MANAS Sosyal Araştırmalar Dergisi 2025 Cilt: 14 Sayı: 1
MANAS Journal of Social Studies 2025 Volume: 14 No: 1
ISSN: 1694-7215
Research Paper / Araştırma Makalesi

# Peer Learning Effects on Students Outcomes: A Second Order Meta Analyses

Metin KAYA[1], Ahmet Taylan AYDIN[2] & İlker ALTUNBAŞAK[3]

**Abstract**
The purpose of this study is to examine the impact of peer learning (PL) on student outcomes. To this end, 11 first-order meta-analysis (FOM) studies were reviewed. FOMs were accessed from the Web of Science, Scopus, Medline, Eric, Academic Search Ultimate, PsycNet, and Google Academic databases. The searches cover the years between 2000 and 2024. FOM (Factoring-Out Misconceptions) research encompasses both K-12 and higher education levels. While k=5 studies reported Cohen's d effect size indexes (d), k=11 studies reported Hedge's g effect size indexes (g).İn this analyses totals sixteen effect size (k=16) values obtained from FOM studies have been statistically analyzed. The research method used was second-order meta-analysis. Statistical analyses were conducted under the random model. Publication bias of effect sizes was examined. The study concluded that the impact of PL on student outcomes is weak (ES= .40 [CI= .33-0.47], p < .01). It was found that the effect sizes between PL and student outcomes have low levels of publication bias. It has been observed that PL has a higher impact on academic achievement compared to affective, professional skills, and social skills. It was also found that the effect sizes vary according to the languages of primary studies and the publication bias status of FOM studies. The group of FOMs exhibiting publication bias has a high-level effect size (while other groups have produced low-level effect sizes.

*Key Words:* Peer Learning, Academic Achievement, Affective, Professional Skills, Social Skills, Second Order Meta Analyses

## Akran Öğreniminin Öğrenci Çıktıları Üzerindeki Etkileri: İkinci Dereceden Bir Meta Analiz

**Öz**
Bu çalışmanın amacı "peer learning"in (PL) öğrenci çıktılarına etkisini incelemektir. Bu doğrultuda 11 first order meta analiz (FOM) araştırması incelenmiştir. FOM'lara Web of Science, Scopus, Medline, Eric, Akademik Search Ultimate, PsycNet and Google Academic veri tabanlarından erişilmiştir. Aramalar 2000-2024 yılları arasını kapsamaktadır. FOM araştırmaları K12 ve yükseköğretim kademesini kapsamaktadır. FOM araştırmalarının beş çalışma Cohen's d etkisini (k=5), on bir çalışma ise Hedge's g etkisini (k=11) raporladı.FOM araştırmalarından elde edilen 16 etki büyüklüğü istatistiksek olarak analiz edilmiştir.Araştırma yöntemi olarak second order meta analiz yöntemi kullanılmıştır. İstatistiksel analizler random model altında yapılmıştır. Etki büyüklüklerinin yayın yanlılığı incelemiştir. Çalışma sonucunda PL'nin öğrenci çıktılarına etkisinin zayıf düzeyde olduğu sonucuna varılmıştır (ES=.40 [CI=.33-.47] p<.01). Akranla öğretimin, akademik başarı üzerindeki etkisinin, duyuşsal, mesleki beceri ve sosyal becerilere göre daha yüksek olduğu gözlenmiştir. PL ve öğrenci çıktıları arasındaki etki büyüklüklerinin düşük düzeyde yayın yanlılığı taşıdığı saptanmıştır. Etki büyüklüklerinin temel araştırmalarının dillerine göre ve FOM araştırmaların yayın yanlılığı statüsüne göre farklılaştığı bulgulanmıştır. Yayın yanlılığı gösteren FOM grubu, yüksek düzeyde etki büyüklüğüne sahip olduğu gözlenmiştir. (diğer gruplar düşük düzeyde etki büyüklükleri üretirken)

*Anahtar Kelimeler:* Akran Öğrenmesi, Akademik Başarı, Duyuşsal, Mesleki Beceriler, Sosyal Beceriler, İkinci Derece Meta Analiz

**Atıf İçin / Please Cite As:**

Kaya, M., Aydın, A.T., & Altunbaşak, İ. (2025). Peer Learning Effects on Students Outcomes: A Second Order Meta Analyses. *Manas Sosyal Araştırmalar Dergisi, 14* (1), 347-357. doi:10.33206/mjss.1579490

**Geliş Tarihi / Received Date:** 05.11.2024 **Kabul Tarihi / Accepted Date:** 15.01.2025

[1] Prof. Dr. - Istanbul Medipol University, Education Faculty, metin.kaya@medipol.edu.tr,
ORCID: 0000-0002-8287-4929
[2] Dr. - Ministry of National Education, Gazi University Faculty of Education, taylanaydin81@gmail.com,
ORCID: 0009-0008-9681-0791
[3] Doç. Dr. - Istanbul Medipol University, Education Faculty, ilker.altunbasak@medipol.edu.tr,
ORCID: 0000-0002-0383-7362

## Introduction

Interest in learning models that emphasize social interaction among students, from elementary to higher education, is increasing. In the social constructivist learning framework, people develop their understanding and abilities through engaging with others in social contexts (Hogan & Tudge, 2014).In this context, learning environments and models where students interact with each other to construct knowledge and skills have gained importance (Noroozi & De Wever, 2023, p. v-xi). One of the learning models based on students' interaction with each other is "peer learning". Cohen (1992) emphasizes that peer learning, grounded in social constructivist and collaborative learning theories, seeks to enhance various skills, including cognitive, social, motor, and vocational abilities. Vygotsky (1978) and Winstone et al. (2017) argue that in a constructivist framework, interactions within pairs or groups enrich students' mental and social learning processes by enabling them to explore diverse perspectives and attitudes through personal experiences, making these processes more dynamic.

PL, also referred to as peer-assisted learning, peer teaching, peer tutoring, peer instruction, and peer mentoring (Choi et al., 2021). Peer learning (PL) is a social constructivist learning model applied in all educational levels from elementary to higher education (Keerthirathne, 2020). The aim of PL is to enable students to learn from each other under the guidance of the teacher (Buchs et al., 2017). Through PL practices, students reinforce the knowledge and skills they learn by interacting with each other. They acquire new knowledge and skills and identify learning gaps, finding opportunities to fill these gaps together with their peers (Boud, 2014). According to Bandura (1986), behavior and the environment are in a reciprocal interaction. In this context, behavior shapes the environment, while the environment also influences behavior. This indicates that the social environment plays a subjective and significant role in the acquisition of behavior. Accordingly, behavioral patterns observed in the social environment are both direct and indirect reflections of individuals' partially harmonious or conflicting expectations during their interactions.

In PL practices, peers may have different statuses, ages, levels of knowledge, and skills, or they may be equivalent. The status of peers can be that of a tutor or a learner. Throughout PL practices, this status can remain constant or change. PL is implemented in different ways according to the status of students (Falchikov, 2003). PL encompasses processes such as group discussions, knowledge sharing, presentations, peer feedback, and peer assessment, in addition to in-class and out-of-class activities guided by teachers (Wessel, 2015). Classroom activities, active learning strategies, group collaboration, and the integration of digital platforms provide valuable opportunities for implementing peer learning. These approaches promote student cooperation, mutual support in teaching and learning processes, and improved academic outcomes (Crouch & Mazur, 2001).

PL is a historically old learning model (Topping et al., 2017). The impact of PL on students' knowledge and skills has been studied by researchers for many years. Systematic reviews compiling the qualitative findings of basic research on the impact of PL on students' knowledge and skills have been conducted, as well as first-order meta-analyses (FOM) studies combining the quantitative findings of basic research on the effectiveness of PL. While some FOM studies were conducted in the undergraduate context, others were conducted in the post-secondary or elementary education contexts (Bengesai et al., 2023; Rohrbeck et al., 2003; Zha et al., 2019).

Furthermore, some FOM studies focus on students' academic performance, while others focus on vocational skills and social skills (Choi et al., 2021; Ginsburg-Block et al., 2006; Zhang , et al., 2022). It is necessary to comprehensively examine the impact of PL on students' knowledge, skills, and attitudes. Such comprehensive examinations are possible by synthesizing the findings of first-order meta-analysis studies. Therefore, this study sought to combine the results of previous research on professional learning through a second-order meta-analysis approach to gauge its overall effectiveness. It is a method used to statistically combine the quantitative findings of FOM studies. It is used to systematically combine the findings of FOM studies (Oh, 2020).In other words, this study aimed to examine the overall impact of PL on student outcomes. In this regard, the following questions were addressed:

1. Does PL have a general effect on student outcomes?

1.1. Does the general effect of PL on student outcomes vary according to moderator variables?

## Method

In this study, the second-order meta-analysis method was used to synthesize the findings of FOM studies (Oh, 2020). Furthermore, this study was conducted following the PRISMA systematic review guidelines (Page et al., 2021).

*Eligibility criteria:*

i) FOM studies must be articles published in English between 2000 and 2024.

ii) FOM studies must focus on experimental designs specifically related to the PL model. Studies that combine PL with different collaborative learning or teaching models are excluded. For example, studies combining PL with collaborative learning or cooperative learning are excluded. Additionally, studies covering single-group experimental designs are excluded.

iii) The outcome of FOM studies must be student outcomes, such as academic achievement, attitudes, social skills, etc.

iv) Control groups in FOM studies must utilize a traditional lecture-based method.

v) FOM studies must contain appropriate statistical data to combine effect sizes. For example, Cohen's d (d), Hedge's g (g), Odd Ratio (OR), Fisher's z, and related effect size lower limit (LL), upper limit (UP), standard error (SE), or variance values. Studies reporting the TauU value are excluded.

vi) The overlap ratio between studies should be less than 25%. If the overlap ratio is less than 25%, the studies are considered independent (Cooper & Koenka, 2012). Studies with an overlap ratio greater than 25% are excluded. In cases of overlap, the study with broader scope is preferred. Overlapping and preferred studies are presented in Appendix 1.

### Search Strategy

Searches were conducted using combinations of the keywords "peer learning," "peer-assisted learning," "peer teaching," "peer instruction," "peer tutoring," and the phrases "meta analyses ," "meta analytic," and "systematic review" in Web of Science, Scopus, Medline, Eric, Academic Search Ultimate, PsycNet, and Google Academic databases. For example, searches such as "peer learning and meta analyses " were performed. The titles and abstracts of the articles identified in the searches were reviewed. A dataset was compiled from the studies that showed promise in meeting the inclusion criteria. The studies in the data pool were examined according to the inclusion criteria, and studies that did not meet the criteria were excluded. The flow diagram of data is presented in Figure 1.

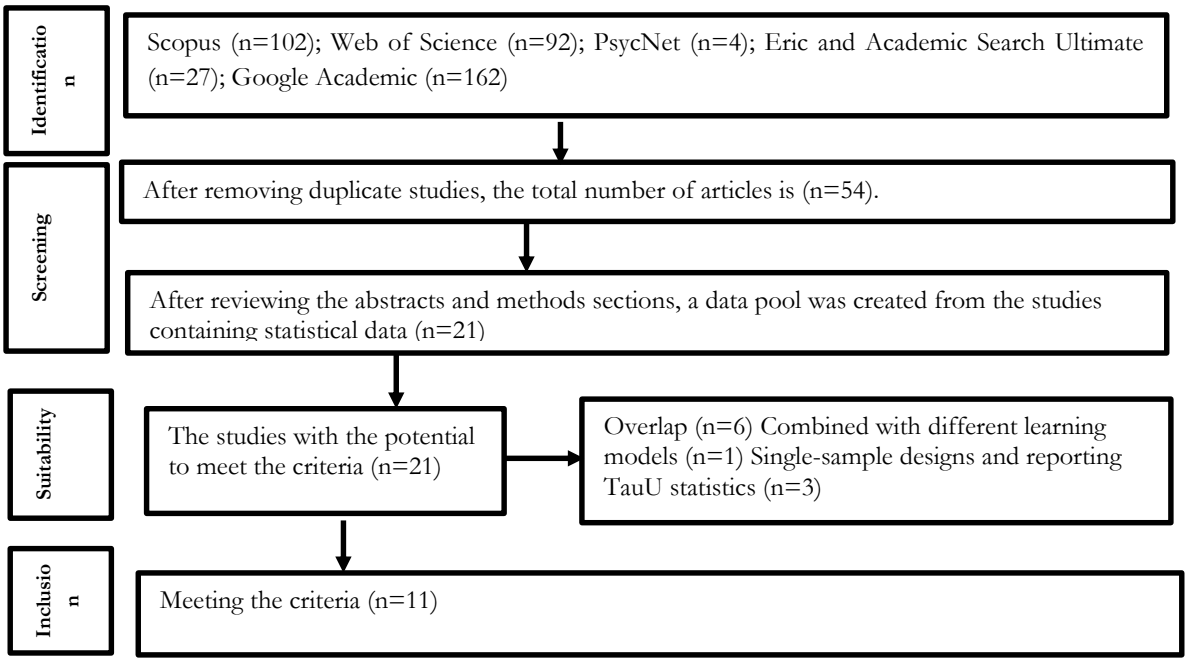


**Figure 1.** *Flow diagram*

### Data Extraction

Researchers prepared a coding form reflecting the characteristics of FOMs. The coding was performed by two researchers. The intercoder reliability coefficient, Cohen's Kappa coefficient $\varkappa$=0.94, was calculated. Cohen's Kappa coefficient indicates an almost perfect agreement between raters. If FOMs reported different student outcomes (e.g., social skills, academic achievement), they were coded as independent studies. The codings are presented in Table 1.

**Table 1.** *The Codings*

| **Coding Group** | Code |
|---|---|
| Study | Researchers (publication year) |
| Student outcome | The student outcomes have been coded as academic achievement, professional skill, social skill, and affective behavior. |
| Education level | If the research encompasses both K-12 and higher education, or if it is combined, it is coded as "mixed." If it is not combined, it is coded separately as "higher" and "K-12." |
| Primary research sampling method | If the FOM covers primary research that includes randomized controlled trials (RCTs), it is coded as "RCT." If the FOM encompasses different experimental designs, it is coded as "mixed." |
| Primary research language | If the primary research is conducted solely in English, it is coded in English. If it is conducted in two languages, it is coded according to the languages used (e.g., English and Turkish). |
| FOM quality | The studies are coded as inadequate, low, medium, and high based on the score obtained from the Revised Assessment of Multiple Systematic Reviews (R-AMSTAR) scale prepared by Kung et al. (2010). |
| FOM publication bias status | If the FOM has detected publication bias, it is coded as "yes." If it has not detected publication bias, it is coded as "no." If it has not reported publication bias, it is coded as "unclear." |
| FOM publication year range | *Before 2010, 2011-2020* and *after 2021* |

## Quality Appraisal

The quality of FOM studies was evaluated using the R-AMSTAR scale (Kung et al., 2010). The R-AMSTAR scale was developed to measure the quality of meta-analysis studies in the medical field. Items 8A and 8B of the R-AMSTAR scale are relevant to clinical applications. Therefore, items 8A and 8B were not included in the scoring. The quality of the studies was evaluated by the first researcher.

## Characteristics of FOM Studies

This study includes n=11 FOM studies. The earliest publication dates back to the year 2003, while the latest publication is from the year 2023. Of these FOM studies, n=9 have combined primary research conducted solely in English, while n=2 have combined primary research conducted in both English and Turkish. The total number of primary research studies covered by FOMs is 465. The primary research studies covered by FOMs span the years 1966 to 2022. The characteristic features of FOMs are presented in Table 2.

## Synthesis Methods

While k=5 studies reported Cohen's d effect size indexes (d), k=11 studies reported Hedge's g effect size indexes (g). In sufficiently large samples, the value of g is equal to d (g=d) (Marfo & Okyere, 2019). In this study, it is assumed that the sample sizes are sufficient. The effect sizes mentioned above have been combined. In meta-analysis studies where the samples are different groups and the characteristics of the studies are different from each other, statistical analyses are conducted under the random effects model (Borenstein, Hedges, Higgins, & Rothstein, 2021). In this study, statistical analyses were conducted under the random effects model. Q statistics were used in calculating the total heterogeneity (Qt) and between-groups heterogeneity (Qb). Additionally, I2 statistics were calculated to determine the level of heterogeneity in the dataset, and tau2 statistics were calculated to interpret the sources of heterogeneity. Moderator analysis was conducted based on the groups of studies comprising the dataset. Furthermore, the reliability of the calculated effect size is related to publication bias. As a result, multiple techniques for analyzing publication bias have been developed. Each publication bias test has its advantages over the others (Borenstein et al., 2021; Jin, Zhou, & He, 2015). Taking this into account, publication bias in the dataset was analyzed using classic fail-safe test, funnel plot graph, Egger's test, and Duval & Tweedie Trim and Fill (DTTF) analysis techniques.

**Table 2.** *Characteristics of First Order Meta analyses*

| | | | | | FOM Characteristics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Study** | **ES** | **LL** | **UL** | **k** | **Scope** | **Language** | **Sampling in FOM** | **Outcome** | **Quality** | **Bias** | **Year range** |
| Zhang et al. (2022)a* | .10 | -.09 | .29 | 15 | Health profession | Ing | RCT | Theoretical knowledge | High | No | Before 2021 |
| Zhang et al. (2022)b* | .37 | .08 | .65 | 27 | Health profession | Ing | RCT | Procedural skills | High | Yes | Before 2021 |
| Choi et al. (2021)a** | .50 | .25 | .74 | 25 | Nursing | Ing | mixed | Affective | Medium | No | 1990-2019 |
| Choi et al. (2021)b** | .27 | .07 | .46 | 8 | Nursing | Ing | mixed | Cognitive | Medium | No | 1990-2019 |
| Choi et al. (2021)c** | .17 | -.15 | .49 | 10 | Nursing | Ing | mixed | Psychomotor | Medium | No | 1990-2019 |
| Bengesai et al. (2023) ** | .43 | .19 | .67 | 37 | Higher education | Ing | mixed | Course performance | High | No | 2010-2021 |
| Zha et al. (2019)** | .36 | .27 | .46 | 28 | Postsecondary | Ing | mixed | Cognitive achievement | Medium | No | 1993-2017 |
| Öz (2023)** | .92 | .75 | 1,1 | 43 | K12+Higher | Ing and Turk. | mixed | Academic Achievement | Medium | Yes | Before 2021 |
| Balta, Michinov, Balyimez & Ayaz (2017)* | .93 | .7 | 1,17 | 29 | K12+Higher | Ing and Turk. | mixed | Academic Achievement | High | Yes | 2000-2015 |
| Leung (2019)* | .43 | .35 | .5 | 16 | K12+Higher | Ing | mixed | Academic Achievement | Medium | Unclear | before-2018 |
| Alegre Ansuátegui, Moliner Miravet, Lorenzo-Valentin, & Maroto (2018)** | .33 | .27 | .39 | 50 | K12+Higher | Ing | mixed | Academic Achievement | Medium | Unclear | before-2017 |
| Zeneli, Thurston, & Roseth (2016)* | .51 | .35 | .67 | 30 | K12 | Ing | mixed | Academic Achievement | Medium | Unclear | 1966-2014 |
| Ginsburg et al. (2006)a** | .28 | .25 | .32 | 30 | Elementary | Ing | mixed | Social skills | Medium | Unclear | 1966-2010 |
| Ginsburg et al. (2006)b** | .18 | .14 | .23 | 15 | Elementary | Ing | mixed | Self-concept | Medium | Unclear | 1966-2010 |
| Ginsburg et al. (2006)c** | .45 | .39 | .5 | 12 | Elementary | Ing | mixed | Affective | Medium | Unclear | 1966-2010 |
| Rohrbeck et al. (2003)* | .33 | .29 | .37 | 90 | Elementary | Ing | mixed | Academic Achievement | High | Unclear | 1966-2000 |

* Effect size type ise Cohen's d ; ** Hedge's g. RCTs= Randomized controlled trials.

## Findings

The effect sizes that make up the dataset range between ES=.10 and ES=.93. The average effect size is calculated as ES=.40 [CI=.33-.47] with $p < .01$. It has been found that the effect of PL on student outcomes is weak. The total heterogeneity of the dataset is $Q(15)=164.99$; $p < .01$; with a heterogeneity level of I2=90.90. Therefore, it can be said that the dataset exhibits a high level of heterogeneity. Additionally, tau2=.01 has been calculated to identify the sources of heterogeneity, suggesting that the heterogeneity originates from sampling error. The classic fail-safe test for the dataset is calculated as N=4151. The result of the classic fail-safe test indicates a safe average effect size ($4151 < 90$; $5k + 10 = 5.16 + 10 = 90$). Egger's regression test did not find publication bias ($t=2.04$, $p=0.6$). The distribution of effect sizes, as shown in the Funnel plot graph in Figure 2, is not symmetric. However, publication bias was found through the DTTF test. It was found that by adding k=2 effect sizes to the right of the mean effect size, the funnel plot graph could become symmetric. According to the DTFF result, the corrected average effect size is calculated as ES=.42 [CI=.35-.49 $Q(t)=189.32$]. The difference between the calculated average effect size and the corrected average effect size is quite small ($\Delta ES=.02$). Considering the publication bias analyses conducted, it can be concluded that there is a minimal presence of publication bias.

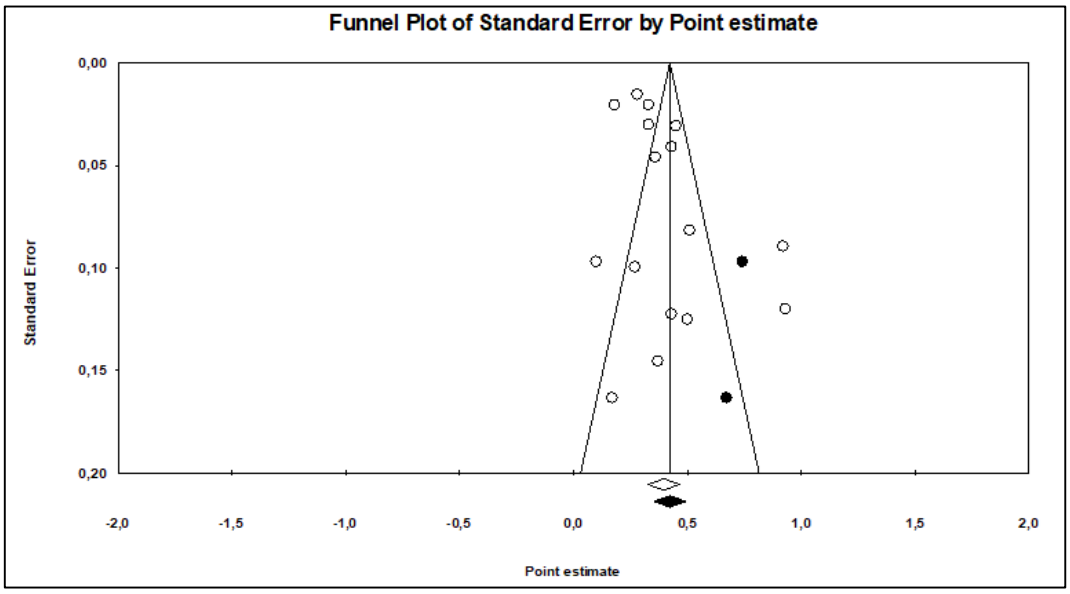


**Figure 2.** *Funnel Plot Graph (k=2 effect sizes need to be added)*

Moderator and heterogeneity analysis have been conducted for the dataset. The notable findings are as follows:

**Table 3.** *Moderator and Heterogeneous Analyses Data Set*

| | Moderator and heterogeneity analyses | | | | | | |
|---|---|---|---|---|---|---|---|
| **Group** | k | ES | LL | UL | Q(b) | df | p |
| **Outcomes** | | | | | 2.19 | 3 | .53 |
| Academic Achievement | 10 | .45 | .34 | .55 | | | |
| Affective | 3 | .36 | .17 | .55 | | | |
| Professional skills | 2 | .28 | -.03 | .58 | | | |
| Social skills | 1 | .28 | -.02 | .58 | | | |
| **Education level** | | | | | 10.62 | 2 | <.01 |
| Higher | 7 | .31 | .20 | .43 | | | |
| K12 | 5 | .34 | .23 | .45 | | | |
| K12+Higher | 4 | .59 | .45 | .72 | | | |
| **Primary research language** | | | | | 35.21 | 1 | <.01 |
| English | 14 | .34 | .28 | .39 | | | |
| English and Turkish | 2 | .92 | .74 | 1,11 | | | |
| **Primary research sampling method** | | | | | 2.75 | 1 | .10 |
| Mixed | 14 | .41 | .34 | .49 | | | |
| RCT | 2 | .21 | -.02 | .44 | | | |
| **First order meta analyses quality** | | | | | .03 | 1 | .87 |
| High | 5 | .41 | .26 | .56 | | | |
| Medium | 11 | .39 | .31 | .48 | | | |
| **FOM publication bias status** | | | | | 24.78 | 2 | <.01 |
| No | 6 | .31 | .20 | .42 | | | |
| Unclear | 7 | .35 | .27 | .42 | | | |
| Yes | 3 | .79 | .62 | .96 | | | |
| **FOM publication year range** | | | | | 3.71 | 2 | .16 |
| Before 2010 | 4 | .31 | .19 | .42 | | | |
| 2011-2020 | 5 | .47 | .35 | .58 | | | |
| After 2021 | 7 | .41 | .29 | .54 | | | |

Effect sizes statistically differ according to the languages of primary research (Q(1)=35.21; p < .01). Studies covering both Turkish and English languages, denoted as FOM (ES=.92 [CI=.74-1.11]), have generated significantly higher effect sizes compared to FOMs covering only the English language (ES=.34 [CI=.28-.39]). The difference between the two groups is ΔES=.58. On the other hand, effect sizes vary significantly by educational level (Q(2)=10.62; p < .01). The K12+Higher group (ES=.59 [CI=.45-.72]) has produced higher effect sizes compared to other groups (solely K12 and solely higher education). However, this finding is inconsistent within itself. This inconsistency arises because the K12 level has produced low-level effect sizes (ES=.34 [CI=.23-.45]) and the Higher level has also produced low-level effect sizes (ES=.31 [CI=.20-.43]). It is expected that both of these groups would produce low-level effect

sizes. The K12+Higher group has produced a moderate-level effect size. The source of inconsistency could be as follows: FOMs covering both Turkish and English primary research (k=2; Öz, 2023 [ES=.92] and Balta et al., 2017 [ES=.93]) are also studies covering the K12+Higher educational level. These FOMs could be the source of this inconsistency.

Furthermore, effect sizes statistically differ based on the publication bias status of FOMs ($Q(2)=24.78$; $p < .01$). The group of FOMs exhibiting publication bias has a high-level effect size (ES=.79 [CI=.62-.96]), while other groups have produced low-level effect sizes.

## Discussion, Conclusion, and Recommendations

In this study, the effect sizes of 11 FOM studies on PL and student outcomes have been synthesized using second-order meta-analysis method. Heterogeneity and moderator analysis have been conducted based on the characteristic features of FOM studies. The research concludes that the effect of PL on student outcomes is weak. PL has a weak effect on students' academic achievement, vocational skills, social skills, and affective behaviors. Similarly, Pai, Sears and Maeda (2015) concluded that small-group learning models have a weak effect on student outcomes. Tai, Molloy, Haines and Canny (2016) emphasized that PL applications allow students to reflect their abilities, support their motivation and self-confidence, and improve their vocational and communication skills. Loda et al. (2019) concluded that PL significantly contributes to the development of students' cognitive and social skills. Considering the research findings, it can be said that PL plays an important role in the development of students' cognitive and social skills. Educators and teachers benefit from PL for their professional development (Tai et al., 2016). In-service training programs on PL practices can be organized to enhance the professional competence of educators and teachers.

In this study, the effect of PL on student outcomes varies according to the language in which primary research is published. FOMs covering both English and Turkish languages have higher effect sizes. In other words, studies from Turkey have higher effect sizes. This situation, known as location bias, is considered when taking into account language bias or the fact that a language is spoken in a specific country (Higgins & yn, 2011). Meta-analysis studies covering different languages and many countries can be conducted to reduce the risk of location bias (Egger & Smith, 1998). Such studies can be made possible by bringing together researchers proficient in different languages to work together as a team. Therefore, collaboration among researchers proficient in different languages can be encouraged.

On the other hand, in this study, FOMs exhibiting publication bias have higher effect sizes compared to FOMs without publication bias. One of the risks associated with meta-analysis studies is publication bias (Lin, 2020). Publication bias arises from the higher likelihood of publication of studies with higher effect sizes or statistically significant findings in scientific journals (Hedin, Umberham, Detweiler, Kollmorgen, & Vassar, 2016). To reduce the risk of publication bias in meta-analysis studies, unpublished doctoral or master's thesis research can be included, and searches can be conducted in databases known as grey literature (Kung et al., 2010).Future research can include grey literature on peer learning. This could contribute to obtaining more reliable effect sizes.

### Limitations

This study is focused on the effect of the PL model on student outcomes.. Other learning models focusing on small group activities, such as cooperative learning, collaborative learning, and team-based learning, could be examined for their effects on student outcomes. This would allow for comparisons between different learning models and student outcomes. Furthermore, this study may be limited in terms of the data related to student outcomes, such as social skills, affective behavior, and professional skills. Research could be conducted on the effects of PL on students' social, professional, and emotional behaviors. Additionally, this study does not encompass research on at-risk students and disadvantaged students. The effect of PL on learning outcomes could be examined in the context of at-risk students and disadvantaged students. Moreover, this research includes studies published in English. For more comprehensive examinations, studies covering different languages and different forms of research reports could be conducted.

## Ethical Declaration

In the writing process of the study titled *"Peer Learning Effects on Students Outcomes: A Second Order Meta Analyses"*, there were followed the scientific, ethical and the citation rules; was not made any falsification on the collected data and this study was not sent to any other academic media for evaluation.

## Statement of Contribution Rate of Researchers

Metin Kaya: The method of statistical data analysis, the results are 40%. Ahmet Taylan Aydın: Theoretical framework, problem situation, discussion 35%. Ilker Altunbaşak: The English spelling of the article's shape layout is 25%.

## Declaration of Conflict

There is no potential conflict of interest in the study.

## References (*Included Studies)

Alegre Ansuátegui, F. J., Moliner Miravet, L., Lorenzo-Valentin, G., & Maroto, A. (2018). Peer tutoring and academic achievement in mathematics: A meta-analysis. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(1), 337-354. doi: 10.12973/ejmste/79805

Alegre Ansuátegui, F. J., Moliner Miravet, L., Maroto, A., & Lorenzo-Valentin, G. (2019). Peer tutoring in mathematics in primary education: A systematic review. *Educational Review, 71*(6), 767-791. doi: 10.1080/00131911.2018.1474176

Balta, N., Michinov, N., Balyimez, S., & Ayaz, M. F. (2017). A meta-analysis of the effect of Peer Instruction on learning gain: Identification of informational and cultural moderators. *International Journal of Educational Research, 86*, 66-77. doi: 10.1016/j.ijer.2017.08.009

Bandura, A. (1986). Human Agency in Social Cognitive Theory (Paper Presedent at the xxıv International Congress of Psychology) Sydney, Australia, 1986.

Bapuji, R., Eagles, D., Ferreira, N., Hecht, N., Zhang, Y., Woo, M. Y., ... Pageau, P. (2024). Comparison of peer-assisted learning with expert-led learning in medical school ultrasound education: a systematic review and meta-analysis. *Canadian Journal of Emergency Medicine*, 26(3), 188-197. doi: 10.1007/s43678-024-00663-x

Bengesai, A. V., Amusa, L. B., & Dhunpath, R. (2023). A meta-analysis on the effect of formal peer learning approaches on course performance in higher education. *Cogent Education, 10*(1), 2203990. doi: 10.1080/2331186X.2023.2203990

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2021). *Introduction to meta-analysis*. West Sussex: John Wiley & Sons.

Boud, D. (2014). Introduction: making the move to peer learning. In D. Boud, & R. Cohen, (Eds.). *Peer learning in higher education: Learning from and with each other* (pp.1-17). London: Routledge.

Brierley, C., Ellis, L., & Reid, E. R. (2022). Peer-assisted learning in medical education: a systematic review and meta-analysis. *Medical Education, 56*(4), 365-373. doi: 10.1111/medu.14672

Cohen, L. G. (1992). *Children with exceptional needs in regular classrooms*. District of Columbia: National Education Association.

Choi, J. A., Kim, O., Park, S., Lim, H., & Kim, J.-H. (2021). The effectiveness of peer learning in undergraduate nursing students: A meta-analysis. *Clinical Simulation in Nursing, 50*(C), 92-101. doi: 10.1016/j.ecns.2020.09.002.

Cooper, H., & Koenka, A. C. (2012). The overview of reviews: Unique challenges and opportunities when research syntheses are the principal elements of new integrative scholarship. *American Psychologist, 67*(6), 446-462. doi: 10.1037/a0027119

Crouch, C.H. & Mazur, E. (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics, 69*(9), 970-977. https://doi.org/10.1119/1.1374249

Egger, M., & Smith, G. D. (1998). Bias in location and selection of studies. *BMJ*, *316*(7124), 61-66. doi: 10.1136/bmj.316.7124.61

Falchikov, N. (2003). *Learning together: Peer tutoring in higher education*. London: Routledge.

Ginsburg-Block, M. D., Rohrbeck, C. A., & Fantuzzo, J. W. (2006). A meta-analytic review of social, self-concept, and behavioral outcomes of peer-assisted learning. *Journal of Educational Psychology, 98*(4), 732-749. doi: 10.1037/0022-0663.98.4.732

Guraya, S. Y., & Abdalla, M. E. (2020). Determining the effectiveness of peer-assisted learning in medical education: A systematic review and meta-analysis. *Journal of Taibah University Medical Sciences, 15*(3), 177-184. doi: 10.1016/j.jtumed.2020.05.002

Hedin, R. J., Umberham, B. A., Detweiler, B. N., Kollmorgen, L., & Vassar, M. (2016). Publication bias and nonreporting found in majority of systematic reviews and meta-analyses in anesthesiology journals. *Anesthesia & Analgesia, 123*(4), 1018-1025. doi: 10.1213/ANE.0000000000001452

Higgins, J. P. T., & Green, S. (2011). *Cochrane handbook for systematic reviews of interventions*. Hoboken, NJ: Wiley-Blackwell.

Hogan, D. M., & Tudge, J. R. (2014). Implications of Vygotsky's theory for peer learning. In A. M. O'Donnell, & A. King, (Eds.) *Cognitive perspectives on peer learning* (pp. 39-65). London: Routledge.

Jin, Z. C., Zhou, X. H., & He, J. (2015). Statistical methods for dealing with publication bias in meta-analysis. *Statistics in Medicine, 34*(2), 343-360. doi: 10.1002/sim.6342

Keerthirathne, W. K. D. (2020). Peer learning: an overview. *International Journal of Scientific Engineering and Science, 4*(11), 1-6. ISSN (Online): 2456-7361.

Kung, J., Chiappelli, F., Cajulis, O. O., Avezova, R., Kossan, G., Chew, L., & Maida, C. A. (2010). From systematic reviews to clinical recommendations for evidence-based health care: validation of revised assessment of multiple systematic reviews (R-AMSTAR) for grading of clinical relevance. *The Open Dentistry Journal, 4,* 84-91.

Leung, K. C. (2019). An updated meta-analysis on the effect of peer tutoring on tutors' achievement. *School Psychology International, 40*(2), 200-214. doi: 10.2174/1874210601004020084

Lin, L. (2020). Hybrid test for publication bias in meta-analysis. *Statistical Methods in Medical Research, 29*(10), 2881-2899. doi: 10.1177/0962280220910172

Loda, T., Erschens, R., Loenneker, H., Keifenheim, K. E., Nikendei, C., Junne, F., … Herrmann-Werner, A. (2019). Cognitive and social congruence in peer-assisted learning – A scoping review. *PLoS ONE*, *14*(9), e0222224. doi: 10.1371/journal.pone.0222224

Marfo, P., & Okyere, G. A. (2019). The accuracy of effect-size estimates under normals and contaminated normals in meta-analysis. *Heliyon, 5*(6), e01838. doi: 10.1016/j.heliyon.2019.e01838.

Noroozi, O., & De Wever, B. (2023). *The power of peer learning: fostering students' learning processes and outcomes*. Amsterdam: Springer Nature.

Oh, I. S. (2020). Beyond meta-analysis: Secondary uses of meta-analytic data. *Annual Review of Organizational Psychology and Organizational Behavior, 7*, 125-153. doi: 10.1146/annurev-orgpsych-012119-045006

Öz, E. (2023). Effects of peer instruction on academic achievement: a meta-analysis. *Pedagogies: An International Journal*, 1-18. doi: 10.1080/1554480X.2023.2246447

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, *372,* n71. doi: 10.1136/bmj.n71

Pai, H. H., Sears, D. A., & Maeda, Y. (2015). Effects of small-group learning on transfer: A meta-analysis. *Educational Psychology Review, 27*(1), 79-102. doi: 10.1007/s10648-014-9260-8

Rees, E. L., Quinn, P. J., Davies, B., & Fotheringham, V. (2016). How does peer teaching compare to faculty teaching? A systematic review and meta-analysis. *Medical Teacher, 38*(8), 829-837. doi: 10.3109/0142159X.2015.1112888

Rohrbeck, C. A., Ginsburg-Block, M. D., Fantuzzo, J. W., & Miller, T. R. (2003). Peer-assisted learning interventions with elementary school students: A meta-analytic review. *Journal of educational Psychology*, *95*(2), 240.

Tai, J., Molloy, E., Haines, T., & Canny, B. (2016). Same-level peer-assisted learning in medical clinical placements: a narrative systematic review. *Medical Education, 50*(4), 469-484. doi: 10.1111/medu.12898

Topping, K., Buchs, C., Duran, D., & Van Keer, H. (2017). *Effective peer learning: From principles to practical implementation.* London: Routledge.

Wessel, A. (2015). Peer learning strategies in the classroom. *Journal on Best Teaching Practices, 2*(1), 14-16.

Winstone, N. E., Nash, R. A., Rowntree, J. & Parker, M. (2017). 'It'd be useful, but I wouldn't use it': barriers to university students' feedback seeking and recipience. *Studies in Higher Education*, *42*(11), 2026-2041. https://doi.org/10.1080/03075079.2015.1130032

Vygotsky, L.S. (1978). *Mind in society: Development of higher psychological processes*. Cambridge: Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Zeneli, M., Thurston, A., & Roseth, C. (2016). The influence of experimental design on the magnitude of the effect size-peer tutoring for elementary, middle and high school settings: A meta-analysis. *International Journal of Educational Research, 76,* 211-223. doi: 10.1016/j.ijer.2015.11.010

Zha, S., Estes, M. D., & Xu, L. (2019). A meta-analysis on the effect of duration, task, and training in peer-led learning. *Journal of Peer Learning, 12*(2), 5-28. https://ro.uow.edu.au/ajpl/vol12/iss1/2

Zhang, H., Liao, A. W. X., Goh, S. H., Wu, X. V., & Yoong, S. Q. (2022). Effectiveness of peer teaching in health professions education: A systematic review and meta-analysis. *Nurse Education Today, 118,* 105499. doi: 10.1016/j.nedt.2022.105499

Zhang, Y., & Maconochie, M. (2022). A meta-analysis of peer-assisted learning on examination performance in clinical knowledge and skills education. *BMC Medical Education, 22*(1), 147. doi: 10.1186/s12909-022-03183-3

## GENİŞ TÜRKÇE ÖZET

Günümüzde, temel eğitimden yükseköğretime kadar tüm eğitim seviyelerinde öğrenciler arası sosyal etkileşimi ön planda tutan öğrenme modellerine olan ilgi giderek artmaktadır. Sosyal yapılandırmacı öğrenme yaklaşımına göre bireyler, sosyal etkileşim ortamlarında bilgi ve becerilerini yapılandırarak öğrenirler (Hogan ve Tudge, 2014). Bu bağlamda, öğrencilerin birbirleriyle etkileşim içerisinde bilgi ve becerilerini inşa ettiği öğrenme çevreleri ve modelleri giderek önem kazanmaktadır (Noroozi ve Wever, 2023, v-xi). Literatürde, öğrencilerin birbirleriyle etkileşime dayalı öğrenme modellerinden biri "peer

learning" (PL) olarak belirtilmektedir. PL, peer-assisted learning, peer teaching, peer tutoring, peer instruction ve peer mentoring gibi farklı adlarla da ifade edilmektedir (Choi vd., 2021). Cohen (1992) sosyal yapılandırmacı ve iş birliğine dayalı öğrenme teorilerine dayanan akran öğrenmesinin, bilişsel, sosyal, motor ve mesleki becerileri geliştirmeyi amaçladığını vurgulamaktadır. Vygotsky (1978) ve Winstone vd. (2017) yapılandırmacı bir çerçevede çiftler veya gruplar arasındaki etkileşimlerin, öğrencilerin farklı bakış açılarını ve tutumları kendi deneyimleri aracılığıyla keşfetmelerine olanak tanıyarak zihinsel ve sosyal öğrenme süreçlerini zenginleştirdiğini ve bu süreçleri daha dinamik hale getirdiğini savunmaktadır. PL, sosyal yapılandırmacı bir öğrenme modeli olarak, tüm eğitim kademelerinde uygulanan ve bireylerin öğrenmelerine akran etkileşimi yoluyla katkı sağlayan bir modeldir (Keerthirathne, 2020). Öğretmenler, kimi zaman ek öğretim ve destekleyici eğitim etkinlikleri için yeterli zaman bulamadıklarında, bu eksikliği PL yoluyla gidermeye çalışmaktadır. PL'nin amacı, öğretmen rehberliğinde öğrencilerin akranlarından öğrenmelerini sağlamak ve bilgi edinim süreçlerini desteklemektir (Topping vd., 2017). Bu uygulamalar sayesinde öğrenciler, birbirleriyle etkileşerek öğrendikleri bilgileri pekiştirme, eksikliklerini tamamlama ve yeni bilgi ile beceriler kazanma fırsatı bulurlar (Boud, 2014). Bandura'ya (1986) göre davranış ve çevre, karşılıklı bir etkileşim içinde bulunmaktadır. Bu bağlamda, davranış çevreyi şekillendirirken, çevre de davranışı etkilemektedir. Bu durum, sosyal çevre faktörünün davranış kazanımında öznel ve önemli bir rol oynadığını ortaya koymaktadır. Buna göre, sosyal çevrede gözlemlenen davranış kalıpları, insanların etkileşim sürecinde birbirleriyle kısmen uyumlu ya da çatışmalı beklentilerinin hem doğrudan hem de dolaylı bir yansımasıdır. PL uygulamaları, statü, yaş, bilgi ve beceri gibi farklılıklar gösteren veya benzer nitelikte olan akranlar arasında gerçekleşebilir. Akranların statüsü öğretici ve öğrenen olabilir ve bu statüler sabit kalabileceği gibi süreç içinde değişkenlik de gösterebilir. PL uygulamaları, öğretmenlerin rehberliğinde sınıf içi ve sınıf dışı tartışmalar, bilgi paylaşımı, sunumlar, akran geri bildirimi ve akran değerlendirmesi gibi süreçleri kapsamaktadır (Wessel, 2015). Sınıf etkinlikleri, aktif öğrenme stratejileri, grup çalışmaları ve dijital platformların kullanımı, akran öğreniminin uygulanması için değerli fırsatlar sunar. Bu yaklaşımlar, öğrenciler arasında iş birliğini teşvik eder, öğretim ve öğrenim süreçlerinde karşılıklı desteği artırır ve akademik başarıyı geliştirir (Crouch ve Mazur, 2001). Tarihsel olarak köklü bir öğrenme modeli olan PL, öğrenci bilgi ve becerilerinin gelişimine etkisi uzun yıllardır araştırmacılar tarafından incelenmektedir (Topping vd., 2017). PL'nin öğrenci bilgi ve becerilerinin gelişimine etkisine dair nitel araştırmalar yapılmış, bu araştırmaların bulgularını derleyen sistematik değerlendirmeler de sunulmuştur (Loda vd., 2019; Tai vd., 2016). Bunun yanı sıra, PL'nin etkinliğini inceleyen birçok nicel meta analiz çalışması da bulunmaktadır. Bazı meta analizler lisans düzeyinde, bazıları ise temel eğitim ve meslekî eğitim düzeyinde yapılmıştır (Bengesai vd., 2023; Rohrbeck vd., 2003; Zha vd., 2019). Bu çalışmanın amacı, PL'ye dair birinci düzey meta analiz (FOM) araştırmalarının bulgularını ikinci düzey meta analiz yöntemi ile sentezlemek ve PL'nin genel etkinliğini değerlendirmektir. Diğer bir deyişle, bu araştırmada PL'nin öğrenci çıktılarına olan genel etkisi araştırılmaktadır. Araştırma kapsamında yanıt aranacak sorular şunlardır: 1. PL, öğrenci çıktılarına genel bir etki sağlamakta mıdır? 2. PL'nin öğrenci çıktılarına olan genel etkisi, moderatör değişkenlere göre farklılaşmakta mıdır? Bu çalışmada, 2000-2024 yılları arasında yayınlanan FOM araştırmalarının bulgularını birleştirmek amacıyla second order meta analiz yöntemi kullanılmıştır (Oh, 2020). Çalışma, PRISMA systematic review rehberine göre yürütülmüştür (Page vd., 2021). Arama stratejisi kapsamında Web of Science, Scopus, Medline, Eric, Academic Search Ultimate, PsycNet ve Google Scholar veri tabanları taranmıştır. Arama sürecinde peer learning, peer-assisted learning, peer teaching, peer instruction ve peer tutoring gibi terimlerin meta analiz, systematic review ile kombinasyonları kullanılarak aramalar yapılmıştır. Başlık ve özet kısımlarının gözden geçirilmesiyle, dahil edilme ölçütlerini karşılayan FOM araştırmalarından oluşan bir veri havuzu oluşturulmuştur. Bu araştırmalar, belirlenen dahil etme kriterlerine göre incelenmiş ve ölçütleri karşılamayanlar hariç bırakılmıştır. Veri setindeki etki büyüklükleri ES=.10 ile ES=.93 arasında olup, ortalama etki büyüklüğü ES=.40 (CI=.33-.47) olarak hesaplanmıştır ve PL'nin öğrenci çıktıları üzerindeki etkisinin zayıf düzeyde olduğunu göstermektedir. Heterojenlik testi sonucunda, veri setinin oldukça yüksek bir heterojenliğe sahip olduğu bulunmuştur ($Q(15)=164.99$; $p<.01$; $I2=90.90$). Heterojenlik kaynaklarının belirlenmesi için yapılan hesaplamalarda, örneklem hatasından kaynaklanan bir heterojenlik olduğu görülmüştür. Veri setine ilişkin classic fail-safe testi sonucu N=4151 olarak bulunmuş olup, yayım yanlılığının oldukça düşük seviyede olduğu sonucuna varılmıştır. Huni Funnel plot grafiği de yayım yanlılığı açısından düşük bir risk göstermektedir. DTTF testi sonuçlarına göre yayım yanlılığı bulgulanmış ve ortalama etki büyüklüğüne k=2 etki büyüklüğü eklenmesiyle funnel plot grafiğinin simetri kazandığı gözlenmiştir. DTTF sonucuna göre düzeltilmiş ortalama etki büyüklüğü (ES=.42 [CI=.35-.49 $Q(t)=189.32$]) olarak hesaplanmıştır. Yayım yanlılığı analizleri dikkate alındığında, düşük düzeyde yayım yanlılığı olduğu söylenebilir. Bu araştırma, PL'nin öğrenci çıktılarına etkisini ikici düzey meta analiz second order meta analiz yöntemiyle inceleyerek PL'nin

etkisinin zayıf düzeyde olduğunu ortaya koymuştur. Bulgular, PL'nin özellikle öğrencilerin akademik başarı, mesleki beceri, sosyal beceriler ve duyuşsal affective davranışlarına etkisinin sınırlı olduğunu göstermektedir. Pai ve arkadaşları (2015), küçük grup öğrenme modellerinin de öğrenci çıktıları üzerindeki etkisinin zayıf olduğunu bulmuştur. Bununla birlikte, Tai vd. (2016), PL uygulamalarının öğrencilerin kendini ifade etme becerilerini, motivasyonlarını, öz güvenlerini ve iletişim yeteneklerini geliştirdiğini vurgulamaktadır. Loda vd. (2019) PL'nin öğrencilerin bilişsel ve sosyal becerilerine katkı sağladığını belirtmektedir. Bu doğrultuda, PL'nin öğrencilerin bilişsel ve sosyal becerilerini destekleme potansiyeline sahip olduğu söylenebilir. Öğretmenler ve akademisyenler de mesleki gelişim açısından PL uygulamalarından yararlanabilirler (Tai vd., 2016). Öğretmen ve akademisyenlerin mesleki yeterliliklerini geliştirmek amacıyla PL'ye yönelik hizmet içi eğitim programları düzenlenebilir. Farklı dillerde ve çok sayıda ülkeyi kapsayacak meta analiz araştırmalarıyla, dil ve lokasyon yanlılığı azaltılabilir (Higgins ve Green, 2011). Meta analizlerde yayım yanlılığı riskini azaltmak için, yayına kabul edilmeyen tez çalışmaları veya gri literatürdeki araştırmalar da dahil edilmelidir (Kung, 2010). Bu çalışma, PL modelinin öğrenci çıktısına olan etkisi ile sınırlıdır. PL'nin etkisini karşılaştırmak amacıyla farklı öğrenme modelleri (cooperative learning, collaborative learning vb.) ile karşılaştırmalar yapılabilir. Öğrenme modellerinin öğrenci çıktılarına etkisi daha kapsamlı şekilde analiz edilebilir. PL'nin dezavantajlı ve risk altındaki öğrenci gruplarına yönelik etkisi araştırılabilir. Bu çalışmada İngilizce dilindeki yayınlar ele alınmıştır; daha kapsamlı incelemeler için farklı dillerdeki araştırmaları içeren çalışmalara ihtiyaç vardır.