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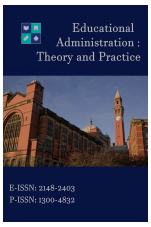

Measuring Service Quality in Teacher Training Programs: The EppekQual Scale

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Abstract

The quality of educational services that prospective teachers received during their training has been in the spotlight of the educational community interest for the past years. This is due to the connection of their training to the efficiency of their profession. Many empirical studies gauge the quality of these educational services by evaluating the students' satisfaction level. The estimations are realized using specialized measurement scales designed to efficiently evaluate specific educational contexts. In Greece, there are no such specialized scales to measure the quality of teacher training programs offered by universities. Hence, the study aims to design and control the validity and reliability of a new measurement scale for service quality in teacher training programs. To design the scale, a mixed methodology was adopted. Firstly, a literature review was conducted to determine the theoretical context from which an initial data pool was formed. To refine the scale, we adopt qualitative techniques, such as expert opinions and focus groups. Structural equation modeling was also applied to assess the validity of the new scale. The outcome of the above methodology revealed the EppekQual scale which consists of six quality dimensions (Administrative Services, Learning Outcomes, Curriculum, Support Services and Facilities, Teaching Process, and Academic Staff) that are interpreted through 34 items. The EppekQual scale constitutes a tool for educational institution managers to successfully design and efficiently realize specialized educational programs by measuring educational service quality based on learners' perceptions.

Keywords: Pedagogical Training; EppekQual; Scale Development; Service Quality

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Introduction

Nowadays, the importance of pedagogical competence of teachers in improving the quality of education is undeniable (Guerriero & Deligiannidi, 2017; Vlachopoulos & Makri, 2021). The need to provide high-quality pedagogical training to prospective teachers is twofold. Firstly, high-quality teachers' training is a prerequisite for quality assurance in school education (European Commission, 2018). Secondly, it is associated with the effectiveness of the educational institution, as the provision of quality training services results in acquiring recognition and gaining preference from a larger number of prospective students (Gregory, 2019). As a result, it ensures the sustainability of the training program, in conjunction with updating the teachers' knowledge base (OECD, 2019).

In the Greek public education system, and particularly in secondary education, various scientists, regardless of their pedagogical and teaching training, are entitled to work in schools. Therefore, when entering the teaching profession, pedagogical and teaching competence is not a requirement, but an additional qualification, which can be certified either before or after the appointment of a prospective teacher in public education. Consequently, to acquire pedagogical and teaching competence, many prospective teachers pursue independent pedagogical training programs, such as the training program under research. These programs, offered only by universities, are annual and require tuition fees. They are part of continuing professional teacher training and are, therefore, not classified as formal educational programs. The term ‘independent' implies training programs that are not integrated into the initial formal education course curricula for prospective teachers. This, combined with their special curriculum content, create a unique educational framework requiring a specialized approach to measure its quality.

The need to improve the quality of educational services has led scientists to create specialized measurement scales (Latif, Farooq Sahibzada, & Ullah, 2019; Marimon, Mas-Machuca, Berbegal-Mirabent, & Llach, 2019; Teeroovengadum, Kamalanabhan, & Seebaluck, 2016), which aim to evaluate service quality by endorsing a holistic approach (Abbas, 2020). Consequently, no scale focuses on evaluating training programs service quality in Greece for prospective teachers by incorporating the peculiarities observed in this field. In this context, the present study develops a new scale to measure teacher training programs' service quality provided by higher education institutions. EppekQual, which is the name adopted for the new scale, is a combination of the term annual teacher training program (in Greek, Eppek) and quality.

Literature Review

Quality, in general terms, is related to customer satisfaction and is evaluated in terms of specific factors. The most effective way to measure quality is by determining whether customers are satisfied (Popli, 2005). In a customer-oriented approach, quality is a factor explained by customers and their perceptions. Consequently, perceived service quality is determined as "the outcome of an evaluation process where the customers compare their expectations with the service they have received" (Grönroos, 1984). As Cronin Jr. and Taylor (1992) stated, service quality can also be evaluated only by service performance. In the service quality literature, two dominant schools are providing the conceptual definition of service quality. The Nordic-European and the American school. The European school proposed two main quality dimensions - functional and technical quality - which can be measured by six sub-dimensions: professionalism and skills, attitudes and behavior, accessibility and flexibility, reliability and trustworthiness, recovery, and reputation and credibility (Grönroos, 1988). However, by the American school of thought, the quality of services is approached through five dimensions: Reliability, Responsiveness, Assurance, Empathy, and Tangibility (Parasuraman, Berry, & Zeithaml, 1991). It is worth noting that both schools agree that service quality is a multi-variable dimension.

From the extensive literature review during 2007-2020, we identified a plethora of empirical studies aimed at measuring the quality of services in the educational context using specialized scales focusing on quality assessment from a trainee's perspective. Among them, the most popular scale seems to be the SERVQUAL scale. According to Abbas (2020), trainees are considered the most crucial stakeholders of an educational institution as they are direct recipients of educational

services and, thus, act as the "clients" of the educational organization (Marzo-Navarro, Pedraja-Iglesias, & Pilar Rivera-Torres, 2005). In the present study, prospective teachers are the primary target group to assess the quality of educational services.

The literature review revealed three groups of empirical studies based on the type of measurement scale they adopted. The first category is comprised of those who have adopted the original SERVQUAL scale without any modifications (Gregory, 2019; Hooda & Jain, 2018; Mpanza, Green, Sentoo, & Gerwel Proches, 2019; Patil, Mariappan, D'Souza, & Nazareth, 2019; Tavakoli, Yadegarfar, Bagherian, & Ghasri, 2019; Tóth & Surman, 2019; Vetri Selvi, 2018). The second includes empirical studies, which have adopted a modified scale to measure educational service quality (Gargoum, 2019; Mamun-ur-Rashid & Rhman, 2017; Rezaee, Yazdani, Zahedani, & Zarifsanaiey, 2018). In this category, researchers are forced to make minor modifications or add new items to the instruments, which are necessary for educational context applications. Finally, the third category includes research approaches attempting to develop and establish a new scale for educational service quality. As the purpose of this work is to develop a new measurement scale of educational service quality in a teacher training program, we focused on the empirical studies of the third category, from which information was obtained on the formation of an initial data pool. The empirical studies of the third category are presented in Table 1.

Table 1. Specialized service quality scales in higher education, number of items, quality dimensions, and items per dimension

Scale	Researchers	Number of items	Quality dimensions	Items per dimension
EduQual	Mahapatra and Khan (2007)	28	Learning Outcomes	6
			Responsiveness	5
			Personality development	5
			Physical facilities	7
			Academics	5
HiEduQUAL	Annamdevula and Bellamkonda (2012)	27	Teaching and course content	8
			Administrative services	6
			Academic facilities	6
			Campus infrastructure	4
			Support services	3
HedQual	İçli and Anil (2014)	26	Academic quality	4
			Administrative service quality	9
			Library services quality	5
			Quality of career opportunities	5
			Supporting services quality	3
InstaQual	Kumar and Dash (2014)	33	Academics	12
			Career and industry interface	6
			Physical facilities	6
			Competence	5
			Leisure	4
CourseQual	Kincsesné Vajda, Farkas, and Málovics (2015)	24	Cooperation	7
			Reliability of teaching method	4
			Assurance and punctuality	7
			Empathy	3
			Tangibles	3
HesQual	Teeroovengadum et al. (2016)	48	Physical environment quality	10
			Administrative quality	7
			Support facilities quality	6
			Core educational quality	17
			Transformative quality	8
MeQual	Verma and Prasad (2017)	25	Academic aspect	5
			Professional assurance	4
			Behavioral responses and supports	4
				3
			Industry institute interaction	5
			Non-academic aspects Physical support	4

Scale	Researchers	Number of items	Quality dimensions	Items per dimension
HiEduQual	Latif et al. (2019)	37	Teacher quality	9
			Administrative services	8
			Knowledge services	7
			Activities	5
			Continuous improvement	4
			Leadership quality	4
UnivQual	Marimon et al. (2019)	17	Curriculum	7
			Skills development	4
			Services and facilities	6

Five quality dimensions were grouped according to the above studies. "Learning outcomes" are suggestions about what a learner is expected to learn, understand, or even be able to demonstrate after completing a learning process. The dimension of learning outcomes originally was proposed by Mahapatra and Khan (2007), but in the empirical studies by Marimon et al. (2019), Mbise and Tuninga (2016), and Teeroovengadum et al. (2016), there are also quality items related to the outcomes of the learning process. According to Teeroovengadum et al. (2016), this dimension involves required learners' knowledge and skills by the labor market, the development of critical thinking, and the improvement of learners' self-confidence.

"Curriculum" as a dimension for assessing the quality of educational services was adopted in the UniQual and HesQual scales, whereas quality indicators related to the curriculum of the evaluated educational program were also identified in the studies by İçli and Anil (2014), Annamdevula and Bellamkonda (2012), and Latif et al. (2019), as integrated into evaluation subjects, such as "Academic Quality" and "Knowledge Services." This dimension assesses the overall structure of the program, the evaluation system, the teaching methods, and the workload of the individual subjects.

"Academic services" is the most widely used quality dimension in all the empirical studies examined as it involves the core educational service offered by an educational organization. The core educational service is associated with the learning-teaching methods Anim & Mensah (2015) and the academic human resources quality, which is the most important resource of the educational organization through which the educational service is provided (OECD, 2019). The academic aspect entails teachers' pedagogical and teaching competence, their behavior, their availability to guide and advise students, and their role as mentors.

The dimension "Support Services and Facilities" assesses the quality of the educational organization's physical facilities, such as classrooms, teaching equipment, academic library, mobility programs, scholarships, apprenticeships, food costs, staff members' appearance, and technological equipment (Annamdevula & Bellamkonda, 2012; Kincsesné Vajda et al., 2015; Mahapatra & Khan, 2007; Marimon et al., 2019; Teeroovengadum et al., 2016; İçli & Anil, 2014).

In the "Administrative Services" dimension, Teeroovengadum et al., (2016), attempt to evaluate the administrative staff's behavior and competence. In contrast, Latif et al. (2019) assess the responsibility of the administration of the educational institution. Overall, the subject of evaluation concerning administrative services implies the measurement of the quality of all the administrative procedures and examines the degree of their reliability and responsiveness to trainees' needs (Annamdevula & Bellamkonda, 2012; İçli & Anil, 2014).

Conceptual Framework

In the literature, on which the design of the measurement scale is based, the constructs of the conceptual models are considered representations of reality determined objectively. Consequently, the constructs of the proposed conceptual framework, i.e., the Dimensions of Quality and Overall Quality of the educational services of the training program, are treated as objectively measurable variables. In all measurement scales discussed above, educational service quality is an underlying variable, which can be measured indirectly by specific educational characteristics. In the educational context, the overall service quality of an organization is a result of its quality performance in specific service fields (Schneider & White, 2004). In the case of independent teacher training programs, these fields comprise the quality dimensions of the educational

services of the program, under Greek state regulations, the goals of the educational program, and the relevant literature findings regarding the service quality of higher education. Therefore, the overall quality of the teacher training program can be determined through the educational organization's performance in specific quality dimensions.

Methodology

A mixed-method approach was used, in which three steps were followed in developing the EppekQual scale (Creswell & Guetterman, 2019). In the first step, theoretical support was provided for the items included in the preliminary list, which was the pool from which the appropriate field assessment items were drawn. The theoretical support was achieved by combining inductive and deductive methods. The deductive method implies the design of the objects on the measurement scale based on a broad literature review of the existing educational service quality scales and the relevant framework of higher education quality in Greece. On the other hand, the induction method involves the qualitative information collected from the two focus groups.

In the second stage of the design, content validity was evaluated. To ensure content validity, a specific algorithm was employed, which estimated the opinions of eight academic experts. The final stage of the design assessed the structural validity and reliability of the new scale by incorporating multivariate statistical analysis techniques.

Preliminary list items

According to the theoretical framework of the present research, the quality of services in a teacher training program is interpreted from the trainees' perspective by evaluating specific dimensions of quality. In Greece, higher education curricula are distinguished as high-quality when they follow the minimum number of the general quality criteria specified by the Hellenic Authority for Higher Education (HAHE), such as learning outcomes, structure, organization of curricula, implementation of teaching processes, teaching staff, quality of research, and quality of support services (Eurydice, 2021). Consequently, the preliminary list included both the quality indicators, which had been adopted in previous measurement scales, and new indicators, which were redesigned including the special characteristics of the training program. These indicators then formed the basis for the discussion held in two focus groups.

Focus Groups and Expert Opinions

The discussion took place in a supportive context in the educational organization using structured questions. The participants' profile in the focus groups was representative of such programs (for example, 30% were male and 70% were female), and all required ethical rules were respected. Discussions started after highlighting the objectives of the research. The interview protocol included the following questions to investigate the quality aspects of educational services in a teacher training program.

Which of the following quality dimensions should be evaluated?

Which of these dimensions is most important for a teacher training program?

Which other dimensions could you add?

Which other indicators could you add?

Thematic analysis was used to analyze the corpus of data of the focus groups. The notes that we have taken were analyzed to identify the keywords, which were then categorized. Upon categorization, academic staff members were consulted. More specifically, two academic members took part in this stage, the program manager, and a local coordinator of the educational program, both with significant experience in the field. Initially, 40 statements were drafted and grouped into five different categories (Academic Staff, Curriculum, Learning Outcomes, Support and Facilities Services, and Administrative Services).

In addition, the initial list of 40 quality items was given to academic experts to assess the content validity of the items to be included in the EppekQual scale by judging each element as "necessary", "useful, but not necessary", or "unnecessary". Thus, the content validity ratio for each

element of the initial questionnaire was calculated (Galanis, 2013):

Content validity ratio = $\frac{ne-\frac{N}{2}}{\frac{N}{2}}$ [1]

N= Total number of experts judging the elements of the questionnaire

ne: The number of experts describing an element of the questionnaire as "necessary"

The minimum ratio for an item to be included in the scale depends on the number of experts assessing the measurement scale, which in the case of EppekQual amounts to (0.85) (Galanis, 2013), due to the eight experts who evaluated the scale. Thus, 3 items were excluded from the scale, as they did not meet the minimum criteria. The removed items involved the teachers' external appearance, which was evaluated as unnecessary, whereas the other two involved classroom design and timetable, which were evaluated as useful but not necessary. At this stage, the scale included 5 quality dimensions and 37 indicators.

Type of Variables

The EppekQual scale adopts seven-point Likert scale variables (1 is for 'Strongly disagree' and 7 is for 'Strongly agree'). We choose a seven-point scale since it entails stronger correlations between variables and more accurate outcomes than other scales with smaller gradations (Awang, Afthanorhan, & Mamat, 2016; Johns, 2010). In addition, using a seven-point scale is preferred in the case of e-questionnaires Finstad (2010), as in the case of EppekQual.

Participants

The program is offered by a public university in Athens, more specifically, the School of Pedagogical and Technological Education (A.S.PAI.T.E.), catering to technological and pedagogical programs, with 12 branches across Greece. Students from seven different disciplines attending the specific teacher training program were included in the pilot study of the EppekQual. The questionnaire was sent via e-mail to 687 trainee teachers using probability-free sampling, and the response rate was 40.61% which amounts to 279 participants. Probability-free sampling is preferred in most studies in the field (Lagrosen, Seyyed-Hashemi, & Leitner, 2004) since the major goal during the pilot stage is to test the recommended scale rather than generalize the outcomes. An ideal sample size in the pilot study is 12% of the total population (Julious, 2005). The number of 275 teachers who finally participated in the study accounted for 13.6% of the total population (2020 prospective teachers for the academic year 2019-2020), satisfying the above condition. Table 2 was representative of the total population in terms of gender, age, and educational status. In addition, participants in the pilot stage should be greater than 100 observations and the 5:1 ratio between the observations and the analyzed variables Hair, Anderson, Babin and Black (2010) to minimize the likelihood of data over-adjustment. The ratio eventually amounted to 7.4 observations per variable. Finally, to check the correctness of the participants' responses, two control statements were included in the questionnaire, and four questionnaires were excluded from the survey.

Table 2. Respondents Demographic Profile

		Frequency	Percentage
Sex	Male	76	27.6%
	Female	199	72.4%
Age	22-35	141	51.3%
	36-45	96	34.9%
	46-55	35	12.7%
	56+	3	1.1%
Discipline	Economics	50	18.2%
	Health	93	33.8%
	Engineering	31	11.3%
	Electrical Engineering	7	2.5%
	Computer Technology	20	7.3%
	Agriculture	28	10.2%
	Sociology	13	4.7%
	Other	33	12.0%
Educational Status	Undergraduate (Higher Technological Institutions)	115	41.8%
	Undergraduate (University)	49	17.8%
	Master	110	40.0%
	PhD	1	0.4%

Results

The reliability of the EppekQual scale questionnaire includes test-retest, parallel forms, and internal consistency reliability. Reliability implies the consistency of trainee teachers' responses, through which the scale measures the concept it claims to measure (Creswell & Guetterman, 2019).

Test-Retest Reliability

Test-retest reliability estimates the degree of participants' response correlations to a questionnaire at two different times (Galanis, 2013). To assess test-retest reliability, the original questionnaire was completed by 30 trainee teachers of the A.S.PAI.T.E. branch in Kozani on March 15, 2020, who were asked to complete it again after two weeks. During the time between the completion of the two questionnaires, no event occurred that could affect teachers' service quality perceptions about the specific teacher training program. The Spearman correlation coefficient of the participants' responses at the two different times was greater than ($r>0.85$) for all responses, indicating a strong positive correlation and thus test-retest reliability (Litwin, 1995).

Parallel Forms Reliability.

The reliability of parallel forms is used to counteract the memory effect in the assessment of test-retest reliability (Webb, Shavelson, & Haertel, 2006). Two similar alternative forms of the same questionnaire should be developed to assess the reliability of alternative forms. In the case of the EppekQual questionnaire, a reversal was made in the order of classification of the Likert scale statements. The reliability of alternative forms is indicated by the similar responses of the participants to the original and alternative forms of the questionnaire. The Spearman correlation coefficient of the participants' responses between the initial and alternative forms of the questionnaire at the two different times was greater than ($r>0.86$) for all responses, indicating a strong positive correlation and, thus, the reliability of parallel forms.

Internal Consistency

Internal consistency assesses the correlation between EppekQual items intended to measure programs' quality. The Cronbach's alpha index was employed to measure internal consistency. The result will be provided in the next session.

Data Normality

Data normality was checked via the Kolmogorov-Smirnoff index, which proved statistically

significant for all variables on the EppekQual scale ($p<0.05$), thus rejecting the zero hypotheses of data normality. In addition, the z-scores of skewness and kurtosis were calculated. The results deviated from the range of (± 2), suggesting that the data do not follow a normal distribution (George & Mallery, 2010). Instead, the variables are negatively skewed and leptokurtic. Regarding multidimensional normality, the critical region for kurtosis (cr) amounted to (cr=41,217), well above the acceptable limit of five (Bentler, 2007); this indication confirms the lack of multidimensional normality between the variables, which is common in cases where researchers adopt Likert scales (Forero, Maydeu-Olivares, & Gallardo-Pujol, 2009). To address the problem of left asymmetry, a logarithmic transformation of the data was made. Bootstrapping techniques were used as the optimal solution for multidimensional normality violations (Byrne, 2016).

Validity

The validity assessment of the EppekQual scale includes criterion validity and construct validity.

Criterion Validity

As regards criterion validity, a researcher considers a criterion based on whether a measuring tool measures the concept it intends to measure (Creswell, 2017). In the case of the EppekQual scale, the questionnaire included an added item of the overall satisfaction of trainee teachers regarding the educational services provided in the training program. In the context of assessing criterion validity, the correlation between the scores averages of the 37 variables was estimated, which aimed to assess the quality of the training program, in terms of the answers given to the additional question of overall satisfaction. The Spearman correlation coefficient showed a statistically strong positive correlation ($rs=0.752$, $p<0.01$), confirming criterion validity.

Construct Validity

Construct validity defines how well a questionnaire reflects the real theoretical structure of a concept (Cohen, Manion, & Morrison, 2013). In the pilot study of the EppekQual scale, factor analysis was chosen as a multivariate statistical technique to reduce the observed variables of a construct - in our case, teachers' training service quality. According to Hair et al. (2010), factor analysis aims to determine the basic structure of the correlations of a large set of observed variables and create subsets of interrelated latent variables, called factors. In the present research, these factors represent the dimensions of educational service quality.

Exploratory Factor Analysis (EFA)

EFA was carried out using SPSS Vol. 22 statistics. The factor analysis efficacy is related to the quantity and strength of the correlations between the measured items (Hair Jr, Sarstedt, Hopkins, & Kuppelwieser, 2014). The study adopts a 0.3 minimum threshold for intercorrelations between the EppekQual questionnaire items. Furthermore, Bartlett's test of sphericity was statistically significant ($X2=9736.779$, $df=666$, $p<0.001$), rejecting the assumption that there were no statistically significant correlations between the variables. The Kaiser-Meyer-Olkin measure of sample adequacy (MSA) was 0.944 indicating an exceptional homogeneity of variables, and finally, all MSA indexes in the diagonal table of partial correlations were greater than 0.856, confirming the appropriateness of the data for factor analysis (Hair Jr et al., 2014).

Principal component analysis with varimax rotation was utilized to explore the structure among the 37 items included in the questionnaire. Variables with loadings less than 0.50 were excluded from the measurement scale after each repetition until all psychometric properties were met (Worthington & Whittaker, 2006). Adopting a strict limit on the retention of variables increases the dynamics of the factors to be created (Cohen et al., 2013). Variables with loadings greater than 0.40 in more than one factor were assessed as problematic and eliminated from the measurement scale. The selection of the most appropriate number of factors and, therefore, the corresponding percentage of variation to be explained was guided by the Kaiser criterion and the Scree test.

Three iterations were carried out during the EFA, which resulted in the creation of six factors with (35) items, shown in Table 3, explaining (74.73%) of the total variance. According to Hair Jr et al. (2014), the number of items in a measurement scale should be at least three to five times more than the emerged factors. In the case of the EppekQual scale, the ratio between items and

factors amounts to approximately 6.

Table 3. Exploratory Factor Analysis, Factor Loadings, Total Variance, Cronbach alpha

Quality factors/items	Loadings	Corrected item to total correlation	Cronbach's alpha if the item deleted	Cronbach's alpha
Academic Staff Eigenvalue:16.09 - Total Variance Explained:45.97%				
ACS7	0.74	0.81	0.93	0.94
ACS2	0.79	0.82	0.93	
ACS8	0.67	0.73	0.94	
ACS6	0.74	0.83	0.93	
ACS3	0.78	0.84	0.93	
ACS1	0.83	0.85	0.93	
ACS4	0.78	0.77	0.94	
ACS5	0.75	0.71	0.94	
Curriculum Eigenvalue:3.52 - Total Variance Explained:10.08%				
CUR8	0.56	0.79	0.93	0.94
CUR7	0.54	0.76	0.93	
CUR6	0.59	0.83	0.92	
CUR2	0.76	0.70	0.93	
CUR1	0.75	0.81	0.92	
CUR3	0.78	0.78	0.93	
CUR4	0.69	0.80	0.92	
CUR5	0.66	0.76	0.93	
Support Services & Facilities Eigenvalue 2.17 - Total Variance Explained:6.21%				
SSF5	0.74	0.69	0.89	0.90
SSF3	0.82	0.76	0.88	
SSF1	0.87	0.83	0.87	
SSF6	0.71	0.64	0.89	
SSF2	0.85	0.80	0.87	
SSF5	0.72	0.64	0.89	
Learning Outcomes Eigenvalue:2.08 - Total Variance Explained:5.95%				
LRO3	0.69	0.80	0.90	0.92
LRO2	0.72	0.81	0.90	
LRO1	0.76	0.82	0.90	
LRO4	0.66	0.83	0.90	
LRO5	0.61	0.73	0.92	
Administrative Staff Eigenvalue1.21 - Total Variance Explained 3.45%				
ADS2	0.86	0.85	0.92	0.94
ADS1	0.87	0.90	0.89	
ADS3	0.84	0.89	0.90	
ADS4	0.76	0.75	0.94	
Teaching Process Eigenvalue:1.06 - Total Variance Explained 3.03%				
TGP4	0.71	0.70	0.89	0.89
TGP3	0.73	0.82	0.85	
TGP2	0.68	0.76	0.87	
TGP1	0.70	0.80	0.86	
KMO: 0.942; Bartlett's test of Sphericity:8851.316; df:595; Sig.: .000 Cumulative variance explained 74.728%				
Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.; Rotation converged in 6 iterations.				
Curriculum (CUR), Learning Outcomes (LRO), Administrative Staff (ADS), Support Services & Facilities (SSF), Academic Staff (ACS), Teaching Process (TGP)				

The Cronbach's alpha internal consistency coefficients of quality dimensions were determined as between 0.89 and 0.94. Item-to-total correlation had values ranging from 0.64 to 0.90, exceeding the empirically defined limit of 0.50. Similarly, high correlations occur between inter-item correlations. Therefore, the three specific indicators support the reliability of the six quality factors from the EFA (Hair et al., 2010).

Confirmatory Factor Analysis (CFA)

The maximum likelihood estimation method with bootstrapping in IBM SPSS Amos 23 software was used to obtain an accurate estimation of standard errors (Byrne, 2016), as reflected in p values and confidence intervals, due to the lack of multivariate normality. Bootstrapping is preferred over other techniques when the above condition is violated (Awang, Afthanorhan, & Asri, 2015). Bootstrap samples were set at 250, as Nevitt and Hancock (2001) recommended. The bias-corrected confidence interval was set at the 95% confidence level (Byrne, 2016).

Construct validity was assessed when the fitness indexes achieved the required level (Hair et al., 2010). The fitness indexes are used to cover both the absolute fit of the model and its incremental and parsimony fit. To effectively interpret the adaptability and predictability of a model, it is necessary to use at least one indicator from the above three categories (Brown, 2015). As interpreted by the goodness-of-fit measures, the model fits the data well, confirming the convergent validity characteristic (Appendix). Specifically, χ 2/df=1,510 (Marsh, Balla, & McDonald, 1988), which in combination with the degree of significance of (Bollen & Stine, 1992) (p value=0.057) confirms that the model is very well applied. Similarly, the root means a square error of approximation (0.043) indicates a particular model adjustment (Browne & Cudeck, 1993). The reliability of this indicator is reinforced by the observed level of statistical significance of the PCLOSE criterion, which amounted to p=0.967 (Joreskog & Sorbom, 1993). The goodness of fit index was (0.866), a value considered satisfactory for the six variables of the model (Marcoulides & Schumacker, 1996). The I.F.I. index values of (0.970) indicate an excellent adjustment of the model (Joreskog & Sorbom, 1993). The root means square residual was (0.003), well below the acceptable limit of (1) (Byrne, 2016). In addition, the comparative fit index had a value of (0.970), indicating perfect adjustment (Bentler, 1990). Furthermore, the parsimony goodness of fit index (0.729) was assessed as acceptable, as it exceeds the (0.50) threshold (Mulaik et al., 1989). Finally, the Fornell and Larcker criterion Table 4 confirmed discriminant validity as each average variance extracted square root was above the correlation coefficients for each construct in the relevant rows and columns (Fornell & Larcker, 1981).

Table 4. Fornell-Larcker criterion output

Latent Variables	**CUR**	**LRO**	**ADS**	**SSF**	**ACS**	**TGP**
Curriculum (CUR)	.796					
Learning Outcomes (LRO)	.729	.820				
Administrative Staff (ADS)	.293	.373	.892			
Support services & Facilities (SSF)	.110	.189	.131	.775		
Academic Staff (ACS)	.520	.460	.262	.092	.830	
Teaching Process (TGP)	.691	.517	.208	.059	.554	.829

EppekQual's reliability was assessed using the following criteria. The value of the average variance extracted should be (0.5) or higher, whereas the values of the composite reliability should be over (0.7) for the measurement scale to be reliable (Nunnally & Bernstein, 1994). The results in Table 5 show that the measurement scale meets both requirements.

Table 5. Composite Reliability, Average Variance Extracted from the EpppekQual Scale

Factor	Item	Loading	Composite reliability	Average variance extracted
Academic Staff	ACS4	0.89	0.939	0.688
	ACS3	0.77		
	ACS7	0.83		
	ACS6	0.87		
	ACS2	0.82		
	ACS1	0.85		
	ACS5	0.73		
Curriculum	CUR3	0.74	0.932	0.633
	CUR4	0.79		
	CUR5	0.75		
	CUR6	0.89		
	CUR2	0.68		
	CUR1	0.77		
	CUR8	0.87		
	CUR7	0.81		
Support Services & Facilities	SSF4	0.73	0.899	0.600
	SSF6	0.70		
	SSF1	0.90		
	SSF3	0.77		
	SSF5	0.63		
	SSF2	0.86		
Learning Outcomes	LOR2	0.82	0.911	0.672
	LOR4	0.82		
	LOR3	0.82		
	LOR1	0.81		
	LOR5	0.79		
Administrative Services	ADS3	0.94	0.939	0.796
	ADS1	0.95		
	ADS4	0.77		
	ADS2	0.88		
Teaching Process	TGP4	0.70	0.897	0.687
	TGP3	0.86		
	TGP2	0.85		
	TGP1	0.86		
Curriculum (CUR), Learning Outcomes (LRO), Administrative Staff (ADS), Support Services & Facilities (SSF), Academic Staff (ACS), Teaching Process (TGP)				

EppekQual is a scale of inter-correlated factors, as the six factors of the teacher training program quality are interrelated. In the confirmatory factor analysis, specific modifications were made. Variables showing high values in the Modifications Indexes (MI) were defined as free estimate pairs (Meyers, Gamst, & Guarino, 2016). The correlation of the error variances of the above variables does not create problems in the model, when it is internal, and corresponds to the same quality factor but also when it is supported by the theoretical framework of the research (Anderson & Gerbing, 1988), as in the cases (Table 6).

Table 6. Modifications Indexes made in Confirmatory Factor Analysis

Dimensions	Index	Error		Error	Correlation index
Curriculum	CUR4-CUR5	e21	<-->	e22	0.621
Curriculum	CUR1-CUR3	e23	<-->	e25	0.595
Curriculum	CUR2-CUR1	e24	<-->	e25	0.204
Learning Outcomes	LOR4-LOR3	e28	<-->	e29	0.550
Learning Outcomes	LOR1-LOR2	e30	<-->	e31	0.519
Academic Staff	ACS7-ACS2	e5	<-->	e43	0.413
Academic Staff	ACS2-ACS1	e44	<-->	e43	0.390
Academic Staff	ACS7-ACS4	e5	<-->	e8	-0.297
Academic Staff	ACS3-ACS5	e7	<-->	e9	0.254
Support Services & Facilities	SSF5-SSF3	e13	<-->	e15	0.335
Teaching Process	TGP4-TGP3	e38	<-->	e39	0.300

Discussion

The current study aimed to develop a multidimensional scale to measure the quality of educational services in teacher training programs for prospective teachers. Based on the relevant theoretical background, the relevant Higher Education Greek framework, and the training program aim and goals, a measurement scale (EppekQual) was developed using both qualitative and quantitative methods. By aiming to assess service quality multidimensionally and comprehensively, 37 evaluation items were initially integrated into a five-dimensional quality scale (Abbas, 2020). These items involved curriculum, academic staff, support services and facilities, learning outcomes, and administrative services. An EFA was then carried out to check the structure between the observed variables. The exploratory analysis demonstrated causality relationships between a total of 35 variables, which were grouped into six quality dimensions (Teaching Process, Curriculum, Learning Outcomes, Academic Staff, Administrative Services, and Support Services and Facilities) through which service quality in pedagogical training programs can be interpreted. The new dimension, which emerged through the exploratory factor analysis, involves the teaching process. This dimension appears as a distinct qualitative variable in the scales of Annamdevula & Bellamkonda (2012) and Teeroovengadum et al. (2016). The adoption of this specific dimension is based both on the relevant literature and the nature of the educational program. The teaching process refers to lesson planning, and the application of specific teaching methods (Guerriero & Deligiannidi, 2017). Whereas the nature of the educational program concerns the development of the teaching skills of prospective teachers which are of high importance (Vlachopoulos & Makri, 2021).

The structure of the model extracted from the EFA was checked by CFA to test whether the data fit the researched measurement model. According to the literature, CFA results revealed a reliable and valid measurement scale of six factors interpreted through a total of 34 items, as all the necessary conditions for good fitness were met. The item excluded from the confirmatory analysis was related to the formation of a cooperation culture among the teaching staff members (ACS8). The decision to accept the removal of the above item was based on the view that in continuing education programs, such as the specific educational program under research, there is no permanent teaching staff, thus, there are no appropriate conditions for boosting the cooperation between the academic staff (Alexopoulos, 2019).

Each of the six quality factors of the EppekQual scale (Table 7) includes individual statements (observed variables), the number of which is above three, as pointed out by Kline (2005), to be able to "identify the model". Furthermore, the individual dimensions of the quality of services included in the measurement scale are congruent with previous studies about higher education.

Table 7. The EppekQual Scale

Quality Dimension	Number of items	Items
Academic Staff	7	Teachers are informed about developments in their discipline (ACS1) Teachers are fully qualified in the subjects they teach (ACS2) When teachers promise something, they keep their promises (ACS3) Teachers have developed communication skills (ACS4) Teachers always have time to answer requests and questions (ACS5) Teachers' behavior inspires confidence in students (ACS6) Teachers are fully qualified in adult education principles (ACS7)
Curriculum	8	Practice Exercises are well structured (CUR1) Curricula provide sufficient time to complete all learning activities per subject based on the expected learning outcomes (CUR2) Practice Exercises are integrated into curricula (CUR3) Curricula provide evaluation types that accurately reflect the knowledge and skills to be acquired through learning (CUR4) Curricula provide appropriate assessment methods per thematic unit (CUR5) Curriculum structure contributes positively to the learning process (CUR6) Curricula are well designed to comply with course contents, and therefore, avoid overlaps (CUR7) The curriculum scope and objectives are suitable and formulated (CUR8)
Support Services & Facilities	6	All teaching and learning areas are clean (SSF1) Accessibility is easy (SSF1) Classrooms are sufficiently heated and cooled (SSF3) Classroom capacity is satisfactory (SSF4) Outer building condition and surrounding area are excellent (SSF5) Laboratories and lecture rooms are well equipped with modern teaching facilities and materials (SSF6)
Learning outcomes	5	Learning outcomes enable practical teaching skills (LRO1) Learning outcomes generate practical experiences that apply to teaching processes (LRO2) Learning outcomes result in adequate teaching knowledge (forms, methods, techniques, teaching tools, lesson plan, selection and formulation of objectives, assessment methods) (LRO3) Learning outcomes produce sufficient pedagogical knowledge (learning theories, classroom management strategies, use of technology during the teaching process) (LRO4) Learning outcomes entail the improvement of learners' skills (communication, decision-making, problem-solving, critical analysis, self-confidence, and self-awareness) (LRO5)
Administrative Services	4	The administrative staff are competent in solving student problems (ADS1) The administrative staff is willing to help students (ADS2) The management staff encourages confidence (ADS3) The administrative staff competently performs standard office duties to reduce bureaucracy (ADS4)
Teaching process	4	Teaching includes educational techniques that will enhance students' interest and involvement in the learning process (TGP1) Teaching methods aim at creative interaction between teachers and students (TGP2) Teaching organization is aimed at the investigation - the discovery of knowledge (TGP3) Teaching is organized by accommodating teaching material to the student's needs and previous knowledge (TGP4)

In addition, the quality dimensions of the EppekQual scale include a different number of indicators due to the range of the field that each dimension evaluates, which is also confirmed

in all measurement scales presented in the literature review.

The Curriculum factor encompasses eight items, through which the aim, goals, content, structure, and evaluation methods are assessed. This quality dimension is adopted by many researchers in studies aiming to measure educational service quality, such as Sultan and Wong (2014), and Marimon et al. (2019). The quality of a curriculum is assessed in terms of its degree of response to the objectives of the academic unit, the coherence, and functionality, the coordination of the course subject matter, and its evaluation system. In the relevant literature, the curriculum is associated with the pre-planned learning experiences of students to develop or improve specific skills such as critical and creative thinking, problem-solving, collaborative work, and effective communication (OECD, 2019; Brown, as cited in Ellis, 2014).

The second dimension of the EppekQual scale is Teaching Process. This factor contributes to the interpretation of overall quality through four items related to how teaching is organized and implemented. This dimension as an independent quality factor is also proposed by (Teeroovengadum et al., 2016) under the name Pedagogy. The Teaching Process appears to significantly influence the quality of educational services in all empirical studies in the field (Ashraf & Ahmed, 2022; Kincsesné Vajda et al., 2015). In a pedagogical training program for prospective teachers, this dimension plays a decisive role in determining teachers' professional competence (Guerriero & Deligiannidi, 2017) and consequently in the quality of the educational program.

The third factor is Learning Outcomes, and it holds five items that account for the pedagogical knowledge and teaching skills of the teachers. Furthermore, this factor examines how the curriculum empowers trainees to develop also soft skills, which are associated with their personal and career development (de Oliveira Silva et al., 2020; Tóth & Surman, 2019). Using variables relating to the soft skills of prospective teachers accounts for the need to adopt a more holistic approach to educational service evaluation (Abbas, 2020; Letcher & Neves, 2010). In teacher training programs, learning outcomes relate to pedagogical knowledge, teaching methodology, job training, student management, educational framework, and personal development (OECD, 2019). The above is in line with the view of Marimon et al. (2019), who noted that learning outcomes include "both information on students' technical achievements and the development of horizontal skills, such as communication skills, teamwork, critical thinking, and decision-making".

Academic staff is the fourth quality dimension in the EppekQual scale. This dimension is explained through seven items, which assess the cognitive and pedagogical competence of the teaching staff, their behavior, and their availability to provide support to students (Naite, 2021). Academic staff, as a quality factor, is included in all studies which explore the field of quality in education and contributes significantly to the overall quality level (Abbas, 2020; Neves & Hillman, 2016).

The administrative staff is the quality factor that, through four items, assesses the capacity and behavior of administrative staff in managing the bureaucratic procedures of the training program. The effectiveness of administrative services as a key dimension of quality assurance in higher education was supported by Latif et al. (2019) and Verma and Prasad (2017).

Finally, Support Services and Facilities are the quality factor that through six variables evaluates classrooms' availability and adequacy, hygiene, teaching equipment, laboratories, and accessibility. In teacher training programs, prospective teachers need to address a supportive environment in terms of specific facilities to achieve better learning outcomes. Therefore, support services and facilities are a factor that significantly defines the quality of the provided educational work and acts as criteria for quality assurance in higher education (Galeeva, 2016; Hanif, Handayani, Lestari, & Wibowo, 2022).

Conclusion

The present study is the first attempt to design a scientific tool to measure the service quality of pedagogical teacher training programs in Greece based on the perceptions of

prospective teachers. Therefore, the EppekQual scale can be used to measure service quality in the pedagogical training programs offered by university institutions. This scale can help the managers of higher institutions to implement training programs that address prospective teachers' needs. In addition, after making any necessary adjustments, the scale could be used to evaluate other continuing education programs. However, in all cases, the reliability and validity of its structure should be checked. This approach focuses on the Greek education system, particularly on a specific teacher training program, thus, requiring further application of the scale in different teacher training programs in Greece is promoted.

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