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The Effect of Teacher Characteristics on Student Achievement: A Meta-Analysis Study

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Abstract

Hypothesizing that teacher characteristics may have an impact on learning outcomes, the current study tested this assumption, presenting statistical evidence of the findings. In this meta-analysis study, teacher characteristics were determined in the light of the existing literature, followed by an analysis of the relationships between teacher characteristics and student achievement. The analysis protocol of the literature review encompassed a total of 1,042 correlational values drawn from 209 independent research articles or theses/dissertations, which included 3,225,488 study subjects. The results of the application of a random effect model showed that teacher characteristics had a low-level positive effect on student achievement. The positive effect is discussed in terms of teacher competences and qualifications. In the context of the components of teacher characteristics, the effects of all dimensions in the framework were found to be significant. More specifically, student achievement was found to be influenced at the greatest level by teachers' personal qualities, while it was least impacted by instructional management. Some suggestions are recommended for future studies in light of the conclusions.

Keywords: *meta-analysis; student achievement; teacher characteristics*

Introduction

Teachers, as the individuals directly involved with learners, play a key role in achieving the goals of education and are critical in shaping educational activities. This role has evolved over the course of time. For instance, in the 21st century, considerable changes

have been made in terms of educational philosophy, resulting in approaches such as "learning to learn," rather than passive acquisition of pre-determined topics; or "active learning" in place of passive reception of information (Güler, 2014). These evolving philosophies have led to discussions on the impact of teachers' knowledge, skills and affective features on the learning process. Moreover, due to the failure of research to define systematic relationships between policy variables and student achievement, recent studies have focused specifically on "teacher variables" (Kukla-Acevedo, 2009). Likewise, in this study, we touch briefly on teacher characteristics identified in the literature as relevant to student achievement. Afterwards, we present a framework of teacher characteristics in accordance with our synthesis of the literature.

Teacher Characteristics

In discussing the qualities and characteristics of an effective teacher, one important element is noted the knowledge needed to teach a topic or concept. In this regard, educational studies have reached a consensus on the types of knowledge that a teacher should possess. The idea of knowledge for teaching was systematically introduced for the first time by Shulman (1986), whose work later inspired other researchers, and the types of knowledge were adapted to various disciplines, such as mathematics, physics, and so on (e.g., Ball, Thames, & Phelps, 2008; Grossman, 1990; Koehler & Mishra, 2009). This type of knowledge concerns the *professional knowledge* that the teacher should have and comprises pedagogical knowledge and knowledge for teaching, along with content knowledge of the course to be taught (Baki, Baki, & Arslan, 2011). Many educators have indicated that a teacher's professional knowledge is related to student achievement (Metzler & Woessmann, 2012; Selling, Gargia, & Ball, 2016), a claim that has been supported by the findings of Baumert et al. (2010), who showed a substantial positive impact of pedagogical content knowledge on student learning.

From another perspective, the teacher's use of professional knowledge in the classroom is also related to instructional management. In other words, effective teaching knowledge requires an adequate approach to classroom organization. Instructional management consists of a series of components, from how the classroom is arranged to the teaching styles and teaching practices to be used within the classroom (Martin & Sass, 2010). The main purpose of instructional management is to create a classroom environment that is beneficial to student achievement; however, while it has been emphasized that instructional management is an influential indicator of teacher effectiveness (Corbett & Wilson, 2002), no consensus exists on which method or strategy is more appropriate for increasing student achievement (Brannon, 2010; Churchward, 2009). On the other hand, it is generally accepted that a student-centred approach provides greater motivation to learn, deeper conceptual understanding of the material, and a more positive attitude toward the subject being taught (Collins & O'Brien, 2003; Meyers & Jones 1993). As such, new curricula are often developed according to a constructivist approach, which defers to student-based learning (Henson, 2015; Tan, 2017).

Moreover, teachers, as a part of their school organization, are constantly communicating with their colleagues, school administrators and students. According to attachment theory (Ainsworth, 1982), one of the basic assumptions is that positive relationships between teachers and students are essential for a safe and secure learning setting, enabling scaffolding for academic achievement as well as developing social skills (Košir & Tement, 2014; O'Connor, Dearing, & Collins, 2011). Thus, in addition to professional knowledge and instructional management, social factors are considered in terms of teacher characteristics. In a detailed study, Lee (2012) investigated whether student-teacher relationships affect student achievement using OECD USA data. As expected, he found that the student-teacher relationship was a significant predictor of reading performance in American high school students. Furthermore, in their critical review, Stronge, Tucker, and Hindman (2004) detailed the characteristics of effective teachers as a social phenomenon, referring to humour, caring, respect and fairness as components of social interaction with students. Finally, communication has been highlighted as a crucial element of socialization between students and teachers and is accepted as another component that affects student achievement. Given the critical role of communication in motivating students to engage in a topic (Robinson & Xavier, 2007), Stronge et al. (2004) assert that "effective communicators are likely to be more effective teachers" (p. 10).

In addition to the social factors mentioned above, teachers' personal qualities are crucial in the teaching and learning process. According to Sandel (2006), the personal qualities of teachers are key to student achievement, yet they are often overlooked. Different and independent from social factors, personal qualities relate to teachers' self-characteristics, such as self-communication skills (Prozesky, 2000), effort, morality, openness to new ideas or approaches (Hare, 2002), readiness to teach, and beliefs about teaching and learning (Ernest, 1989). In a recent study, Timmermans et al. (2016) investigated the link between teachers' expectations and student achievement and found a positive relationship. Similarly, in his book on the philosophy of mathematics education, Ernest (1991) discussed how teachers' beliefs affect their instructional decisions and drew a conceptual framework for the case of mathematics. Furthermore, another study by Xu (2012) revealed the impact of teachers' beliefs on teacher consciousness, teaching methods and teaching policy. On the other hand, in investigating another component of personal qualities, Loy (2006) demonstrated the impact of communication skills in a learning setting on student achievement; while Klusmann, Richter, and Lüdtke (2016) also tested whether teachers' emotional exhaustion impacts student achievement and found a negative relationship between those variables.

Finally, related to but distinct from professional knowledge, teachers' backgrounds may also affect student achievement. In this sense, background refers to the source of a teacher's fund of knowledge. For instance, whether the type of school from which a teacher has graduated is a variable in the success of their students is a question that has been frequently studied (e.g., Alexander & Fuller, 2004; Wenglinsky, 2000). Alexander

and Fuller (2004), for example, compared the scores on the Texas Assessment of Academic Skills (TAAS) of students who were taught by certified teachers compared to those taught by non-certified teachers. Their results revealed a statistically significant difference in favour of students of certified teachers. Similarly, teaching experience (years of teaching) and teaching degrees are seen as important components of background. In this regard, Sauceda (2017) investigated whether both years of experience and teaching degree had an impact on student achievement and revealed a positive relationship, as expected. Similar findings have been reported by researchers such as Dial (2008), Ferguson (2005) and Woolridge (2003).

Given all of the characteristics and qualities discussed above, we have constructed a conceptual relational network in order to frame our meta-analysis in a rational manner. The network is illustrated below, in Figure 1.

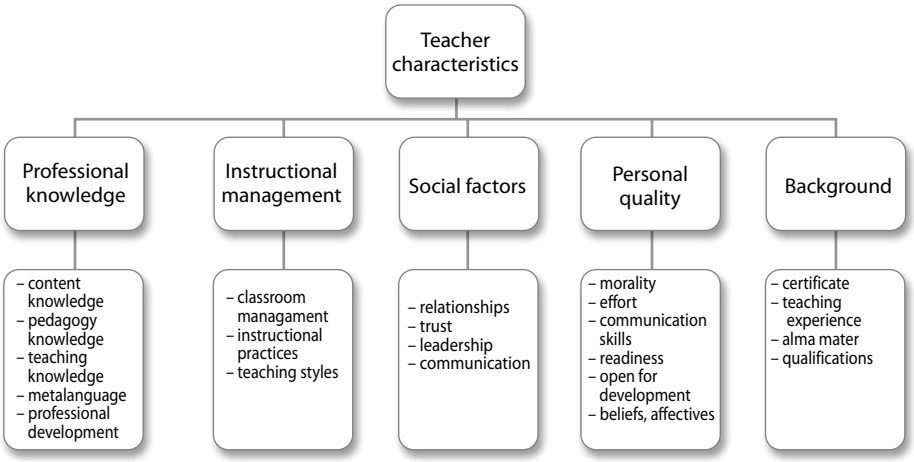

Figure 1. Components of teacher characteristics

Many researchers have arrived at the consensus that teacher characteristics have an important effect on student achievement. However, the extent of this importance is open to discussion and has multi-dimensional characteristics. Moreover, the effect of teacher characteristics on student achievement is a complicated issue, as academic achievement can be influenced by many factors, both in school and out of school. Furthermore, it is very difficult to test the effect of teacher characteristics on student achievement alone, and the generalizability of data obtained from a limited number of subjects is rather low. Due to these limitations, investigating the effects of characteristics from different perspectives using a large number of studies and reaching a general conclusion can give more reliable results.

Numerous studies have investigated the relationship between teacher characteristics and student achievement, ranging from issues such as teachers' professional knowledge to instructional management style, personal qualities, background and social factors. However, differing results were found concerning the effects of various factors on student

achievement. For example, while Gbore and Daramola (2013) revealed that teachers' backgrounds had a high correlation to student achievement, Bice (2016) found a low correlation between social factors and achievement. Likewise, differences have been noted in terms of subjects being taught. Bird (2017), for instance, found a significant relationship between students' science achievement and teachers' personal qualities, while he found a negative relationship for language. In addition, while Wilson (2012) found no relationship between student achievement and instructional management at the elementary school level, Akbari and Allvar (2012) did observe that classroom management had an impact on achievement at the high school level.

As can be seen in these examples, the effect of teacher characteristics on student achievement is influenced by many variables, such as subjects taught and grade levels. Moreover, aside from these issues, the roles of teachers varying with time have often been mentioned by researchers. As Cranston (2000) points out, teachers' skills and knowledge competencies, as well as their classroom activities, are in the process of change in the 21st century. Moreover, when the cultural dimension of education is considered, it has also been that this differentiation varies according to country. For example, Nortvedt et al. (2016) revealed a surprising conclusion in their large-scale study, which examined 37 education systems in TIMSS 2011 and PIRLS 2011 and revealed a significant positive correlation between instructional quality and reading and mathematics achievement in fewer than half the participating educational systems. This raises the question of whether the effect of teacher qualities on student achievement varies from country to country. Finally, it has been observed that the changing role of education and schools inevitably brings about changes in the roles of teachers, as well, requiring them to adapt accordingly (Griffin, Care, & McGaw, 2012). This brings to mind the question of how the characteristics of teachers impacting student achievement have changed over time.

Research Hypotheses

Considering the variables mentioned above, and considering the existing studies on the relationship between teacher characteristics and student achievement, this study aimed to test the following hypotheses, bringing together the results of previous research:

- **H_1** Teacher characteristics have a positive effect on student achievement.
- **H_2** The sample group is a moderator for the positive effect of teacher characteristics on student achievement.
- **H_3** The school subject/course is a moderator for the positive effect of teacher characteristics on student achievement.
- **H_4** Country is a moderator for the positive effect of teacher characteristics on student achievement.
- **H_5** The year in which a study was conducted is a moderator for the positive effect of teacher characteristics on student achievement.
- **H_6** The type of teacher characteristics is a moderator for the positive effect of expectation on student achievement.

Method

Study Design

In this study, the effect of teacher characteristics on student achievement was tested through meta-analysis, which is a research design used to gather the results of several independent studies on certain subjects and to apply a statistical analysis to the findings (Littel et al., 2008; Petitti, 2000; Wampold, Ahn, & Kim, 2000).

Review Strategy and Criteria for Inclusion/Exclusion

To determine which studies to include in the meta-analysis, the Science-Direct, ProQuest and EBSCO academic databases were used to conduct a review of the literature. For this process, the titles of the studies were screened for the appearance of the terms *teacher* and *achievement/ success/ performance,* while the main texts were screened for the term *correlation*. Since there is a very high volume of studies on teacher characteristics, the term "teacher" was used as a keyword to search the databases for relevant research on teacher characteristics. The start and end dates for the research to be included in the current study were identified as January 1, 2000, and December 31, 2017; i.e., research published between these dates was included. Types of research that were targeted included doctoral dissertations and master's theses, as well as peer-reviewed journals. The reason for the inclusion of the dissertations and theses was to eliminate possible publication bias.

A number of strategies were used to identify the research studies that were appropriate for the meta-analysis. Firstly, the full-text studies that were identified according to the review strategy explained above were examined via their titles and abstracts to determine their relevance to the aim of this research. Secondly, a study pool of 1321 documents was established by downloading the seemingly relevant studies according to their titles and abstracts after refining all the studies according to the keywords. Thirdly, all studies in the pool were examined in detail to see whether they meet the criteria to be included in the meta-analysis. At this stage, the relevant studies including the required quantitative measures were coded, while those studies that did not meet the criteria set by the researchers were omitted from the analysis. According to the results of the coding, a total of 209 of the studies in the pool were found to be appropriate, while 1112 of them were found to be irrelevant and were hence eliminated. The 209 studies yielded 1042 correlation coefficients. The descriptive statistics of the 209 studies included in the analysis are presented in Table 1.

The criteria for inclusion of the studies in the analysis were identified as follows:

- To have the statistical information necessary for correlational meta-analysis (n and r, or R^2 values);
- To be a study measuring the correlation between a sub-domain of teacher characteristics and student achievement/ success/ performance.
- Reasons for not including a study in the meta-analysis were as follows:

- ❏ Having no quantitative data (i.e., qualitative research);
- ❏ Not having a correlation coefficient;
- ❏ Not focusing on student achievement;
- ❏ Not focusing on teacher characteristics.

Table 1

Characteristics of the studies included in the meta-analysis

Options		1	2	3	4	5	6	Total
Type of publication		Article	Thesis/ Dissertation					-
	n	231	811					1042
	%	22.1	77.9					100
Sample group/unit		Preschool	Elementary school	Middle school	High school	University	Mixed	
	n	71	377	178	221	28	167	1042
	%	6.9	36.2	17.1	21.2	2.6	16	100
School subject/ course		General	Language	Mathematics	Science	Other		
	n	167	308	418	113	36		1042
	%	16	29.5	40	10.8	3.4		100
Country		V-C	H-I					
	n	82	960					1042
	%	7.9	92.1					100
Publication year		2000-2005	2006-2011	2012-2017				
	n	169	447	426				
	%	16.2	42.9	40.9				100
Type of teacher characteristics		Background	Instructional	Personal quality	Professional knowledge	Social factors		
	n	207	221	405	14	195		1042
	%	19.8	21.2	38.8	1.3	18.9		100

Coding Process

The coding process was essentially a data sorting process used to ascertain which data were clear and suitable for the study. In this scope, a coding form was developed before the statistical analysis was conducted, and the coding was conducted according to the form. The main aim was to develop a specific coding system that allowed the researchers to see the entirety of the studies in a general way, without missing any of the characteristics of each individual study. The coding form that was developed for this study was comprised of:

- ❏ References for the research;
- ❏ Sample information;
- ❏ Type of publication;
- ❏ Sample group;
- ❏ School subject/course;

- Country;
- The years in which the studies were conducted;
- Type of teacher characteristics;
- Quantitative values (n and r or R^2).

Although all the studies with a correlation coefficient between teacher characteristics and student achievement were coded, not all of them were included in the meta-analysis. One of the reasons for this was that some of the studies examined the relationship using more than one sub-domain of the teacher characteristics determined in our theoretical framework as an integrated characteristic, rather than examining them separately. Hence, we could not decide under which sub-domain to include those correlations. Another reason for exclusion was that the studies included teacher characteristics irrelevant to those that were defined in the theoretical framework, such as teacher salary and teacher absence.

Data Analysis

The effect size acquired in the meta-analysis was a standard measurement value used in the determination of the strength and direction of the relationship in the study (Borenstein, Hedges, Higgins, & Rothstein, 2009). Pearson's correlation coefficient (r) was determined to be the effect size in this study. Because the correlation coefficient has a value between *+1* and *-1,* the *r*-value was evaluated by converting it into the value as it appears in the *z* table (Hedges & Olkin, 1985). Provided that more than one correlation value was given between the same structure categories in correlational meta-analysis studies, two different approaches were used in the determination of which to use in the meta-analysis (Borenstein et al., 2009; Kulinskaya, Morgenthaler, & Staudte, 2008). For the purposes of this study, (*i*) if the correlations were independent, all the related correlations were included in the analysis and were considered to be independent studies; and (*ii*) if there were dependent correlations, then the *highest correlation value* was accepted. Since we wanted to encompass all teacher characteristics, we attempted to include all the independent correlations in our analysis. Moreover, a *random-effect model* was used for the meta-analysis processes in this study, and the *Comprehensive Meta-Analysis* (CMA) program was applied. In interpreting the values obtained from CMA, Cohen's criterion (1988) for effect size was considered. In accordance with Cohen, the values between 0.10 – 0.30 were identified as a low (small), between 0.30 – 0.50 as a medium and 0.50 and greater as a high (large) effect size.

Moderator analysis

Moderator analysis is a method used to test the direction of the differences between subgroups and between the average effect sizes of the variables (Karadağ, Bektaş, Çoğaltay, & Yalçın, 2015). The statistical significance of the difference between moderator variables is tested using the Q statistic method developed by Hedges and Olkin (1985). Through this method, Q-within (Qw) tests the internal homogeneity

of the moderator variable, while Q-between (Qb) tests the homogeneity between the groups (Borenstein et al., 2009).

To determine the statistical significance of the differences between the moderators of the study, only the Q_b values were used. Five moderator variables that were expected to have a role in the average effect size were identified in the study. The first of these was the *sample group,* which was thought to play a role on the average impact of teacher characteristics on student achievement. The second was the type of teacher characteristics, which was also thought to have an effect on the relationship between teacher characteristics and student achievement. The others were *school subject/course, country* and *year in which the studies were conducted.*

Reliability and validity

To ensure the reliability and validity of the research, we took into consideration the following:

- For inclusion and exclusion, we evaluated the field related to the research variables and attempted to include all related studies except those that were irrelevant. We carried out a thorough literature review to outline the components of teacher characteristics, making an effort to include distinct and comprehensive categories. The criteria for inclusion and exclusion are presented in the methodology section. In this sense, the authors attempted to include all correlations related to different teacher characteristics but not to include repeated measures.
- The moderator analysis assisted in examining the effects from different perspectives as a means to reach more appropriate conclusions.
- Publication bias was examined to determine whether it influenced the effect size.
- To determine the reliability of the coding system, two researchers performed the coding process independently. Cohen's Kappa reliability coefficient was determined between the coders to be .91, which is an acceptable value for reliability.

Publication Bias

A funnel plot was used to determine the existence of publication bias in the studies selected for the analysis. Evidence from the funnel plot that publication bias affected the studies can be seen in Figure 2. A serious asymmetry would be expected in the funnel plot if there were a publication bias. In this regard, the concentration of the plots on one side under the line of average effect size, particularly in the bottom section of the funnel, would suggest the probability of publication bias in the studies. In the present study, no evidence of partiality of the publications was observed in any of the 1042 data points subjected to meta-analysis.

Although no partiality in publications was observed in the funnel plot, the results of Duval and Tweedie's trim and fill test, which was applied to determine the effect of partiality in publications acquired with the meta-analysis using the random effect model, have also been examined. As is seen in Table 2, there is no difference between

the effect observed and the artificial effect size created to address the effect of the partiality of the publications. The research on each side of the centre line is symmetrical; this is an indicator of non-difference. Because there is no evidence indicating lost data on either side of the centre line, the difference between the fixed effect size and observed effect size is zero.

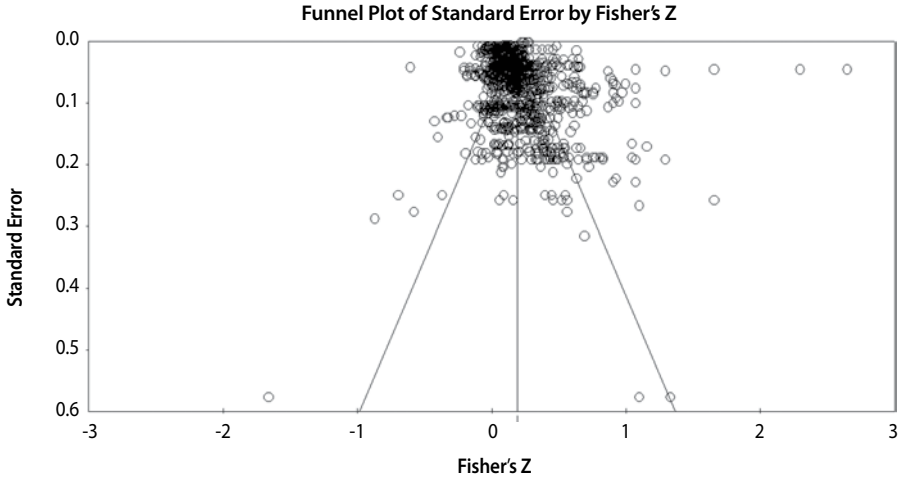

Figure 2. Effect size funnel for publication bias

Table 2

Duval and Tweedie's trim and fill test results

	Excluded Studies	Point Estimate	CI (Confidence Interval)		Q
			Lower Limit	Upper Limit	
Observed values		.19	.19	.20	45155.37
Adjusted values	0	.19	.19	.20	45155.37

Table 3 shows the results of the meta-analysis in terms of student achievement and teacher characteristics. The findings supported H_1, which posits that there is a positive relationship between student achievement and teacher characteristics. The effect size of teacher characteristics on student achievement was calculated to be .19. This value shows that teacher characteristics have a low-level effect (see Cohen, 1988) on student achievement.

The findings also supported hypothesis H_2, which asserts that the sample group plays a moderator role on the level of effect that teacher characteristics have on student achievement. The moderator analysis showed that the difference between the level of effect of a sample group was statistically significant ($Qb=117.650$, $p<.01$). In line with this, the analysis revealed that the level of effect of teacher characteristics on student achievement is statistically significant for preschool [r=.22], elementary school [r=.17], middle school [r=.14], high school [r=.26], university [r=.22], and mixed school levels [r=.19]; and all these effect sizes can be accepted to be low-level.

Table 3

Findings regarding the relationship between student achievement and expectation: Meta-analysis results

Variable	K	N	R	CI (Confidence Interval)		Q	Q_b
				Lower Limit	Upper Limit		
Teacher Characteristics	1042	3,225,488	.19*	.18	.20	**45155.37***	
Moderator [Sample Group]							**117.650***
Preschool	71	68,775	.22*	.20	.25		
Elementary school	377	477,526	.17*	.16	.19		
Middle school	178	297,736	.14*	.12	.16		
High school	221	2,272,302	.26*	.24	.28		
University	28	30,380	.22*	.18	.26		
Mixed	167	78,769	.19*	.17	.21		
Moderator [School Subject/ Course]							**107.677***
General	167	166,279	.22*	.20	.24		
Language	308	293,517	.22*	.20	.23		
Mathematics	418	2,587,752	.15*	.13	.16		
Science	113	160,025	.21*	.19	.23		
Other	36	17,915	.32*	.28	.35		
Moderator [Country]							**24.358***
V-C	82	57,659	.26*	.23	.29		
H-I	960	3,167,829	.19*	.18	.20		
Moderator [Year of Publication]							**0.553**
2000-2005	169	1,946,331	.20*	.18	.21		
2006-2011	447	613,758	.19*	.18	.20		
2012-2017	426	665,399	.19*	.18	.20		
Moderator [Type of Teacher Characteristics]							**248.941***
Background	207	2,132,912	.14*	.12	.15		
Instructional management	221	412,189	.13*	.11	.15		
Personal Quality	405	455,209	.27*	.26	.28		
Professional Knowledge	14	5,451	.23*	.16	.30		
Social Factors	195	219,727	.17*	.15	.18		

*p<.01

The moderator analysis likewise supported hypothesis H_3, which presumes that school subject/course is a moderator variable for the effect of teacher characteristics on student achievement, as there was a statistically significant difference in the level of effect for school subjects (Qb=107.677, p<.01). The findings also revealed that the level of effect of teacher characteristics on student achievement is statistically significant and low for general achievement [r=.22], for language [r=.22], for mathematics [r=.15], for science [r=.21], and for other courses such as sociology, history, physical science and so on) [r=.32].

Moreover, the results of the moderator analysis showed that hypothesis $H_{4,}$ regarding the moderator role of the country on the level of effect of teacher characteristics on student achievement, was also supported. The moderator analysis also showed that the difference between the level of effect of countries was statistically significant (Qb=24.358, p<.01). In this scope, it was found that teacher characteristics in studies conducted in vertical-collectivist [r=.26] and horizontal-individualist [r=.19] countries had a low-level effect on student achievement, and the countries with the higher level of effect were found to be vertical-collectivist cultures.

The results did not support $H_{5,}$ which hypothesized that publication year plays a moderator role in expectation having an effect on student achievement. Namely, the moderator analysis did not reveal a statistically significant difference in the level of effect for publication year of the studies (Qb=0.553, p>.05), suggesting that the strength of the relationship is similar among publications from different time intervals. On the other hand, a low-level effect of teacher characteristics on student achievement was found in regard to publications dated between 2000 and 2005 [r=.20], between 2006 and 2011 [r=.19], and 2012 and 2017 [r=.19].

In comparing the strength of the relationships across types of teacher characteristics (H_6), it was found that the average weighted correlation for each type of teacher characteristic and student achievement was significantly different (Qb=248.941, p<.01). Additionally, it was found that the effect of teacher background [r=.14], instructional management [r=.13], personal qualities [r=.27], professional knowledge [r=.23], and social factors [r=.17] on the student achievement were significant and low-level. Hence, it was found that personal qualities had the strongest effect on student achievement.

Conclusion and Discussion

A total of 1042 correlation values from 209 independent research studies published between 2000 and 2017, with a total of 3,225,488 participants, were included in this meta-analysis to examine the magnitude of the effect size of teacher characteristics on student achievement. Sample group, school subject/course, country, year of publication, and type of teacher characteristics were considered as moderator variables in the study. The results show that teacher characteristics have a low-level positive effect on student achievement. No similar study examining the aforementioned relationship has been encountered in the literature, but there are other studies investigating the different types of teacher characteristics that have concluded that these characteristics played a significant role on student achievement. Although a significant difference was expected, the low level of the effect may be seen as surprising, given the claims that teacher characteristics are the main determinants of student achievement. As Jepsen (2005) indicated, there is a common and strong belief on the effect of teacher characteristics on student achievement, but the specific characteristics that affect student achievement are difficult to identify. Therefore, the moderator analysis using the classification in Fig. 1 gave us the opportunity to demonstrate the effect sizes of the dimensions.

In this sense, the moderator analysis for the sample group was significant in terms of the effect of teacher characteristics on student achievement. The results of existing studies examining the relationship between teacher characteristics and student achievement in different types of schools are in conflict, with some suggesting a positive and strong relationship in middle school (e.g., Akiba et al., 2017; Baker, 2013), and others suggesting no relationship (Marszalek et al., 2010; Odom & Bell, 2015) for the same level. Similar inconsistencies exist in relation to high schools (e.g., Gbore & Daramola, 2013; Jarvis, 2006). The current meta-analysis study, however, revealed that the level of effect size is significant for all school levels and that high school has the highest effect size, although it is close to the effect sizes for the preschool and undergraduate levels. One reason for the increase in effectiveness may be the academic difficulty of the disciplines addressed in high school and higher education. On the other hand, the relationship between student achievement and teacher characteristics at the preschool level is important, since it exhibits the role of the teacher at the first stage of schooling, as indicated by many researchers (Boye, 2014; Gaias, Abry, Swanson, & Fabes, 2016).

Furthermore, when the effect of teacher characteristics on student achievement was examined in terms of subjects/courses, a significant and positive effect was found for all subjects. The effect sizes were found to be similar for science, language and general achievement, and lowest for mathematics. The existing research supports this result in that they found the effect of teacher characteristics on student achievement in non-math courses to be higher than for math courses (e.g., Ferguson & Ladd, 1996; Scrivner, 2009) as well as little effect of teacher characteristics in students' mathematics achievement (Leavy, 2016; Oliveras, 2014). The low-level effect revealed for mathematics in comparison to other courses is thought to be a result of the nature of mathematics and its axiomatic structure. In other words, conceptual understanding, rather than repetition, is at the forefront in mathematics (Rittle-Johnson, Siegler, & Alibali, 2001). For this reason, it is known that a different type of intelligence is dominant in mathematics learning (Gardner, 1994). According to the results of the moderator variable analysis for countries in which the study samples were chosen, the country variable was found to play a moderator role on the effect of teacher characteristics on student achievement. The sample groups chosen from vertical-collectivist countries yielded a higher level of effect sizes than the horizontal-individualist countries. This may be the result of the properties of this dual categorization of countries in that the people in the vertical-collectivist countries focus on enhancing the cohesion and status of their in-groups, while the people in the horizontal-individualist countries tend to express their uniqueness and self-reliance (Shavitt, Johnson, & Zhang, 2011). Triandis and Gelfand (1998) also define vertical collectivism as seeing the self as a part of a collective, and horizontal individualism as seeing the self as fully autonomous. Hence, it may be asserted that the students in vertical-collectivist countries are more collaborative than those in horizontal-individualist countries, which affects their achievement positively. Hence, it may be claimed that students and teachers in vertical-collectivist countries work more collaboratively than those in horizontal-individual countries.

The moderator analyses carried out in regard to the year of publication showed that the level of effect of teacher characteristics on student achievement was not statistically significant for its sub-categories. However, the effect sizes for the unique sub-categories of publication year were significant and similar. This shows that the results regarding the relationship between the teacher characteristics and student achievement did not change over three consecutive five-year periods. Thus, although this result restricts the effect of time on the impact of the teacher on the student, the effect does not change over the years. Finally, the study also tested the effect of types of teacher characteristics as a moderator variable. According to the moderator analysis, this variable plays a moderator role on the effect of teacher characteristics on student achievement. This suggests that the effect sizes of different types of teacher characteristics differentiate from one another. Moreover, the two highest effect sizes belong to personal qualities and professional knowledge, which is supported by a number of studies asserting that teachers' personal qualities (Eells, 2011; Yu & Singh, 2018) and professional knowledge (Hill, Rowan, & Ball, 2005; Kraft, Blazar, & Hogan, 2016) are influential on student achievement. In light of the results of this study, it can be stated that teacher characteristics have a meaningful effect on student performance, which is thought to be the main outcome of education.

When the results of this study are examined, it can be concluded that the moderator variables of the sample group, school subject/course, country, the publication year of a study and type of teacher characteristics have an impact on the relationship between teacher characteristics and student achievement. In other words, the level of this relationship may change according to these moderator variables. The findings related to the hypotheses of this research have been summarized in Table 4. As seen in the table, all the hypotheses except H_5 have been accepted.

Table 4

Findings regarding the relationship

Hypotheses	Independent Variables	Dependent Variable	Effect Size	Decision
H_1	Teacher Characteristics	Achievement	.19	Accept
	Moderators			
H_2	Sample Group			Accept
H_3	School Subject/ Course			Accept
H_4	Country			Accept
H_5	Year of Publication			Reject
H_6	Type of Teacher Characteristics			Accept

Limitations and future research

The current study aimed to investigate whether teacher characteristics have an effect on student achievement. Although this study found a low but significant impact of teacher characteristics on student achievement, there are considerable limitations, as well as suggestions for future research. First, the analyses were restricted to the existing body of literature. Therefore, even if a researcher who has conducted quantitative integrations sees that his or her work could have been improved, there is no way to put such changes into practice. Second, as one of the major disadvantages of the current study, the research from which the data were obtained were correlational. Thus, it is not possible to objectively claim that the results can better explain causal influences, considering that qualitative studies are more effective in explaining the nature of teacher characteristics. Third, given the fact that the studies included in this meta-analysis were carried out in the English language, the majority of these studies were centred on English-speaking countries. Considering the influence of culture on education, this situation may raise questions about generalizability. Finally, the present study examined the influence of the teacher characteristics on student achievement by taking a large framework into consideration. As such, the comments made were of a general nature.

Considering all of these limitations, the following suggestions are made for future research:

1. There is a need for studies to specifically examine the impact of sub-components (e.g., content knowledge, pedagogical knowledge, instructional practices, relationships, and so on) on student achievement in terms of each component in the framework (professional knowledge, instructional management, social factors, personal qualities and background).
2. This analysis was limited to three databases, with studies conducted in the English language. Further meta-analysis studies should consider other databases, as well as studies in other languages.
3. Quantitative studies are better able to explain a given situation; as such, further investigations are needed to examine why the expected components had little effect on student achievement.

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Utjecaj osobina učitelja na učenička postignuća: metaanalitička studija

Sažetak

Pretpostavljajući da osobine učitelja imaju utjecaj na rezultate učenja, istraživanjem su se ispitali stavovi te su izneseni statistički dokazi i rezultati istraživanja. U ovoj metaanalitičkoj studiji osobine učitelja određene su na temelju postojeće literature na osnovi koje su analizirani odnosi osobine učitelja i učeničkih postignuća. Analitički protokol pregleda literature pokriva u cijelosti 1,042 međuovisne vrijednosti pronađenih u 209 neovisnih istraživačkih članaka ili teza/ disertacija, koje uključuju 3 225 488 sudionika istraživanja. Rezultati primjene modela slučajnoga učinka pokazuju da osobine učitelja imaju nizak pozitivan utjecaj na učenička postignuća. Pozitivni utjecaji analizirani su u okviru učiteljskih vještina i kvalifikacija. U kontekstu sadržajnih elemenata učiteljskih vještina posljedice svih dimenzija unutar okvira pokazale su se značajnima. Preciznije, pokazalo se da na učenička postignuća ponajviše utječu učiteljske osobne kvalitete, dok je najmanji učinak ostavljao proces upravljanja učenjem. U svjetlu ovih zaključaka dane su određene sugestije i preporuke za buduća istraživanja.

Ključne riječi: *metaanaliza, učeničko postignuće, učiteljske osobine*

Uvod

Učitelji, koji su u izravnom kontaktu s onima koje poučavaju, imaju ključnu ulogu u postizanju ciljeva obrazovanja i presudni su za oblikovanje obrazovnih aktivnosti. Ova se uloga razvijala tijekom vremena. U 21. stoljeću su, npr. napravljene značajne promjene u obrazovnoj filozofiji što je dovelo do pristupa kao što su „učenje učenja" nasuprot pasivnom stjecanju predodređenih sadržaja kao i „aktivno učenje" umjesto pasivnoga usvajanja informacija (Güler, 2014). Navedeni izmijenjeni pristupi doveli su do rasprava o važnosti učiteljskoga znanja, vještina i afektivnih značajki na proces učenja.

Štoviše, uzrokovano neuspjehom da se u istraživanju sustavno definira odnos između varijabli politika i učeničkih postignuća, novije studije posebice su se usredotočile na „učiteljsku varijablu" (Kukla-Acevedo, 2009). I ova studija također, u jednom dijelu analizira osobine učitelja opisane u literaturi kao značajne za učenička postignuća.

Nakon provedene analize donosimo okvir osobina učitelja usklađen s našom sintezom postojeće literature.

Učiteljske osobine

U raspravi o kvalitetama i osobinama učinkovitoga učitelja važan je element njegovo znanje potrebno za poučavanje o određenoj temi ili ideji. U tome smislu istraživanja o učiteljskim osobinama imaju jedinstveni stav o vrstama znanja koje učitelj treba posjedovati. Ideju znanja o poučavanju sustavno je po prvi put uveo Shulman (1986) čiji je rad nadahnuo druge istraživače. Znanje o poučavanju prilagođeno je specifičnim disciplinama kao što su matematika, fizika itd. (npr. Ball, Thames, i Phelps, 2008; Grossman, 1990; Koehler i Mishra, 2009). Ova vrsta znanja tiče se prvenstveno *profesionalnoga znanja* koje učitelj treba posjedovati i obuhvaća pedagoško znanje i znanje o poučavanju te poznavanje gradiva nastavnoga predmeta (Baki, Baki, & Arslan, 2011). Brojni poučavatelji naveli su kako je učiteljevo profesionalno znanje povezano s učeničkim postignućima (Metzler i Woessmann, 2012; Selling, Gargia, i Ball, 2016), a ovu tvrdnju potvrđuju i rezultati istraživanja Baumerta i sur. (2010) koji pokazuje značajan pozitivan utjecaj pedagoškoga znanja na učeničko učenje.

Iz drugog kuta gledanja, učiteljevo korištenje profesionalnoga znanja u učionici je povezano i s upravljanjem učenja. Drugim riječima, učinkovito poučavanje zahtijeva prikladan pristup organizaciji učionice. Upravljanje učenjem sastoji se od niza elemenata, od toga kako je učionica uređena do stila i prakse poučavanja koja se u njoj izvode (Martin & Sass, 2010). Glavna svrha upravljanja učenjem je stvaranje učioničke okoline pogodne za ostvarivanje učeničkih postignuća. Unatoč tome, dok je upravljanje učenjem naglašeno kao značajan pokazatelj učiteljeve učinkovitosti (Corbett i Wilson, 2002), ne postoji konsenzus o metodi ili strategiji koja bi bila učinkovitija u postizanju većih učeničkih postignuća (Brannon, 2010; Churchward, 2009). S druge strane opće je prihvaćeno da pristup koji u središte stavlja učenika, stvara veću motivaciju za učenjem, dublje konceptualno razumijevanje materijala i pozitivniji stav prema poučavanom predmetu (Collins i O'Brien, 2003; Meyers i Jones 1993). Zbog toga su novi kurikuli često usmjereni na konstruktivistički pristup koji upućuje na učenje usredotočeno na učenika (Henson, 2015; Tan, 2017).

Osim toga, učitelji kao dio školske organizacije kontinuirano komuniciraju s kolegama, školskom upravom i učenicima. Prema teoriji vezivanja (Ainsworth, 1982) jedna je od osnovnih pretpostavki da su pozitivni odnosi između učitelja i učenika nužni za stvaranje sigurnoga okruženja za učenje, stvaranje mostova za akademski napredak i razvoj društvenih vještina (Košir i Tement, 2014; O'Connor, Dearing, i Collins, 2011). Iz toga su razloga uz profesionalno znanje i upravljanje učenjem, i socijalni faktori uzeti u obzir kao osobine učitelja . U detaljnoj studiji Lee (2012) na osnovi OECD USA podataka istražuje utječu li odnosi učitelja i učenika na učenička postignuća. Kako je i očekivano, utvrdio je kako su odnosi učitelja i učenika značajan prediktor vještine čitanja među američkim srednjoškolcima. Usto su, u svojem kritičkom pregledu, Stronge,

Tucker i Hindman (2004) precizirali pokazatelje djelotvornih učitelja kao društvene fenomene, navodeći humor, brigu, poštovanje i pravednost kao sastavnice društvene interakcije s učenicima. Naposljetku, komunikacija je istaknuta kao ključni element socijalizacije među učenicima i učiteljima i prihvaćena je kao još jedan čimbenik koji utječe na učenička postignuća. Uzimajući u obzir važnost komunikacije u motiviranju učenika za sudjelovanje u obradi nekog nastavnoga sadržaja (Robinson i Xavier, 2007) Stronge i sur. (2004) procjenjuju da će „djelotvorni komunikatori vjerojatnije biti i djelotvorni učitelji" (str. 10).

Kao dodatak gore navedenim društvenim čimbenicima, osobne kvalitete učitelja ključne su u poučavanju i procesu učenja. Prema Sandelu (2006), osobne kvalitete učitelja ključ su za učenička postignuća, no one su, bez obzira na to, često zanemarene. Različite i neovisne o društvenim čimbenicima, osobne kvalitete odnose se na učiteljeve osobine kao što su samo-komunikacijske vještine (Prozesky, 2000), trud, moralnost, otvorenost prema novim idejama ili pristupima (Hare, 2002), spremnost na poučavanje i stavovi o poučavanju i učenju (Ernest, 1989). U skorijim studijama Timmermans i sur. (2016) istražuju vezu između učiteljskih očekivanja i učeničkih postignuća pri čemu pronalaze međusoban pozitivan odnos. Slično tomu, u svojoj knjizi o filozofiji poučavanja matematike, Ernest (1991) razmatra kako učiteljska uvjerenja utječu na njihove nastavne odluke i oslikava konceptualni okvir u slučaju matematike. Dodatno, studija Xua (2012) rasvjetljava utjecaj učiteljevih uvjerenja na njegovu svijest, metode poučavanja i pristup poučavanju. S druge strane, istražujući drugi čimbenik osobnih kvaliteta Loy (2006) demonstrira utjecaj komunikacijskih vještina u prostoru poučavanja na učenička postignuća; dok Klusmann, Richter i Lüdtke (2016) također testiraju utječe li iscrpljenost učitelja na učenička postignuća i pronalaze negativnu vezu među varijablama.

Konačno, povezano, ali jasno odvojeno od profesionalnoga znanja, životna iskustva učitelja mogu utjecati na učenička postignuća. U tome smislu životna iskustva učitelja odnose se na izvore učiteljskoga znanja. Na primjer, ima li utjecaja škola koju je učitelj završio na uspjeh njegovih učenika pitanje je koje se često istraživalo (npr., Alexander i Fuller, 2004; Wenglinsky, 2000). Alexander i Fuller (2004), na primjer, uspoređuju rezultate na Teksaškom ispitu akademskih vještina (TAAS) među učenicima koje su poučavali certificirani učitelji i onima koje su poučavali necertificirani učitelji. Njihovi rezultati otkrivaju statistički značajnu razliku u korist učenika certificiranih učitelja. Slično, učiteljevo iskustvo (godine poučavanja) i njegova diploma smatraju se važnim sastavnicama učiteljevih životnih iskustava. S tim u vezi Sauceda (2017) istražuje imaju li i godine radnoga iskustva i učiteljska diploma utjecaj na učenička ostvarenja te, očekivano, otkriva pozitivan odnos. Do sličnih su zaključaka došli i istraživači kao što su Dial (2008), Ferguson (2005) i Woolridge (2003).

Uzimajući sve osobine i kvalitete razmotrene u gornjem tekstu sastavili smo konceptualnu mrežu veza kako bismo našu metaanalizu uobličili na racionalan način. Mreža je prikazana na slici 1.

Slika 1.

Brojni su istraživači došli do konsenzusa da osobine učitelja imaju važan učinak na učenička postignuća. Bez obzira na to, mjera u kojoj je tomu tako otvorena je za raspravu i obilježena višedimenzijskim svojstvima. Usto, učinci osobina učitelja na učenička postignuća složeno je pitanje jer akademsko postignuće može biti potaknuto mnoštvom čimbenika u školi i izvan nje. Nadalje, iznimno je teško povjeriti učinke osobina učitelja na učenička postignuća izdvojeno dok je generalizacija podataka skupljenih od ograničenoga broja ispitanika razmjerno mala. Zbog tih ograničenja istraživanje učinaka osobina iz različitih kutova korištenjem velikog broja studija i postizanje općenitijega zaključka može dati vjerodostojnije rezultate.

Brojne studije istraživale su odnos između osobina učitelja i učeničkih postignuća u rasponu od pitanja kao što su učiteljeva profesionalna znanja do stila upravljanja poučavanjem, osobnih kvaliteta, životnih iskustava i društvenih čimbenika. Međutim, raznovrsni su rezultati pronađeni u istraživanju učinaka različitih čimbenika na učenička postignuća. Na primjer, dok Gbore i Daramola (2013) otkrivaju da učiteljeva životna iskustva imaju visok utjecaj na studentska postignuća, Bice (2016) pronalazi malu vezu između društvenih čimbenika i postignuća. Slično tomu, razlike su uočene i u odnosu predmeta koji se uče i poučavaju. Bird (2017) npr. pronalazi značajnu vezu između postignuća učenika u znanosti i učiteljevih osobnih kvaliteta, dok pronalazi negativnu vezu s jezicima. Nadalje, dok Wilson (2012) ne pronalazi vezu između učeničkih postignuća i upravljanja poučavanjem na osnovnoškolskoj razini, Akbari i Allvar (2012) zamjećuju kako upravljanje poučavanjem ostavlja utjecaj na srednjoškolskoj razini.

Kao što iz prethodnih primjera možemo vidjeti, djelovanje učiteljevih osobina na učenička postignuća pod utjecajem je brojnih čimbenika uključujući predmete i razinu obrazovanja. Dodatno, ostavimo li po strani ova pitanja, uloga učitelja mijenja se i vremenom, što je također spomenuto u istraživanjima. Kako Cranston (2000) ističe, mijenjaju se učiteljske kompetencije, vještine i znanja kao i njihove aktivnosti u učionici u 21. stoljeću. Usto, kada se razmatra i kulturna dimenzija, dolazi se do različitih zaključaka ovisno o zemlji u kojoj je provedeno istraživanje. Na primjer, Nortvedt i sur. (2016) dolazi do iznenađujućih zaključaka u svojoj opsežnoj studiji koja ispituje 37 obrazovnih sustava u TIMSS 2011 i PIRLS 2011 i zaključuje kako postoji značajna pozitivna korelacija između kvalitete poučavanja i čitateljskih i matematičkih postignuća u manje od polovine obrazovnih sustava uključenih u istraživanje. To dovodi do pitanja variraju li učinci učiteljskih kvaliteta na učenička postignuća u različitim zemljama. U konačnici, uočeno je kako promjene u školskom obrazovanju neizbježno dovode do promjena u ulozi učitelja te od njih zahtijeva da im se prilagode (Griffin, Care i McGaw, 2012). To također dovodi i do pitanja kako se utjecaj učiteljevih osobina na postignuća učenika mijenjao tijekom vremena.

Istraživačke hipoteze

Razmatrajući prethodno navedene čimbenike te razmatrajući postojeće studije o odnosu između osobina učitelja i učeničkih postignuća, ova studija nastoji provjeriti sljedeće hipoteze, uzimajući u obzir i rezultate prijašnjih istraživanja:

H_1 Osobine učitelja imaju pozitivan utjecaj na učenička postignuća.
H_2 Uzorak ispitanika je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.
H_3 Školski predmet je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.
H_4 Država je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.
H_5 Godina u kojoj je ova studija provedena je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.
H_6 Tip osobina učitelja je moderator pozitivnih učinaka očekivanih učeničkih postignuća.

Metodologija

Oblikovanje istraživanja

U ovom istraživanju utjecaj osobina učitelja na postignuća učenika testiran je metaanalizom, što je istraživački dizajn koji se koristi za prikupljanje rezultata nekoliko neovisnih studija o određenim temama i primjenu statističke analize na dobivene rezultate (Littel i sur., 2008; Petitti, 2000; Wampold, Ahn i Kim, 2000).

Pregled strategije i uvjeta za uključivanje/isključivanje

Kako bi se odredilo koja istraživanja uključiti u metaanalizu, pregledana je postojeća literatura pri čemu su korištene znanstvene baze podataka Science-Direct, ProQuest i EBSCO. U tome procesu naslovi istraživanja pretraženi su prema pojavnosti termina *učitelj* i *postignuće/ uspjeh/ performansa*, dok je glavni tekst pretražen prema pojavnosti termina *korelacija*. Kako postoji velik opseg studija o osobinama učitelja, termin „učitelj" korišten je kao ključna riječ u pretraživanju baza podataka kako bi se došlo do relevantnih istraživanja o osobinama učitelja. Kao početni i završni datum u pretraživanju relevantnih istraživanja uključenih u ovu studiju određeni su 1. siječanj 2000. i 31. prosinac 2017., tj. istraživanja objavljena u razdoblju između dva datuma. U pretražena istraživanja uključene su doktorske disertacije, diplomski radovi kao i članci objavljeni u stručnim časopisima. Razlog uključivanja disertacija i diplomskih radova jest eliminacija moguće pristranosti u odabiru vrste publikacija.

Značajan broj strategija korišten je pri identificiranju istraživačkih studija adekvatnih za provedbu metaanalize. Prvo, cjeloviti radovi koji su identificirani prema ranije pojašnjenoj strategiji ispitani su preko naslova i sažetaka kako bi se odredila njihova važnost za ciljeve ovoga istraživanja. Drugo, preuzimanjem relevantnih radova načinjen je istraživački fond od 1321 dokumenta, koji su se nakon početne pretrage po ključnim riječima na osnovi naslova i sažetka činili potencijalno značajnima. Treće, sve studije u istraživačkom fondu detaljno su proučene kako bi se utvrdilo ispunjavaju li preduvjete za uključivanje u metaanalizu. Ovdje su značajne studije, zajedno s traženim kvantitativnim mjerama, kodirane, dok su studije koje nisu ispunjavale preduvjete izostavljene iz daljnje analize. Prema rezultatima kodiranja, ukupno je 209 studija iz

fonda utvrđeno kao primjereno, dok je 1112 utvrđeno kao irelevantno i stoga nisu uvrštene u daljnji proces istraživanja. 209 studija dalo je 1042 korelacijska koeficijenta. Deskriptivna statistika 209 studija uključenih u analizu prikazana je u tablici 1.

Tablica 1.

Kriteriji za uključivanje studija u analizu određeni su na sljedeći način:

- Posjeduju statističke informacije neophodne za korelacijsku metaanalizu (*n* i *r,* ili R^2 vrijednosti)
- Radi se o studiji koja mjeri korelaciju između poddomena osobina učitelja i učeničkih postignuća/ uspjeha/ performansi.

Razlozi za neuključivanje studija u metaanalizu bili su sljedeći:

- Ne posjeduje kvantitativne podatke (tj. radi se o kvalitativnom istraživanju)
- Ne posjeduje korelacijski koeficijent
- Nije usredotočena na učenička postignuća
- Nije usredotočena na osobine učitelja.

Proces kodiranja

Proces kodiranja svodio se primarno na proces sortiranja korištenih podataka koji su relevantni za ovo istraživanje. U okviru toga, kodiranje je razvijeno prije nego što je rađena statistička analiza, te je proces kodiranja usklađen s tom formom. Glavni cilj bio je razviti specifičan sustav kodiranja koji bi omogućio istraživačima da u cjelosti vide cjeline studija, a da istodobno ne propuste bilo koju karakteristiku svake pojedine studije. Format kodiranja razvijen za ovu studiju sastoji se od:

- izvora istraživanja
- informacija o uzorku
- vrste publikacije
- uzorka ispitanika
- školskog predmeta
- zemlje
- godina u kojima je istraživanje provedeno
- vrste osobina učitelja
- kvantitativnih vrijednosti (n i r ili R2).

Iako su sve studije s korelacijskim koeficijentom između osobina učitelja i učeničkih postignuća kodirane, nisu sve uključene u metaanalizu. Jedan je od razloga za to što neke od studija istražuju odnos korištenjem više od jedne poddomene osobina učitelja utvrđenih u našem teorijskom okviru u obliku integriranih karakteristika umjesto da ih ispituju pojedinačno. Iz toga razloga nismo mogli odlučiti pod koju poddomenu uključiti integrirane korelacije. Drugi je razlog za isključivanje što studije uključuju one osobine učitelja koje se nisu dio našega teorijskog okvira kao što su osobni dohodak i odsutnost učitelja.

Analiza podataka

Učinak obujma postignut u metaanalizi je standardna mjera vrijednosti korištenih u određivanju jačine i smjera odnosa u studiji (Borenstein, Hedges, Higgins i Rothstein, 2009). Pearsonov korelacijski koeficijent *r* određen je kao efekt dimenzija studije. Kako korelacijski koeficijent ima vrijednost između *+1* i *-1* vrijednost *r* je evaluirana pretvaranjem u vrijednosti koje se pojavljuju u tablici *z* (Hedges i Olkin, 1985). Podrazumijevajući postojanje više od jedne korelacijske vrijednosti između istih strukturalnih kategorija u korelacijskim metaanalitičkim studijama, korištena su dva različita pristupa pri utvrđivanju koje korelacije koristiti u ovoj metaanalizi (Borenstein i sur., 2009; Kulinskaya, Morgenthaler i Staudte, 2008). Za potrebe ove studije, (*i*) ukoliko su korelacije neovisne, sve povezane korelacije uključene su u analizu i smatrane neovisnim studijama; (*ii*) ukoliko su korelacije ovisne, tada je uzeta *najviša korelacijska vrijednost*. Kako smo željeli obuhvatiti sve učiteljske osobine, nastojali smo uključiti sve neovisne korelacije u našu analizu. Dodatno, *model slučajnog učinka* korišten je za metaanalizu procesa studije kao te je primijenjen i *Comprehensive Meta-Analysis* (CMA). Pri tumačenju vrijednosti dobivenih korištenjem CMA u obzir je prema Cohenovu kriteriju (1988) uzet i učinak veličine. U skladu sa Cohenom, vrijednosti između 0.10 – 0.30 smatrane su niskim (malim), između 0.30 – 0.50 kao srednje i od 0.50 naviše kao visoke (velike) po intenzitetu učinka.

Moderatorska analiza

Moderatorska analiza je metoda koja se koristi za testiranje smjera razlika između podgrupa i između prosječnih posljedičnih veličina varijabli (Karadağ, Bektaş, Çoğaltay i Yalçın, 2015). Statistička važnost razlike među moderatorskim varijablama testirana je korištenjem Q statističke metode koju su razvili Hedges i Olkin (1985). Ovom metodom, Q- unutar (Qw) provjerava se unutarašnja homogenost moderirane varijable, dok Q- između (Qb) testira homogenost među grupama (Borenstein et al., 2009).

Samo su *Qb* vrijednosti korištene pri određivanju statistički značajne razlike među moderatorima. Identificirano je pet moderatorskih veličina za koje se očekivalo da će imati ulogu u prosječnom intenzitetu efekta. Prva od njih bila je veličina uzorka ispitanika za koju se vjerovalo da će imati važnost za prosječni učinak osobina učitelja na učenička postignuća. Druga je bila vrsta osobina učitelja za koju se također mislilo da će imati utjecaj na odnos između učiteljskih osobina i učeničkih postignuća. Ostale su bile *školski predmet*, *zemlja* i *godina u kojoj je istraživanje provedeno.*

Pouzdanost i opravdanost

Kako bi se osigurala pouzdanost i opravdanost istraživanja, u obzir smo uzeli sljedeće:

- Pri uvrštavanju i neuvrštavanju evaluirali smo područje povezano s istraživanim varijablama i nastojali uvrstiti sve vezane studije osim onih koje su se pokazale irelevantnim. Proveli smo detaljan pregled literature kako bismo utvrdili zajedničke sastavnice osobina učitelja, nastojeći pritom uključiti različite sveobuhvatne

kategorije. Kriteriji za uvrštavanje ili neuvrštavanje objašnjeni su u metodološkom dijelu. U određenom smislu autor je nastojao uvrstiti sve korelacije vezane uz različite osobine učitelja, ali istovremeno ne uvrstiti ponovljene vrijednosti.

- Moderatorska analiza pomogla je u ispitivanju utjecaja različitih perspektiva kao načina za postizanje primjerenih zaključaka.
- Pristranost u odabiru publikacija ispitana je da bi se odredilo koliko ona utječe na intenzitet utjecaja.
- Kako bi se odredila pouzdanost sustava kodiranja, dva su istraživača izvela postupak kodiranja odvojeno. Cohenov Kappa je utvrdio kako je koeficijent pouzdanosti između dva kôda 91, što je prihvatljiva razina pouzdanosti.

Pristranost u odabiru publikacija

Dijagram lijevka upotrijebljen je kako bi se utvrdila pristranost u odabiru publikacija među studijama odabranima za ovu analizu. Dokazi iz dijagrama lijevka o utjecaju publikacijske pristranosti vidljivi su u slici 2. Očekivana bi bila značajna asimetrija ako postoji pristranost u odabiru publikacija. U tom smislu koncentracija lijevka na jednoj strani ispod crte prosječnoga utjecaja, posebice u donjem dijelu lijevka, upućivala bi na vjerojatnost pristranosti u odabiru publikacija u studiji. U ovom istraživanju nije pronađen dokaz za pristranost u odabiru publikacija u bilo kojem među 1042 skupa podataka u metaanalizi.

Slika 2.

Iako nije utvrđena pristranost u izboru literature, pri korištenju dijagrama lijevka rezultati su ispitani i Duvalovim i Tweedijevim testom izrezivanja i dopune korištenjem slučajnog efekta kako bi se utvrdile posljedice djelomičnosti u publikacijama prikupljenim u metaanalizi. Kao što je vidljivo u tablici 2, ne postoji razlika između primijećenog učinka i veličine umjetnoga učinka stvorenoga da se riješi učinak pristranosti publikacija. Istraživanje pokazuje središnju simetriju na objema stranama, što je indikator ujednačenosti. Kako ne postoji dokaz koji bi upućivao na nedostatak podataka na bilo kojoj strani od središnje linije, razlika između utvrđene posljedične veličine i promatrane posljedične veličine je nula.

Tablica 2.

Tablica 3 pokazuje rezultate metaanalize u odnosu na učenička postignuća i osobine učitelja. Dobiveni reultati potvrđuju $H_{1,}$ što znači da postoji pozitivan odnos između učeničkih postignuća i osobina učitelja. Veličina učinka osobina učitelja na učenička postignuća izračunata je na vrijednost .19. Ta vrijednost pokazuje da osobine učitelja imaju mali učinak (vidi Cohen, 1988) na učenička postignuća.

Rezlutati potvrđuju i hipotezu $H_{2,}$ kojom se tvrdi kako uzorak ispitanika igra moderatorsku ulogu na razini utjecaja osobina učitelja na učenička postignuća. Analiza moderatora pokazuje kako je razlika između razine učinka na uzorku ispitanika statistički značajna ($Qb=117.650$, $p<.01$). S tim u vezi analiza otkriva kako

je razina posljedičnosti osobina učitelja na učenička postignuća statistički značajna na predškolskoj razini [r=.22], nižim razredima osnovne škole [r=.17], višim razredima osnovne škole [r=.14], srednjoj školi [r=.26], sveučilištu [r=.22] i mješovitoj kategoriji razina [r=.19] i da svi učinci mogu biti uzeti kao niski.

Analiza moderatora potvrđuje i hipotezu $H_{3,}$ kojom se tvrdi kako je školski predmet moderator varijable učinka osobina učitelja na učenička postignuća, budući da se pokazala statistički značajna razlika na razini učinka za različite školske predmete (Qb=107.677, p<.01). Ovi rezultati otkrivaju kako su osobine učitelja na učenička postignuća statistički značajne i niske za općenita postignuća [r=.22], za jezike [r=.22], matematiku [r=.15], znanost [r=.21] i ostale predmete kao što su sociologija, povijest, fizika, tjelesni i tako dalje [r=.32].

Štoviše, rezultati analize moderatora pokazuju i kako je pretpostavka o ulozi države na razinu utjecaja osobina učitelja na učenička postignuća, kako je pokazano u hipotezi $H_{4,}$ također utemeljena. Analiza moderatora također pokazuje kako je razlika u razinama učinka među državama statistički značajna (Qb=24 358, p<.01). U tom okviru utvrđeno je kako osobine učitelja u studijama provedenim u okomito-kolektivističkim [r=.26] i vodoravno-individualističkim [r=.19] državama rezultiraju u malom učinku na učenička postignuća i da u zemljama sa snažnijim učinkom pronalazimo okomito-kolektivističke kulture.

Rezultati ne potvrđuju pretpostavku $H_{5,}$ kojom se tvrdi kako godina objavljivanja igra ulogu moderatora u očekivanju postojanja učinka na učenička postignuća. Naime, analiza moderatora ne otkriva statistički značajnu razliku na razini učinka na osnovi godine objavljivanja studije (Qb=0.553, p>.05), što upućuje kako je veličina učinka slična među publikacijama iz različitih razdoblja. S druge strane, nizak učinak osobina učitelja na učenička postignuća pronađena je među publikacijama objavljenim između 2000. i 2005. [r=.20], između 2006. i 2011. [r=.19] i 2012. i 2017. [r=.19].

Uspoređujući intenzitet odnosa između različitih tipova osobina učitelja (H_6) utvrđeno je kako je prosječni intenzitet korelacije za različite tipove osobina učitelja i učeničkih postignuća značajno različit (Qb=248.941, p<.01). Dodatno je utvrđeno kako su učiteljeva životna iskustva [r=.14], upravljanje obrazovanjem [r=.13], osobne kvalitete [r=.27], profesionalno znanje [r=.23] i društveni faktori [r=.17] u odnosu na učenička postignuća značajna i niska. Time je utvrđeno kako osobne kvalitete imaju najjači učinak na učenička postignuća.

Tablica 3.

Zaključak i rasprava

Kako bi se istražile dimenzije učinka osobina učitelja na učenička postignuća, odabrano je ukupno 1042 korelacijske vrijednosti iz 209 nezavisnih studija objavljenih između 2000. i 2017. s ukupno 3 225 488 sudionika koje su uključene u metaanalizu. Kao moderator uzet je uzorak ispitanika, školski predmet, zemlja, godina objavljivanja

publikacije i vrsta osobina učitelja. Rezultati pokazuju kako osobine učitelja imaju mali pozitivan utjecaj na učenička postignuća. U literaturi nije pronađena slična studija gore spomenutoga odnosa, ali postoje druge studije koje istražuju različite vrste učiteljskih osobina i zaključuju kako te osobine imaju značajnu ulogu u učeničkim postignućima. Iako je značajna razlika bila očekivana, nizak utjecaj može se smatrati iznenađujućim uzme li se u obzir tvrdnja kako su osobine učitelja glavna odrednica učeničkih postignuća. Kako Jespen (2005) upućuje, postoji uobičajeno i snažno vjerovanje o učinku osobina učitelja na učenička postignuća, ali je teško utvrditi specifične osobine koje utječu na učenička postignuća. Zbog toga nam je analiza moderatora korištena pri klasifikaciji u slici 1 poslužila za pokazivanje veličine učinka korištenih dimenzija.

U tom smislu, analiza moderatora za uzorak ispitanika bila je značajna pri utvrđivanju učinka osobina učitelja na učenička postignuća. Rezultati postojećih studija koje ispituju odnos između osobina učitelja i učeničkih postignuća u različitim vrstama škola nisu podudarni jer neke ukazuju na pozitivnu i snažnu vezu u višim razredima osnovne škole (npr. Akiba i sur., 2017; Baker, 2013) dok druge ukazuju na nepostojanje veze (Marszalek i sur., 2010; Odom i Bell, 2015) za istu razinu. Slične nedosljednosti postoje u odnosu na srednje škole (npr. Gbore i Daramola, 2013; Jarvis, 2006). Ova metaanalitička studija, međutim, otkriva kako je razina učinka značajna na svim školskim razinama i da je najviša u srednjoj školi, iako neznatno viša od predškolske i preddiplomske razine. Jedan od uzroka povećanoga učinka može biti akademska zahtjevnost obrađenih disciplina u srednjoj školi i visokom obrazovanju. S druge strane, odnos učiteljskih osobina i učeničkih postignuća na predškolskoj razini važan je jer ukazuje na ulogu učitelja na prvoj razini obrazovanja, na što upućuju rezultati nekih istraživanja (Boye, 2014; Gaias, Abry, Swanson i Fabes, 2016).

Nadalje, kada je učinak učiteljskih osobina na učenička postignuća ispitan prema školskim predmetima, značajan i pozitivan učinak pronađen je za sve predmete. Razina učinka podudarala se za znanost, jezik i opći uspjeh, a najniža bila je za matematiku. Postojeća istraživanja potvrđuju ovaj rezultat jer i ona pronalaze veći učinak u nematematičkim predmetima nego za matematiku (npr. Ferguson i Ladd, 1996; Scrivner, 2009) kao i nizak učinak osobina učitelja na učenička postignuća u području matematike (Leavy, 2016; Oliveras, 2014). Za nisku razinu učinka otkrivenu kod matematike u odnosu na druge predmete vjeruje se da potječe iz njezine aksiomatske strukture. Drugim riječima, konceptualno razumijevanje umjesto ponavljanja u matematici je prioritet (Rittle-Johnson, Siegler i Alibali, 2001), stoga je poznato kako je pri učenju matematike dominantna druga vrsta inteligencije (Gardner, 1994). U odnosu na rezultate za države u kojima je istraživanje provedeno kao varijable moderatora utvrđeno je kako države imaju moderatorsku ulogu na učinak osobina učitelja na učenička postignuća. Uzorak ispitanika izabrani u okomito-kolektivističkim državama davali su više razine učinka nego one iz vodoravno-individualističkih država. To može biti rezultat karakteristika dvojne kategorizacije država u kojima se ljudi u okomito-kolektivističkim državama usredotočuju na osnaživanje kohezije i statusa njihovih

unutarnjih grupa, dok ljudi u vodoravno-individualističkim državama nastoje iskazati svoju jedinstvenost i samodostatnost (Shavitt, Johnson i Zhang, 2011). Triandis i Gelfand (1998) također definiraju okomiti kolektivizam kroz težnju k identifikaciji unutar kolektiva, a vodoravni individualizam kroz identifikaciju putem osobne i pune autonomije. Stoga možemo procijeniti kako su učenici u okomito-kolektivističkim zemljama skloniji suradnji od onih u vodoravno-individualističkim zemljama, što pozitivno utječe na njihova postignuća. Iz istoga se razloga može tvrditi kako učenici i učitelji u okomito-kolektivističkim zemljama intenzivnije rade zajedno od onih u vodoravno-individualističkim zemljama.

Moderatorska analiza provedena o pitanju godine objave publikacije pokazuje kako razina učinka osobina učitelja na učenička postignuća nije statistički značajna za potkategorije. Unatoč tome, efekti veličina za pojedine potkategorije godina izdanja bili su značajni i slični. To pokazuje kako se rezultati u odnosu između osobina učitelja i učeničkih postignuća nisu mijenjali u tri uzastopna petogodišnja razdoblja. Stoga, iako rezultati ograničavaju vremenske posljedice utjecaja učitelja na učenike, utjecaj se ne mijenja tijekom godina. Zaključno, u istraživanju ispitani su učinci tipa osobina učitelja kao moderatorske varijable. Prema moderatorskoj analizi, ova varijabla imamoderatorsku ulogu u utjecaju osobina učitelja na učenička postignuća. To upućuje na činjenicu kako se intenzitet utjecaja pojedinih vrsta učiteljskih osobina međusobno razlikuje. Dodatno, dva najviša intenziteta utjecaja pripadaju osobnim iskustvima i profesionalnom znanju, što potvrđuju i brojna istraživanja koje ističu učiteljske osobne kvalitete (Eells, 2011; Yu i Singh, 2018) i profesionalno znanje (Hill, Rowan i Ball, 2005; Kraft, Blazar i Hogan, 2016) kao utjecajne na učenička postignuća. U svjetlu rezultata provedenoga istraživanja može se reći kako osobine učitelja imaju smislen utjecaj na učenička ostvarenja, što se smatra glavnim rezultatom obrazovanja.

Kada se analiziraju rezultati ovoga istraživanja, može se zaključiti kako moderatorske varijable uzorak ispitanika, školski predmet, zemlja, godina objavljivanja studije i tip učiteljskih osobina utječu na odnos između osobina učitelja i učeničkih postignuća. Drugim riječima, razina ovoga odnosa može se promijeniti na osnovi tih moderatorskih varijabli. Rezultati vezani uz hipoteze ovoga istraživanja objedinjeni su u tablici 4. Kako se iz tablice vidi, sve su hipoteze osim H_5 prihvaćene.

Tablica 4.

Ograničenja i buduća istraživanja

Istraživanjem se nastojalo ispitati imaju li osobine učitelja utjecaj na učenička postignuća. Iako je istraživanjem potvrđeno kako postoji nizak, ali značajan utjecaj osobina učitelja na učenička postignuća, uočena su i značajna ograničenja koja mogu biti osnova za buduća istraživanja. Kao prvo, analiza je bila ograničena na postojeću bazu literature. Stoga, ako istraživač koji provodi kvantitativne integracije uoči kako bi se njegov rad mogao poboljšati, ne postoji mogućnost da se te izmjene primijene u praksi. Kao drugo, jedan od najvećih nedostataka ovoga istraživanja jest taj što su

istraživanja iz kojih su prikupljani podatci bila u međuodnosu. Zato nije moguće objektivno tvrditi kako rezultati mogu bolje objasniti kauzalne utjecaje, uzimajući u obzir da su kvalitativne studije efikasnije u objašnjavanju prirode osobina učitelja. Treće, uzimajući u obzir činjenicu kako su istraživanja uvrštena u ovu metaanalizu provedene na engleskom jeziku, većina tih studija koncentrirana je na zemlje engleskoga govornog područja. Razmatrajući utjecaj kulture na obrazovanje, ova okolnost može otvoriti pitanja o mogućnosti generalizacije. Konačno, u istraživanju su se ispitivali utjecaji osobina učitelja na učenička postignuća uzimajući u obzir široki okvir. Stoga su i komentari koji iz ovoga istraživanja proizlaze opće prirode.

Razmatrajući sva navedena ograničenja, dani su sljedeći prijedlozi za buduće istraživanje:

Postoji potreba za istraživanjem utjecaja specifičnih potkategorija (npr. poznavanje sadržaja, pedagoško znanje, nastavna praksa, odnosi i tako dalje) na učenička postignuća u odnosu na svaku pojedinu kategoriju koja čini širi okvir (profesionalno znanje, upravljanje znanjem, društveni faktori, osobne kvalitete i životna iskustva).

Ova je analiza ograničena na tri baze podataka sa studijama provedenim na engleskom jeziku. Buduće metaanalitičke studije trebaju u obzir uzeti druge baze podataka kao i studije provedene na drugim jezicima.

Kvantitativne studije uspješnije su u objašnjenju postojeće situacije, stoga su potrebna buduća istraživanja koja će ispitati zašto očekivani elementi imaju slab utjecaj na učenička postignuća.