized education programs for children with disabilities especially increased. Regarding this competency area, 17.3% of the teachers stated that they are at the level of *novice* and 25.5% of teachers in this cluster are at the level of *developing*. Similarly, 18.4% of the teachers rated themselves as *low competent* in the competency of including children with disabilities in the education process. Furthermore, in terms of instructional technology, 18.4% of the teachers in this cluster assessed themselves as *low competent* in the competency of using electronic content (video, presentation, animation, sound file, etc.) for online education; 9.2% of the teachers stated that they were at the level of *novice* and 15.3% of teachers stated that they were at the level of *developing* at the same competency area.
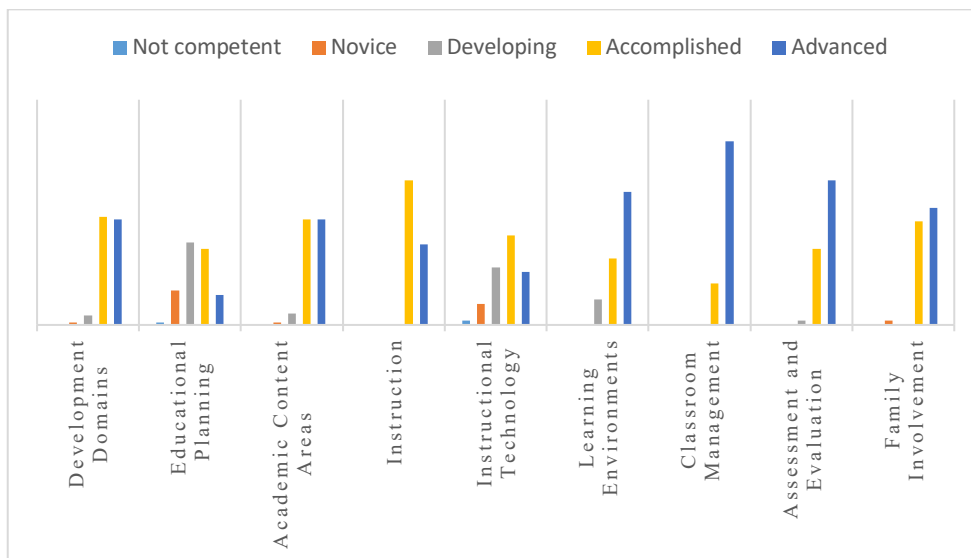

Figure 2. *The performance levels of the mid-competence cluster in the competency areas*

The low-competence cluster. This cluster included 18.7% of the total participants. In this cluster, there was a significant decrease in the rate of teachers who were at the advanced level compared to the other clusters, while the levels of novice and developing teachers increased, as Figure 3 shows. The rate of teachers who assess themselves at the *developing* level in competency areas including developmental domains (46%), educational planning (51.9%), and instructional technology (46.3%) was higher than in other clusters. Similarly, there were increasing rates for those who assess themselves at the level of *novice* in competency areas including educational planning (22.2%), academic content areas (11.1%), instructional technology (11.1%), learning environment (9.3%), and family involvement (11.1%). Findings related to the competencies of developmental domains showed that 11.1% of teachers were at the *novice* level, and 33.3% were at the *developing* level with regard to the competency of supporting the physical development of children. In supporting social-emotional development, 11.1% of the teachers were at the level of *novice* and 37% were at the level of *developing*. In addition, almost half of the teachers in this cluster rated themselves at the level of *developing*

(44.4%) in the competency to support children's cognitive development. This rate is near to the level of *developing* in the competency to support children's language development (46.3%).

Findings related to the educational planning competency area showed that 24.1% of the teachers were at the level of *novice* and 42.6% of teachers were at the level of *developing* with regard to the competency of planning the daily education process. 51.9% of the teachers stated that they were at the level of *developing* and 16.7% of teachers were at the level of *novice* in the planning of the monthly education process. The teachers mostly rated themselves as *not competent* (24.1%), *novice* (24.1%), and *developing* (22.1%) in implementing individualized education programs for children with disabilities. Similarly, the teachers in this cluster rated themselves as *not competent* (20.4%), *novice* (14.8%), and *developing* (42.6%) in the competency of including children with disabilities in the education process, which shows that teachers in this cluster have moved away from the accomplished and advanced levels.

Moreover, the teachers rated themselves as *novice* (16.7%) and *developing* (37%) regarding the competency of supporting children's development through online education. In using electronic content in online education, teachers rated themselves in the *not competent* (14.8%), *novice* (9.3%), and *developing* (33.3%) level. In addition, the teachers in this cluster stated that they are at the level of *developing* (40.7%) and *novice* (9.3%) regarding the competency to support the development of children by using different teaching technologies. None of the teachers stated that they are at the level of *advanced* regarding this competency.

Teachers in this cluster also rated themselves as incompetent in the learning environments competency area compared to other clusters. They assessed themselves as *novice* (14.8%) and *developing* (38.9%) regarding the competency of creating an educational environment where children feel safe. Teachers rated themselves as *novice* (18.5%) and *developing* (35.2%) regarding the competency of using an out-of-school learning environment effectively. None of the teachers chose the level of *accomplished* or *advance* related to this competency. The members of this cluster rated themselves as *novice* (22.2%) and *developing* (29.6%) regarding the competency of guiding families to support the development of their children.
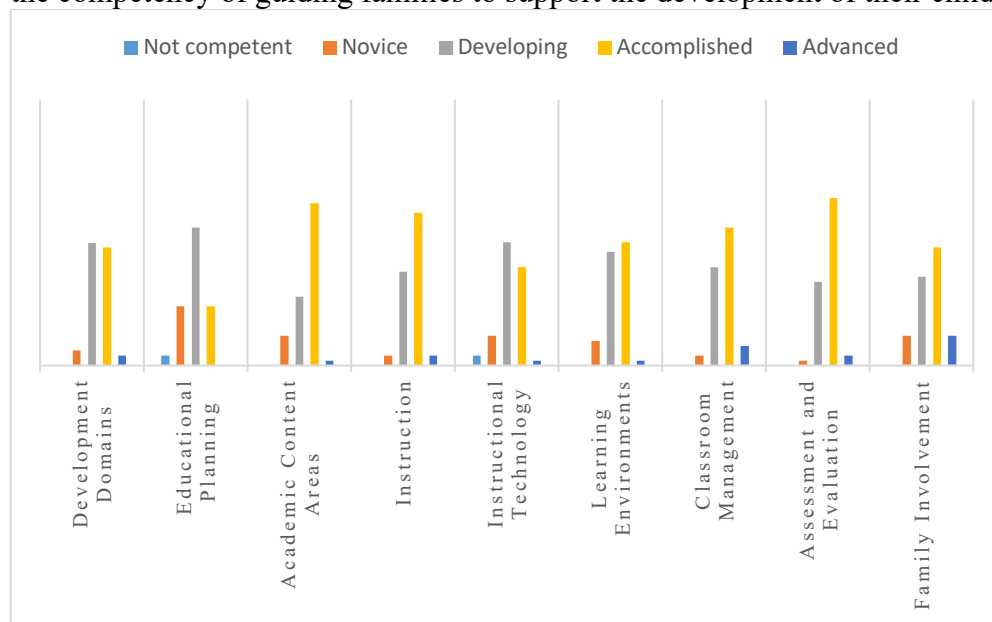

Figure 3. *The performance levels of the low-competent cluster in the competency areas*

The Relationship between Demographic Characteristics and Group Membership

Another focus point for us was to find out if there was a relationship between teachers' demographic characteristics and group membership. For this, we used chi-square analysis. The demographic characteristics included in the analysis were the teachers' gender, teaching experience, and their working institutions. The analysis revealed that there were no observed differences between teachers' gender (χ^2(2, 290) = 0.708, p=0.48), their teaching experience (χ^2(2, 290) = 0.179, p = 0.91), their working institutions (χ^2(2, 290) = 1.745, p = 0.17), and group membership.

Qualitative Analysis

Teachers' Opinions About Factors Shaping/Improving Their Competency Profiles

The qualitative findings of the study are illustrated in Tables 6 and 7 below, and we then examine them in detail based on the clusters revealed via qualitative analysis.

Table 6. *Factors Shaping the Early Childhood Teachers' Competency Profiles*

Factors	Positive (f)			Negative (f)		
	High	Mid	Low	High	Mid	Low
Working environment	14	-	-	-	2	4
Personal characteristics	7	10	3	-	1	4
Undergraduate education	4	4	4	9	9	8
Professional experience	6	7	2	1	1	3

Table 6 shows the characteristics that influence their competency profiles and identifies four primary domains. The teachers sometimes mentioned these factors as having a positive or negative impact on their competency profiles. Table 6 also shows that some aspects, such as the working environment and personal characteristics, were consistently seen as favorable by high-competence teachers. Furthermore, teachers perceived undergraduate education more negatively than positively. More detailed explanations are made based on the clusters below.

After finding out the factors shaping the teachers' competencies for each cluster, we asked the teachers about their self-improvement efforts toward becoming more competent teachers. Table 7 shows their explanations and the frequency levels.

Table 7. *Techniques/Methods Carried Out by the Early Childhood Teachers to Improve Their Competency Profiles*

Improvement Techniques/Methods	Clusters (f)		
	High	Mid	Low
Individual learning endeavors	8	8	2
Expert/colleague/friend support	6	2	1
Formal pieces of training	4	4	3

As Table 7 shows, the improvement techniques and methods were grouped into three categories, and all the teachers emphasized all of them with different frequency levels. Below are more detailed explanations based on the clusters.

The high-competence cluster. The teachers in the high-competent cluster explained that such factors as working environment, personal characteristics, undergraduate education, and professional experience have shaped their competency profiles. They indicated the contributions of their working environment more frequently and elaborated them by mentioning *school administration support* and *their encouraging expectations, colleague support,* and *sufficient physical facilities in classrooms.* Some teachers in this cluster explained the positive effect as follows:

> *"Since my school administration supports me and provides necessary teaching materials, I feel more competent."* **(HC-T1)**

> *"When I have a problem in the class, the closest people are my colleagues. When you collaborate to solve that problem, you, both, get more competent."* **(HC-T2)**

The high-competence teachers also mentioned that their personal characteristics contributed to their competency profiles. Characteristics such as strong communication skills, the ability to empathize, loving children or the profession, and a desire to succeed positively shaped their competency profiles. The high-competent teachers especially emphasized the positive effects of their desire to succeed using statements such as, "I get happy when I succeed, I improve myself" **(HC-T3).**

Furthermore, the teachers in the high-competence cluster indicated that their professional experience and their undergraduate education affected their competency profiles both positively and negatively. However, they especially emphasized the negative effects of their undergraduate education. They specified such negative factors as theoretical or not practice-based courses, inappropriate course content in terms of children's age group, lack of some courses focusing on instructional technology, special education, and more. To them, the internship, an important part of undergraduate education, was too short and inefficient. They explained the negative effects of undergraduate education in comments such as, "Some courses at the university are not specified to the children's age groups" **(HC-T3).**

Furthermore, as Table 7 illustrates, the teachers in this cluster explained the ways to support themselves in being more competent teachers based on individual learning endeavors, expert/colleague/friend support, and formal pieces of training. They frequently indicated that they tried to improve their competencies via such activities as research on the internet, making

use of social media accounts, making self-evaluations, going through trial-and-error processes. One teacher explained it as follows: "I'm doing research online. I even learn the activities in different branches and adapt them to their own group" **(HC-T3).**

The teachers also mentioned that they received support from experienced teachers, academicians at nearby universities, school administrators, colleagues, or friends to improve their competencies. One of the teachers in the high-competence cluster explained the importance of such support:

> *"I try every way to improve myself. I read a book. I watch videos. Once I even asked the faculty members in my neighborhood. But most importantly, I consult my friends. My friends who have experienced and solved similar problems always give the most practical information." (HC-T4)*

Finally, the teachers occasionally explained that they tried to improve their competencies by participating in formal training such as in-service training and seminars. Such formal training was the least frequently implemented technique or method. Thus, the findings indicate that teachers prefer informal ways to improve themselves. One of the teachers explained the reason why she could not attend formal trainings: "All projects are in big cities, but I can't participate due to family issues and COVID-19 epidemics. When it is online and it remains too theoretical, I do not prefer such training" **(HC-T5).**

The mid-competence cluster. The mid-competence teachers mentioned that their personal characteristics, professional experience, and undergraduate education have shaped their competency profiles. In contrast to the teachers in the high-competence cluster, they did point to the positive effects of their working environment on their competency profiles. Instead, they occasionally regarded it as a negative factor.

For the teachers in this cluster, characteristics like having strong communication skills, having the ability to empathize, loving children or the profession, being open to learning, and having a desire to succeed contributed to their competency profiles. Some teachers in this cluster stressed these factors as follows:

> *"I get happy when I succeed, and so that I can improve myself." (MC-T7)*

> *"I can easily communicate with children because I love them, which makes me more competent in my profession." (MC-T8)*

They also indicated that their professional experience and, last, their undergraduate education contributed to their competency profiles. On the other hand, they frequently explained the negative effects of their undergraduate education like the high-competence teachers. They elaborated the negative factors as theoretical/not practical-based courses, inappropriate course content in terms of children's age group, lack of some courses focusing on instructional technology, special education… etc. To them, the internship, an important part of undergraduate education, is very short and inefficient. One teacher explained the negative effects of his undergraduate education via such explanations: "Some courses were only theoretical. For example, we did not make any implementation about national days. Also, we did not do any role play about the first day of a child in a pre-school." **(MC-T9)**

Furthermore, as Table 7 illustrates, the teachers in this cluster named the following ways to support themselves in being more competent teachers: individual learning endeavors, formal pieces of training, and expert/colleague/friend support. Like the teachers in the high-

competence cluster, they more frequently indicated they have tried to improve their competencies by doing research on the internet, making use of social media accounts, making self-evaluations, going through trial-and-error processes, and so forth. One of the teachers explained it as follows:

> *"Especially in the first months of my profession, when I had difficulty with something, I said that I could solve it when I tried. I did much research online. When I saw something better than my own, I decided to research and find it again. This is how I realized my inadequacy. I tried harder to improve myself."* **(MC-T6)**

They also mentioned that they frequently tried to improve their competencies by participating in formal training such as in-service training and seminars. One of the teachers explained as follows: "I receive in-service training from Teacher Academy in my city. I attend face-to-face and online seminars" **(MC-T10)**.

Last, they rarely explained that they received support from experienced teachers and school administrators to improve their competencies. One of the teachers explained the importance of such support: "When I have difficulties, I get help from my teacher friends who work in different schools. They give practical suggestions in a very short time" **(MC-T8).**

The low-competence cluster. The teachers in the low-competence cluster explained that such factors as working environment, personal characteristics, undergraduate education, and professional experience have shaped their competency profiles. However, they regarded factors such as working environment and personal characteristics as negative.

As Table 7 indicates, the low total frequency of positive factors is notable considering the high frequency of negative factors. However, teachers in this cluster less frequently pointed to the positive effects of factors such as personal characteristics, undergraduate education, and professional experience. Some of the teachers' explanations were as follows:

> *"In the first weeks, in the first months, I felt like a fish out of water. The children are looking at me. They are waiting for me. I staggered at first."* **(LC-T14)**

> *"Experience gives the teacher confidence and makes you feel more competent."* **(LC-T15)**

As mentioned above, the teachers in this cluster very frequently explained the negative effects of their undergraduate education in addition to factors like working environment and personal characteristics. For them, the negative factors of their undergraduate education were as follows: theoretical or not practice-based courses, inappropriate course content in terms of children's age group, and lack of courses focusing on especially instructional technology. To them, the internship, an important part of undergraduate education, was too short and inefficient. The following quote typifies how they explained the negative effects of undergraduate education: "We went to the internship school once a week, so we cannot learn about students, activity plans … etc. It was like a short visit, not an efficient internship" **(LC-T12).**

The teachers in the low-competence cluster also frequently mentioned the negative effects of their working environment and personal characteristics. Among the negative effects of the working environment, they emphasized the low quality of the physical facilities of schools/classrooms, lack of colleague support, and the geographical drawbacks of schools. For example, two teachers explained,

> *"There are inadequacies in the classroom environment. I have the necessary information to apply many techniques, but these inadequacies prevent me."* **(LC-T11)**

> *"The school I am working at is far away from the residential area due to some infrastructural issues and the children have to walk to school, which prevents regular attendance. I have difficulty in applying my plans."* **(LC-T13)**

The teachers in this cluster occasionally expressed that some personal characteristics affected their competency profiles negatively. They explained their lack of efficacy, fears about trying new methods, and gender roles may prevent them from improving themselves as teachers. Some of them explained that they felt inefficient and were afraid to try new methods, and some female teachers explained that their gender roles prevent them from attending some courses for their pedagogical developments organized in other cities than where they live. One teacher explained their opinion as follows: "I'm afraid to practice. I think that it will be inefficient because I feel inadequate and I do not apply it at all" **(LC-T14).**

Furthermore, as Table 7 illustrates, the teachers in this cluster explained ways to support themselves in being more competent teachers including formal training, individual learning endeavors, and expert/colleague/friend support. The frequency level for each one was low. The most frequently named among the three was formal training, but formal training such as in-service training and seminars were mentioned only rarely.

Discussion

ECTs and their competencies have been an important determinant of the quality of ECE practices, which increases the interest of many stakeholders in teachers' competencies and their development. Therefore, this study focused on ECTs' competency profiles and their determinants.

The descriptive quantitative analyses of teachers' competency profiles revealed that more teachers fell short of expectations in some competency areas, such as instructional technology and educational planning, than in others. The two-step clustering analysis indicated these two competency areas were significant in the separation of the clusters. A large number of the teachers in the high-competent cluster were at the accomplished and advanced levels, so they met the expectations. In the mid-competence cluster, the teachers also generally met the expectations. However, in this cluster, the number of teachers who did not meet the expectations in the competency areas of instructional technology and educational planning increased compared to the high-competent cluster. Last, in the low-competent cluster, the number of teachers who were below expectations increased even more. In this respect, it significantly differed from the other two clusters. Teachers who evaluated themselves as inadequate, especially in the areas of instructional technology and educational planning, increased even more in this cluster. In addition, the number of teachers who were below expectations was higher in this cluster than in other clusters in terms of developmental domains and learning environment competency areas. Although this cluster comprised only 18.7% of the study group, all teachers should be at the desired levels, namely the accomplished and advanced levels, in all competency areas, as teachers are an important determinant of the quality of educational practices. However, the competency levels of the teachers in the mid- and, especially, low-competence clusters in the competency areas of instructional technology and educational planning were not at the desired levels. In particular, we found that the teachers in the low- and mid-competence clusters were at the level of novice and developing. The educational planning competency area includes competencies related to planning for inclusion

of disabled children in the learning process. Our findings related to inclusion of the disabled children were supported by other studies reporting that teachers did not regard themselves as competent to include disabled children in the learning process (Chang et al., 2005; Miller & Losardo, 2002). As the inclusion of children with disabilities in the education process is an important competency emphasized in early childhood pedagogy (Bredekamp & Copple, 2006), our finding may give important insights for ECTs, policymakers, and teacher training programs in higher education. Because teachers' competency is one of the important predictors of the quality of early childhood inclusive education (Altun & Gülben, 2009; Bakkaloğlu et al., 2019), teachers' competencies in this area should be improved to reach the expected quality.

The quantitative findings of the current study also revealed that the teachers were not at the expected level in instructional technology. These findings parallel recent studies conducted in different countries that have shown that ECTs are insufficient in instructional technology (Alan, 2021; Atiles et al., 2021; Jalongo, 2021; Kruszewska et al., 2022; Steed & Leech, 2021). Considering all of the findings, it may be concluded that the "instructional technological inadequacy" that emerged in our study is a general problem for ECTs. Although we could not observe teachers' classroom practices and examine children's academic and developmental achievements, we speculate that the quality of teachers' practices in areas where they feel inadequate may decrease, and children's development may be reduced. Our assumption is in line with the common idea that teachers' professional competencies predict the quality of implementation process and child outcomes (Pianta et al. 2005; Taylor et al., 2010). Moreover, the results of the analysis carried out to determine whether the demographic characteristics of teachers affect the formation of clusters revealed no such effect. This finding suggests that teachers with different demographic characteristics have similar competencies and that their competency levels more directly affected the formation of clusters.

Using mixed methods allowed us to develop a deep understanding of teachers' competency profiles. Like Blömeke and Kaiser (2017) and Karila (2008), we understand from our qualitative data that individual factors, such as personal characteristics, undergraduate education, professional experience, and social ones such as working environment influence the teachers' competency profiles. In modern understanding, the concept of competency cannot be limited to only cognitive skills because personal characteristics play an important role in transforming a teacher's competency in any field into performance (Bandura, 1977; Bullock et al., 2015; Gregoire, 2003; Rimm-Kaufmann & Hamre, 2010; Sandilos et al., 2015; Tschannen-Moran & Woolfolk Hoy, 2007). Consistent with this explanation, the findings in the current study revealed that personal characteristics shape teachers' competency profiles. Our findings also showed that the teachers in the mid- and high-competence clusters love their profession and children and have adequate communication skills. These findings were also supported by studies investigating ECTs' competencies and their professional quality focusing on their job satisfaction (Lubinski & Benbow, 2000), teacher-child interactions (Rimm-Kaufmann & Hamre, 2010), and communication skills (Lillvist et al., 2014; NAEYC, 2019; Sheridan et al., 2011). On the other hand, psychological characteristics such as low self-efficacy and high fear threaten teachers' classroom practices and competencies (Bruder et al., 2013; Tschannen-Moran & Woolfolk Hoy, 2007). In this study, we determined that the teachers in the low-competent cluster have characteristics such as low self-efficacy and high fear. Self-efficacy determines teachers' confidence in handling challenging classroom situations (Bandura, 1986). Moreover, higher self-efficacy can be protective against stress and fear (Bandura, 1977; Jerusalem & Schwarzer, 1992). Therefore, it is not surprising that teachers with low self-efficacy and high fear are in the low-competent cluster. Several studies supported our findings by showing that ECTs' fearfulness and low self-confidence negatively influence their

competency to serve young children (Chang et al., 2005; Miller & Losardo, 2002). The evidence in the current study of the teachers' psychological characteristics suggests that the more positive psychological characteristics teachers have, the more they can transform their knowledge into practice.

Another important finding in our study based on the qualitative data analysis demonstrated that teachers' ongoing professional development endeavors shape their competency profiles. In particular, the teachers in the high- and mid-competence clusters engaged in individual learning and development efforts after graduation by using technological sources and employing self-evaluation. This finding parallels the common assumption that individual development efforts are more important for professional growth (Evans, 2002; Hargreaves & Fullan, 1992; Zeichner et al., 1987). Furthermore, professional experience plays a key role in shaping teachers' competency profiles. According to qualitative data, the teachers in the high- and mid-competence clusters stated that rich classroom experiences developed their competencies, while the teachers in the low-competent cluster stated that professional experience negatively influenced their competency development. Teachers who do not have enough experience may have difficulty in making sense of relevant or irrelevant information cognitively. In other words, the competencies of teachers with rich experience will be more developed (Moos & Pitton, 2014). This is in line with our findings showing that rich classroom experiences are important in the development of teachers' competencies. Indeed, Bandura (1977) noted that mastery experiences are an important source of information for a teacher's self-efficacy beliefs. In light of this, we may explain why teachers in the low-competent cluster have lower levels of self-efficacy. In other words, teachers with less professional experience may have lower levels of self-efficacy. Consequently, teachers' competency levels may improve as professional experience increases.

In spite of our expectations about the impact of undergraduate education in the shaping of teachers' competency profiles, the results of the current study indicate that undergraduate education does not have any significant impact on teachers' competency profiles because the effect was the same for all three clusters. Moreover, the teachers in all clusters regarded its effects as negative. With respect to its negative effect, teachers mostly considered that courses with non-practice-based and inappropriate or low content negatively affect their competency development. Although it is not a distinguishing factor in constructing teacher profiles, it is noteworthy that the negative effect of undergraduate education is the same for all clusters. Studies examining ECT education have revealed that the quality of teacher education predicted pre-service teachers' competency (Blank, 2010; Isikoglu, 2008). Moreover, a meta-analysis study including 82 related studies from 1980 onward found that there is a positive and statistically significant relationship between teacher qualifications and professional experience (Manning et al., 2017). The findings of our study also revealed that competency development is a continuing process. Moreover, the current study has revealed that teachers can eliminate the negative impact of their undergraduate education through continuing professional development after graduation. As previous findings have shown, the teachers in the high- and mid-competency clusters developed their competencies in the process when the necessary conditions were met and they used the opportunities given to them. Similarly, some studies have already showed that continuing professional development efforts improve teachers' competencies (EC, 2011; Opfer & Pedder, 2011). Our findings suggest that ECTs can continue to improve their professional growth with social support and individual effort after they graduate. However, there is a need for more investigations to develop a better understanding of pre-service teachers' competencies and the factors that may be related to them.

The most important findings of our qualitative data analysis of social factors are related to the work environment. While the teachers in the high-competent cluster emphasized the positive contribution of the working environment, the teachers in the other two clusters stated that the working environment had a negative effect. The working environment in early childhood is one of the main elements for teachers to improve their competencies (Evans et al., 2007; Karila, 1998). Moreover, school context research revealed that the school environment, including sufficient physical facilities and colleague and administration support, significantly affects teachers' professional learning (Cordingley, 2015; Evans et al., 2007; Louis et al., 1996). The overall findings in the current study extend the steadily growing early childhood literature by highlighting that a work environment including sufficient physical facilities and administration and colleague support influences teachers' competency profiles. As teacher competency is a significant predictor of teacher success, the findings may inform the importance of the work environment for teachers to improve their competency.

Conclusion and Suggestions

Efforts to improve the quality of ECE must continue to be carried out by various stakeholders focusing on different dimensions of ECE such as undergraduate education, professional development, legal regulations, physical capacities of the learning environment, increasing attendance of all children, and so forth. This current study focused on the ECTs' competencies, and the main contribution of this study is to provide an in-depth understanding of the competency profiles of teachers. In addition, understanding the factors that are effective in constructing competency profiles is another important contribution of the current study. We concluded that the ECTs who regard themselves at a higher level of competency generally are the ones who continue to improve themselves. In other words, they are teachers with lifelong learning skills. We also observed that their lifelong learning skills are supported by communication and collaboration with their colleagues, friends, and administration. Their skills are also supported by critical thinking skills to determine which of their competency areas need to be developed and find ways creatively to develop them. To conclude, determining their competency profiles by revealing the common competency deficiencies and the factors constructing the profiles gives important insights for teachers themselves, curriculum developers and faculty members at higher education institutions, and policymakers at national and international levels in the hard way to reach more qualified ECE.

We offer the following suggestions for researchers. First, our study focused on determining competency profiles and underlying factors of teachers' competencies. Future studies may seek to relate children's academic, social, or emotional development and their teachers' competency profiles. Also, the data in our study are only based on the ECTs' self-reported assessments of their competencies. We should note that we would also have included the observation process in our study procedure, but all preschool education was given via distance education because of the COVID-19 lockdown in Turkey. As self-reported assessments of teachers' competency profiles may be subjective, future studies can be conducted including independent raters who observe teachers' teaching performance over a longer time period. Although we tried to increase the generalizability via applying a mixed method and comparing and contrasting other research results in this study, we did not manage to reach a larger sample due to the COVID-19 lockdown. For that reason, in future studies, the number of participants can be increased to reach a larger sample.

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Appendix A: An Abbreviated Version of the Early Childhood Teacher Competencies Assessment Rubric

An Abbreviated Version of the Early Childhood Teacher Competencies Assessment Rubric
Dear Teacher,
ECTCAR is an analytic rubric designed to determine early childhood teachers' competency profiles. The rubric includes nine competency areas, A. Developmental Domains, B. Educational Planning, C. Academic Content Areas, D. Instruction, E. Instructional Technology, F. Learning Environments, G. Classroom Management, H. Assessment & Evaluation, and I. Family Involvement. There are seven competencies in Competency Area C, five in Competency Areas A and D, four in Competency Area B, and three in Competency Area D, for a total of 36 competencies that are accepted as performance criteria (PC). Each PC has five levels of performance descriptions (PD), showing the level of competency. Each level of performance descriptions covers the performances of the previous grade (s): For example, choosing the PD-C means that the PD-A and PD-B of the same competency are also shown by the person, but the PD-D has not yet been displayed. In other words, to regard a teacher as an accomplished teacher in terms of the related competency, that teacher should perform at the previous level of performance.

Competencies	Not competent	PERFORMANCE DESCRIPTIONS				Explanation
		A	B	C	D	
COMPETENCY AREA-A: DEVELOPMENTAL DOMAINS						
A1. I can support the *physical* development of children between the ages of 3–6.		I can explain the physical development characteristics of children between the ages of 3–6.	I can plan activities that will support the physical development of children between the ages of 3–6.	I can implement these planned activities by ensuring the active participation of children.	By evaluating these practices, I can make reflective decisions that will guide future activities.	

A2. I can support the *cognitive* development of children between the ages of 3–6.		I can explain the cognitive development characteristics of children between the ages of 3–6.	I can plan activities that will support the cognitive development of children between the ages of 3–6.	I can implement these planned activities by ensuring the active participation of children.	By evaluating these practices, I can make reflective decisions that will guide future activities.	
COMPETENCY AREA-B: EDUCATIONAL PLANNING						
B1. I can plan the monthly education process within the framework of the preschool curriculum.		I can explain how to make a monthly plan within the framework of the preschool curriculum.	I can prepare the plan of the month, taking into account the developmental characteristics of children.	I can apply the monthly plan I prepared into daily applications.	By evaluating the monthly plan I have implemented, I can make reflective decisions that will guide the next month's plan.	
B2. I can plan the daily education process in accordance with the plan of the relevant month within the framework of the		I can explain how to plan the daily education process in accordance with the plan of the relevant month within the framework of the	I can prepare the daily education process in accordance with the plan of the relevant month, taking into account the	I can implement the plan for the daily training process.	By evaluating the daily plan I apply, I can make reflective decisions that will guide the plans of the next days.	

preschool curriculum.		preschool curriculum.	developmental characteristics of children.		
COMPETENCY AREA-C: ACADEMIC CONTENT AREAS					
C1. I can effectively use different *mathematics* activities to enable children to acquire developmental skills.		I can explain the concepts, principles and methods of pre-school mathematics education.	I can plan a mathematics activity to gain developmental skills.	I can implement the planned mathematics activity in a way that ensures active participation of children.	By evaluating the mathematics activity applications, I can make reflective decisions that will guide the next applications.
C2. I can effectively use different *science* activities to enable children to acquire developmental skills.		I can explain the concepts, principles and methods of pre-school science education.	I can plan a science activity to gain developmental skills.	I can implement the planned science activity in a way that ensures active participation of children.	By evaluating the science activity applications, I can make reflective decisions that will guide the next applications.

COMPETENCY AREA-D: INSTRUCTION					
D1. I can effectively use various/different teaching methods/ techniques* while implementing the activities. *Project, drama, question and answer etc.		I can explain the teaching methods/ techniques that can be used while implementing the activities.	I can determine the appropriate teaching methods/ techniques for the activity.	I can apply the activity in accordance with the teaching methods/ techniques I have determined.	By evaluating the effectiveness of the teaching methods/ techniques used in educational activities, I can make reflective decisions that will guide future applications.	
D2. I can use authentic* materials to ensure that children get the most out of the educational process. *Water, sand, stones, beads, buttons, pieces of wood, boxes, etc.		I can explain how to use authentic materials in the educational process.	I can identify a variety of authentic materials that can be used in the educational process.	I can guide children to use the materials I have determined.	By evaluating the effectiveness of the materials used, I can make reflective decisions that will guide future applications.	

COMPETENCY AREA-E: INSTRUCTIONAL TECHNOLOGY					
E1. I can support the development of children by using different teaching technologies.		I can explain instructional technologies and how to use them in the educational process.	I can plan activities to use instructional technologies in the educational process.	I can implement these planned activities.	By evaluating these applications, I can make reflective decisions that will guide the next applications.	
E2. I can support the development of children through distance education.		I can explain the basic principles to be considered in distance education.	Considering these principles, I can plan distance education.	I can apply distance education activities.	By evaluating these applications, I can make reflective decisions that will guide the next applications.	
COMPETENCY AREA-F: LEARNING ENVIRONMENT					
F1. I can use learning centers to support the development of children.		I can explain the learning centers and the materials that should be in these centers.	I can design developmentally appropriate learning centers for children.	I can guide children to use the learning centers I have designed independently.	I can update the centers by evaluating the effectiveness of the learning centers according to the changing interests/needs of the children.	

F2. I can effectively use out-of-school areas*.* Museum, garden, etc.		I can explain the extracurricular areas and how they will be.	I can plan activities to be implemented in out-of-school areas.	I can implement the planned activities in non-school areas.	By evaluating these practices, I can make reflective decisions that will guide future activities.	
COMPETENCY AREA-G: CLASSROOM MANAGEMENT						
G1. I can guide children to follow classroom rules.		I can explain how to create class rules.	I can set the classroom rules together with the children.	I can consistently apply the class rules I set.	By evaluating the children's compliance with the classroom rules, I can make reflective decisions that will guide the next applications.	
G2. I can communicate effectively with children.		I can explain the basic rules of communication with children.	I can identify various ways to communicate with children.	I can communicate with children by applying the methods I have determined.	I can make reflective decisions through self-assessment about communicating with children.	

COMPETENCY AREA-H:ASSESMENT & EVALUATION					
H1. I can direct my teaching practices by self-assessment.		I can explain how to do self-assessment.	I can plan how to do the self-assessment.	I can do the self-assessment.	By evaluating the results of the self-assessment, I can make reflective decisions that will guide further practice.	
H2. I can evaluate children's multi-faceted development*. *Physical, affective, cognitive, social, language development		I can explain the methods and techniques of evaluating children's versatile development.	I can identify appropriate methods and techniques to assess children's versatile development.	I can use the methods and techniques I have determined to evaluate children's versatile development.	I can make reflective decisions that will guide the next applications by evaluating the multi-dimensional development level of the children.	

COMPETENCY AREA-I: FAMILY INVOLVEMENT					
I1. I can communicate effectively with the family.		I can explain effective communication techniques with families.	I can decide on the appropriate communication technique for sharing information with families.	I can share information with families using the communication technique I have determined.	I can take reflective decisions that will guide the next communication process by evaluating the results of information sharing with families.	
I2. It can guide families in supporting children's all-round development.		I can explain the ways in which families identify their needs to support the multi-faceted development of children.	By determining the needs of families, I can plan a family education activity based on this.	I can apply the family education activities that I have prepared.	By evaluating family education activities in line with the feedback of families, I can make reflective decisions that will guide further education activities.	