

A Meta-Analysis Study on the Effectiveness of Flipped Classroom Learning on Students' Academic Achievement

Assoc. Prof. Dr. İbrahim Yaşar Kazu

Firat University -Turkey
ORCID: 0000-0002-1039-0482
iykazu@firat.edu.tr

Cemre Kurtoğlu Yalçın (Ph.D. Student)

Firat University -Turkey
ORCID: 0000-0002-2148-7466
cemrekurtoglu@hotmail.com

Abstract

Flipped classroom learning (FCL), which is focused on offering online video lectures and expecting students to work on and comprehend the material prior to coming to class, has become a popular strategy in recent years, allowing the instructor to reinforce it with metacognitive exercises. Thus, this study will analyze 58 research results from 54 quantitative studies published between 2007 and 2020 to determine the overall influence of FCL on students' academic attainment. Relevant research was found using academic publishing databases. After that, the sample was meta-analyzed using the Comprehensive Meta-Analysis software. As moderator factors, the kind of publishing, the educational level, and the length of the application were identified. The data indicate that the FCL has a statistically significant influence on student accomplishment ($g = 0.976$) in the random-effects model. The sample produced a heterogeneous distribution. Additional subgroup analyses using Analog ANOVA indicated that the only statistically significant variable is the time of the application. The study's objective is to contribute to the increased use of flipped classrooms in educational settings due to their large impact size on academic success. It has pedagogical consequences for teachers to extend the duration of this approach in their classrooms in order to have a greater impact.

Keywords: Academic achievement, Educational technology, Effect size, Flipped classroom learning, Meta-analysis



**E-International Journal
of Educational
Research**

Vol: 13, No: 1, pp. 85-102

Research Article

Received: 2021-12-07
Accepted: 2022-01-14

Suggested Citation

Kazu, İ. Y. & Kurtoğlu Yalçın, C. (2022). A meta-analysis study on the effectiveness of flipped classroom learning on students' academic achievement, *E-International Journal of Educational Research*, 13(1), 85-102. DOI: <https://doi.org/10.19160/e-ijer.1033589>

INTRODUCTION

The effective deployment of technology in education continues to be a topic of great interest and scope internationally. While events such as the coronavirus pandemic can help us to appreciate many of its features, the field of education itself is constantly evolving to meet the needs of society. Today's teachers use technology to assist them to enable students' learning, understanding, and participation (Prasojo, Habibi, Mukminin & Yaakob, 2020). They have done so by utilizing methods and resources that were previously unthinkable, such as the FCL, which refers to a blended learning process that places the teacher at the center, in contrast to the traditional education approach that is limited to the school environment. In this model, the students study outside the classroom from the videos prepared by the teacher and come to the lesson ready (Kazu & Kurtoğlu, 2020). The homework and activity parts are done in the classroom under the guidance of the teacher. It is to enable students to use their time in the most effective and active way. Since no time is spent on lectures, the time spent in the classroom is used more effectively and efficiently for both students and educators (Latorre-Cosculluela, Suarez, Quiroga, Sobradie, Lozano & Rodriguez, 2021).

Numerous studies have been conducted on the FCL in educational settings. Generally, it has been discovered that it increases students' motivation for learning (Davies, Dean & Ball, 2013), academic performance (Albahuoth, 2020; Hajebi, 2020; Kithinji, 2020; Wei et al., 2020), positive attitude towards the lecture (Johnston 2017; McLaughlin, Gharkholonarehe & Davidson, 2014). For example, Ugwuanyi, Nduji, Elejere & Omeke (2020) discovered that implementing this approach to learning had a beneficial effect on students' physics success. Additionally, İyitoğlu (2018) discovered that students who came prepared to class were more engaged in class than others. Kang and Shin (2016) also confirmed that the FCL improved learners' reflective thinking abilities as well as their information literacy. Elian and Hamaidi (2018), on the other hand, concluded that it was more enjoyable than traditional approaches and supported learning. Webb and Doman (2016) carried out an experimental study to investigate the impacts of this model on students' success. In conclusion, they discovered that students who learned English using this model had a higher rate of success than those who took a traditional course. Similarly, Bhagat, Chang, and Chang (2016) carried out an experimental study and reached similar results. Indeed, almost all research in this field has found this pedagogical model beneficial in terms of developing students' academic performance as well as their critical thinking, teamwork, and self-assessment competencies.

A cursory review of the literature reveals that numerous independent studies have examined the model's impact on learners' academic success. Unfortunately, their findings are so complex that they are useless to researchers and educators. According to various researchers, this approach increases academic achievement (Bolatlı & Korucu, 2020; Çalışkan, 2019; Gökdaş & Gürsoy, 2018; Najmi, 2020), has moderate effect (Sağlam & Aslan, 2018), or has no effect (Abdullatif, 2020). In light of this situation, the current authors set out to conduct a reputable meta-analysis study known as analysis of analysis (Glass, 1976), in an attempt to systematize the interpretation of previous studies' findings and to guide future research. With an effort to conduct a meta-analysis that could be used to synthesise the findings was undertaken by Karagöl and Esen in 2018. A similar research also has been reported by Chen, Wang, & Chen (2018); Lag & Saele, (2020); Zheng, Bhagat, Zhen, & Zhang (2020), however, no truly international meta-analysis covering the period 2007-2020 has been conducted. As evidenced by the findings of a meta-synthesis study conducted by Kozikoğlu, (2019), interest in applying FCL has increased in recent years, and the number of local studies has grown steadily since 2017. The rise of distance education, particularly in the aftermath of the coronavirus pandemic, has also increased its popularity, and the continuation of education based on this model has gained prominence throughout the world. As a result, it is believed that a meta-analysis of the issue is necessary to evaluate the quantitative findings of recent studies examining the impact of this approach on academic success. The following questions were posed in support of this primary objective:

- What is the magnitude of the effect of FCL on academic achievement?
- How does the impact of FCL on academic success differ according to moderator factors (publication kind, intervention length, and educational level)?

METHOD

The meta-analysis quantitative approach is selected premised on meta-analytic processes, that include (1) undertaking a literature review, (2) conducting an investigation the moderation effect of a study's character traits on the outcome measures, (3) trying to calculate the effect sizes of each study's outcome measurements, and (4) investigating the moderation effect of a study's features on the outcome measures.

1. Review of the Literature and Selection Criteria

The Firat University Social and Human Sciences Ethics Committee assessed that this work was ethically acceptable at its 97132852/302.14.01/ numbered meeting on 21/12/2020. As a consequence, data were collected from articles, master's theses, and doctoral dissertations that met the criteria for inclusion specified in Table 1. Between September and December 2020, publications were chosen utilizing national and international databases that are used in the field of education and are available online, including ERIC, Web of Science, EBSCOHost, Google Scholar, SCOPUS, PROQUEST, and CHE Thesis Center. Additionally, the research's bibliography section indicated older papers that may not have been made available online.

Table 1. Study selection criteria

Criteria	Inclusion
Publication period	Completed between 2007 and 2020.
Publication type	An essay published in a peer-reviewed publication on a national or international level, or a master's or doctorate thesis.
Language	English or Turkish.
Research design	A randomized controlled trial includes a control group. The control group should be instructed in the usual manner, whereas the experimental group should be instructed in the FCL manner.
Outcome	Academic success
Implementation	Evaluate the FCL's impact in the area of education.
Accessibility	The whole text is accessible.
Data	The sample size, the standard deviation, and the mean values are all provided.

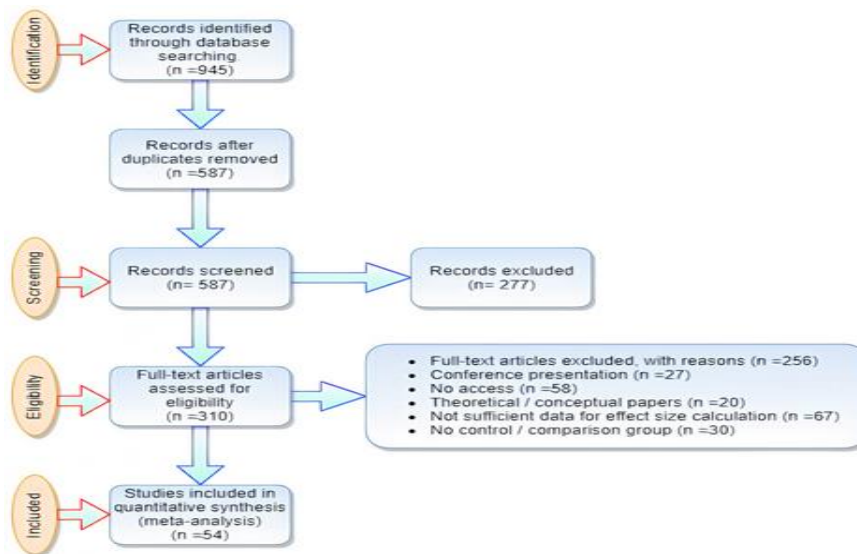


Figure 1. The search procedure

The researchers developed a list of keywords to aid in resource discovery. During the search, binary combinations of terms such as 'FCL+ academic performance,' 'inverted learning+ academic success,' and 'inverted classes+ learning result' were searched in all databases. In all, the keyword search

returns 945 articles and theses as a result of the search technique. Following that, 358 studies were discarded due to duplication, and 277 were discarded due to their inadequacy for the research topic. 256 more studies were considered unsuitable based on the inclusion criteria. As a consequence, the research sample was composed of 54 studies. However, since Yousefzadeh and Salimi (2015) demonstrated the influence of the FCL on performance in their study via collaboration with five other disciplines, the researchers were able to expand the sample size to 58. The search and selection procedure are shown in Figure 1 using a Prisma flow diagram.

2. Coding the Study's Characteristics

The studies' data were coded by creating an Excel file and sequentially numbered the experiments. To assure the reliability of the data encoded in the study, the coding procedure was carried out by two coders, one of whom has a PhD in the subject of curriculum teaching and education, and another of whom is an expert in that sector. After the coding procedure was done, the programmers' compatibility was determined. Calculation of inter-encoder dependability (consensus / (consensus + disagreement) x 100) (Miles & Huberman, 1994) and revealed a 96% reliability.

A meta-analysis study's validity is proportional to the validity of the research it incorporates (Petitti, 2000). The validity results from the research included in the study were analyzed in this context, and every effort was taken to assure their validity. Additionally, papers that used erroneous data and research techniques were excluded from the meta-analysis, which increased their validity.

3. Data Analysis

The data analysis procedure includes calculating the effect size for each study, assessing publication bias, doing a heterogeneity test, and calculating the overall effect size. The data were analyzed using the Comprehensive Meta-Analysis (CMA) Version 3.

RESULTS

This section contains the meta-analysis results and an investigation of moderator factors.

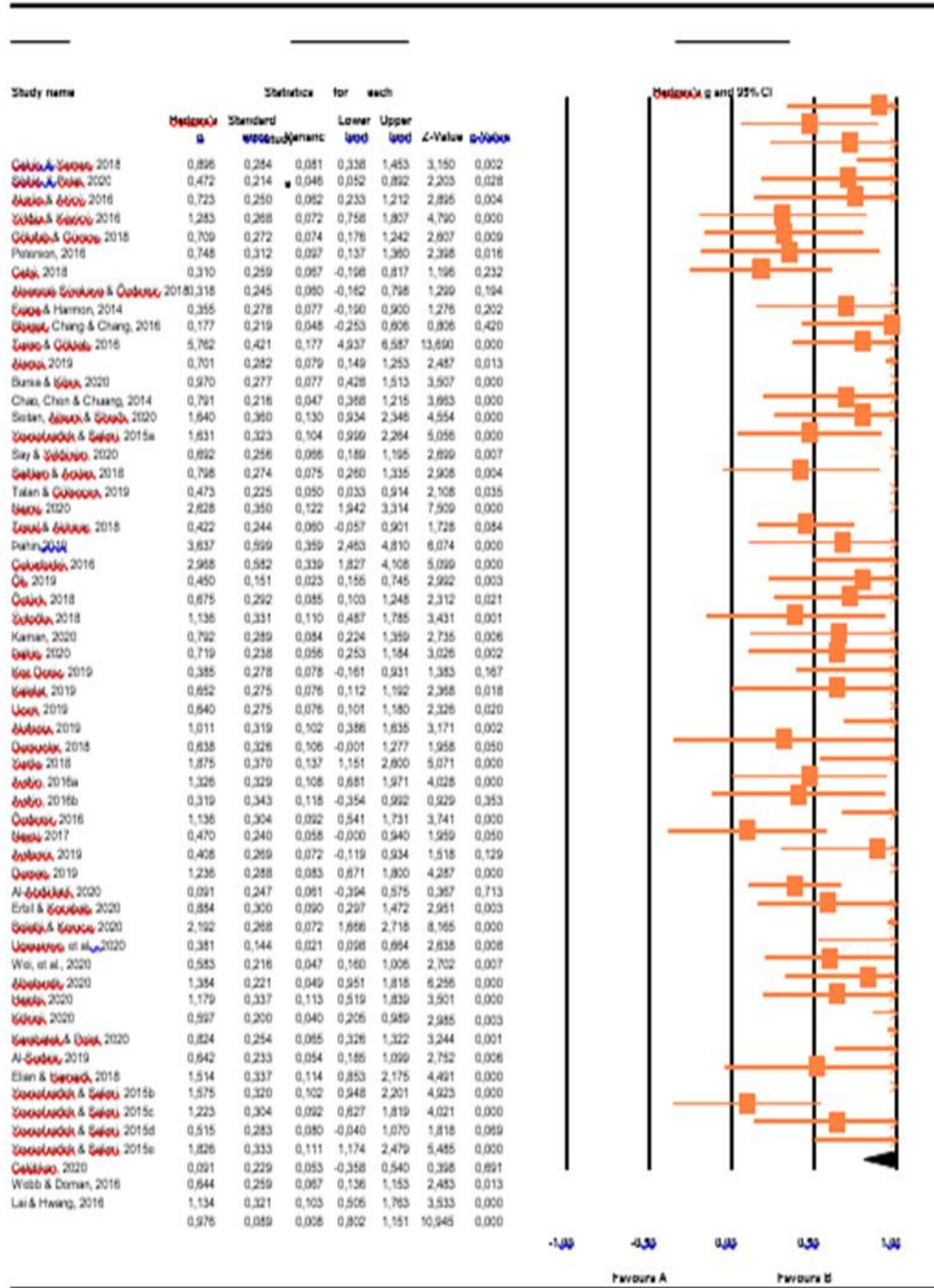
1. Meta-Analysis Findings of the Studies Included in the Research

In meta-analyses, the effect size of each study is utilized to draw a general conclusion. The meta-analysis approach included 58 publications in order to estimate the impact of the FCL on student academic progress, and the effect size for each study was calculated. The results of the general effect size and heterogeneity tests are shown in Table 2.

Table 2. Table of heterogeneity, confidence interval, and average effect size regarding the effect of FCL on academic achievement

Model	K	95% CI			Test of Mean		Heterogeneity	
		ES	Lower	Upper	Z	p	Q	p
Fixed	58	0.808	0.740	0.876	23.262	.000	362.786	.000
Random	58	0.976	0.802	1.151	10.945	.000		

The heterogeneity test is significant (Q model = 362.786; $df(Q) = 57$; $p = .000$), as shown in Table 2. Furthermore, I^2 value of greater than 75% indicates high heterogeneity (Higgins & Thompson, 2002), 84% means high heterogeneity ($I^2 = 84.288$). As a result, both the significance of Q value and I^2 value show that there is a lot of diversity in the effect sizes in this meta-analysis. The effect size of the fixed effect model was 0.808, and the effect size of the random-effect model was 0.976, both of which were significant ($p = .00 < 0.5$). According to Cohen (1988) effect size categorization, the latter corresponds to a 'high impact' value. Figure 2 shows a forest plot of the experiments to show the distribution of effect size values derived from the random-effects model.



Meta Analysis

Figure 2. Forest plot demonstrating the distribution of effect size values

The black vertical lines in the forest plot reflect the effect size of the relevant meta-analysis research, while the horizontal lines around it indicate that the impact size of that study is within the 95% confidence interval. In other words, the bigger the confidence interval, the longer the horizontal line. The study with the largest confidence interval was ascribed to Şahin (2019), whereas the study with the lowest confidence interval was published by Peterson (2016), according to the forest plot shown in Figure 2.

When the effect sizes of the studies included in the meta-analysis are examined in Figure 2, the study with the lowest effect size ($g = 0.091$) is attributed to Al-Abdullatif (2020), while the study with the largest effect size ($g = 3.637$) is attributed to Şahin (2019). While 36 studies (62.06%) have effect sizes less

than the average effect size, it can be seen that 22 studies (37.93%) have a value greater than the average effect size of the study.

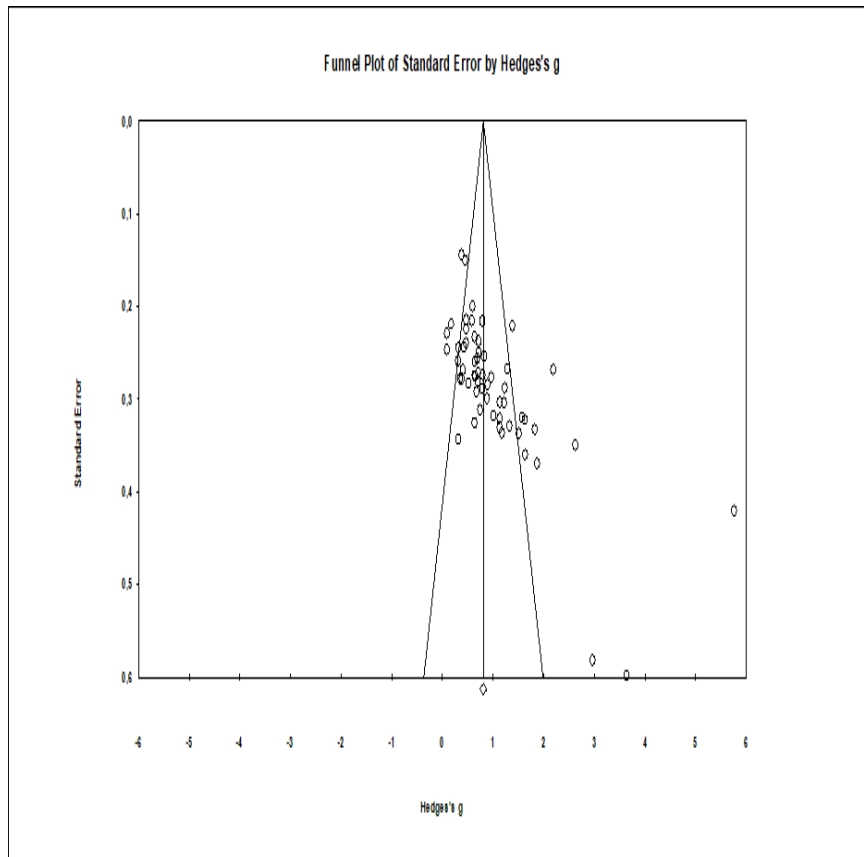


Figure 3. Funnel plot of standard error by effect size

To measure publication bias, a funnel plot, the standard fail-safe N, and Orwin's fail-safe N were utilized. As demonstrated in Figure 3, the funnel plot exhibits a symmetrical distribution. As a consequence, there was no publication bias in the present meta-analysis. The typical fail-safe N found that 9704 more investigations would be needed to negate the effect size, which was much larger than 300 ($5k+10$). Additionally, Orwin's fail-safe N revealed that it would take 4631 missing studies to reduce Hedges' g to an insignificant level (0.01). As a consequence of the data analysis, it was determined that publication bias had no influence on this meta-analysis.

1. Findings Regarding the Moderator Variables

The meta-analysis sampled articles, master's theses, and doctoral dissertations. Due to the shortage of master's and doctoral theses, they were merged and assigned to the 'theses' subgroup in the moderator analysis. Table 3 summarizes the analysis's results.

Table 3. Effect of FCL on academic achievement according to the publication type

Moderator Variable	Heterogeneity	p	K	ES	CI (95%)	SE
Publication type						
Article	0.207	0.649	38	0.994	[0.759; 1.229]	0.12
Thesis			20	0.917	[0.678; 1.155]	0.12

According to Table 3, the article type has the largest impact size ($g = 0.994$), while the thesis type has the smallest effect size ($g = 0.917$). There is no discernible variation in the kind of research published ($Q_b = 0.207$; $p = 0.649 > .05$).

The meta-analysis consists of studies conducted at the elementary, secondary, high school, and university levels. To help explain the observed heterogeneity, we included education level in the moderator analysis. Table 4 summarizes the analysis's results.

Table 4. Effect of FCL on academic achievement according to education levels

Moderator Variable	Heterogeneity	p	K	ES	CI (95%)	SE
Education Level						
Primary school	1.528	0.66	6	0.804	[0.538; 1.110]	0.146
Secondary school			22	0.604	[0.788; 1.340]	0.141
High school			7	1.021	[0.530; 1.512]	0.251
University			23	0.917	[0.595; 1.239]	0.164

According to Table 4, the maximum impact size ($g = 1.021$) occurs in high school, while the lowest effect size occurs in secondary school ($g = 0.604$). It may be inferred that no significant difference exists between the studies' educational levels ($Q_b = 1.528$; $p = 0.676 > .05$).

To assist analysis, the different time periods used to assess FCL pedagogy applications were classified as '2-5 weeks', '6-9 weeks', '10-13 weeks', and '14 weeks and above'. Table 5 summarizes the results.

Table 5. Effect of FCL on academic achievement according to the intervention length

Moderator Variable	Heterogeneity	p	K	ES	CI (95%)	SE
Duration of intervention						
2-5 weeks	9.321	0.025	14	1.181	[0.680; 1.682]	0.256
6-9 weeks			28	0.791	[0.622; 0.961]	0.086
10-13 weeks			7	1.766	[1.059; 2.473]	0.361
14 weeks and above			9	0.726	[0.445; 1.007]	0.143

According to Table 5, the maximum impact size ($g = 1.766$) was achieved between 10-13 weeks, while the minimum effect size ($g = 0.726$) was achieved after 14 weeks. By comparing the effect sizes between the groups generated according to the length of the intervention ($Q_b = 9.321$; $p = 0.025 < .05$), it is possible to conclude that there is a significant difference in the experimental group according to the time this model was used.

DISCUSSION

In a globalizing world, today's youth, dubbed Generation Z, want to incorporate technology actively into their educational and training processes, just as they do in other aspects of their life. Additionally, the emergence of technology and a variety of electronic devices has garnered considerable attention in educational settings (Tamur et al, 2020), more recently, the coronavirus pandemic has compelled humanity to safeguard itself by suspending all activities that involve face-to-face communication (Kurtoğlu Yalçın & Kazu, 2020). That is why, with the aid of technology, a great deal of labor, as well as education, has been maintained online (Ioannou & Ioannou, 2020). Additionally, education and training have to be conducted remotely, as is the case with all employees. A number of novel learning techniques and courses based on educational technologies and theories have gained popularity (Chang, Lee, Tang & Hwang, 2021), moreover, the FCL, a technology-based education paradigm, has gained favor. Recent work on the FCL, which is scheduled to be implemented in the next years, has yielded a variety of outcomes. Numerous meta-analyses have been conducted over the last decade to examine the impact of FCL and its relationship to learning effectiveness (Algarni, 2018; Chen et al., 2018; Cheng et al., 2019; Hew & Lo, 2018; Hu et al., 2018; Kang & Shin, 2016; Karagöl & Esen, 2018; Lag & Saele, 2020; Orhan, 2019; Shi et al., 2019; Zheng et al., 2020). Each of these research showed a modest to moderate positive impact size in favor of technology-integrated settings vs conventional ones. With the need to update these types of studies, this study used meta-analysis to assess the influence of FCL on students' academic accomplishment, to create a bigger picture, and to throw light on researchers, since there are many studies in this subject. In this context, the meta-analysis procedure incorporated 58 results from 54 research that used the experimental technique to assess the influence of this model on student accomplishment and satisfied the requirements. The study revealed that the distribution of the studies included in the meta-analysis was diverse (Q value = 362.786, degrees of freedom = 57, $p = .000$) was found to be heterogeneous. On the other hand, since it is well established that I^2 value more than 75% indicates strong heterogeneity (Higgins & Thompson, 2002), $I^2 = 84.288$ and 84% proved to be high heterogeneity. Thus, this finding revealed that the large variation of impact sizes may be explained by

the diversity of study designs, types, application periods, evaluation, population, and quality. The study revealed that only time of intervention explained a considerable degree of effect size variability among the moderator factors identified to account for the heterogeneity.

Given that the random-effects model is more applicable in the area of social sciences (Field, 2010), the outcomes in this research were interpreted appropriately. The meta-analysis discovered an average effect size of $g = 0.976$; $p = .00$ for the studies considered. According to Cohen's (1988) classification, a large effect was concluded on this classification. In other words, FCL seems to have a significant favorable influence on academic attainment. While Karagöl and Esen (2018) discovered an average impact size $d = .56$ based on 55 study findings, Orhan (2019) obtained a similar conclusion. Similarly, Hu et al. (2018), Hew and Lo (2018), Zheng et al. (2020), Zhu (2021) found that FCL had a beneficial effect on academic attainment. In this regard, one may observe that comparisons of experimental research examining the FCL's influence on academic success have shown a beneficial effect. In response to this statement, our current research is deemed to give a more nuanced understanding of the influence of this style of learning on learners' accomplishment when compared to the conventional technique.

1. Type of Publication

The studies included in the meta-analysis were chosen from theses and publications because they were authorized by at least one juror or referee. The publication type was chosen as a moderator variable since articles and theses are deemed to be more detailed than presentation papers. There was no significant difference in terms of publishing type between the two categories of publications. This results was consistent with Cheng et al. (2019), Kang & Shin (2018), Orhan (2019), Alten et al. (2019), Tatal & Yazar (2021) who discovered no significant influence of publishing type on the efficacy of FCL.

2. Education Level

The meta-analysis covers articles written at the elementary, secondary, secondary, and post-secondary levels of education. The effect of the moderator variable on the teaching level on the average effect size was examined; however, no significant difference was observed, and it was concluded that the FCL of the teaching level could not account for the effect on academic achievement. Karagöl & Esen (2018), Cheng et al. (2019), Lag & Sæle (2019); Hew & Lo (2018), Orhan (2019), Alten et al. (2019) also conducted a meta-analysis on the effect of the FCL on It is understandable that the results of these investigations corroborate this conclusion.

3. Intervention

In this meta-analysis, another moderator variable was discovered to be the length of applying the model to the experimental group. At the conclusion of the investigation, it was determined that there is a substantial difference in response to the duration of the FCL application to the experimental group. In other words, the magnitude of this model's influence on academic accomplishment changes according to the FCL's application time to the experimental group. The current research discovered that a medium-duration intervention (10-13 weeks) resulted in the biggest impact magnitude. The primary issue might be that excessively lengthy periods introduce possible variance, while too short durations do not allow for validation of the method's efficacy (Zheng et al., 2020). It has long been recognized that the brief length of FCL makes it difficult to discern the model's contribution to learners' accomplishment via an inventive impact (Clark, 2015). Without a doubt, this outcome will help throw light on future study, since it was shown that the aforementioned model should be employed for at least 10 weeks in order to get significant results about its efficacy on success. Similarly, Zheng et al. (2020) determined that the moderate application period had the largest impact size for this approach's efficacy on academic success in their research. In comparison, Cheng et al. (2019), Karagöl and Esen (2019), Shi et al. (2019) included the length of intervention as a moderator variable in their meta-analyses, but found no statistically significant difference.

CONCLUSION AND IMPLICATIONS

The integration of technology into educational settings has started, and the process of formulating education policy via the use of technology has begun. Integrating technology into the teaching and

learning process improves the quality of education and alters how instructors teach and students learn. FCL, one of the technology-integrated teaching and learning methodologies, is founded on the premise that learners study a topic at home and class time is used for reinforcing activities and what was formerly referred to as homework. This innovative strategy has been deemed beneficial for learners since it allows them to study the topic at their own speed. Additionally, it is beneficial for instructors who are under pressure to adopt active learning methodologies while still conveying content via conventional lectures. Additionally, this report indicated that by incorporating technology into teaching, FCL has a significant impact on learners' academic progress. The globe is being compelled to employ technology to accomplish objectives during contemporary epidemic times. As a result, educators may predict that they will need to continue facilitating face-to-face education alongside online instruction in the future. This circumstance necessitates an examination of study results on the impact of FCL on academic attainment. The purpose of this research is to do a meta-analysis of these investigations. These results are quite encouraging and give insight into the future deployment of the FCL. According to Cohen's categorization, this research ended with a high impact size. On the other hand, it is recognized that the impact size varies with the length of the intervention, with a preference for medium duration interventions.

In light of the study results, it was determined that the FCL had a significant influence on students' academic progress. In light of the findings, it was thought suitable to offer the following recommendations:

- It was recognized that the length of the application was a distinguishing factor in the FCL's academic accomplishment. The effect sizes of studies conducted on the experimental group over a period of 10-13 weeks were shown to be larger. As a result, researchers may be advised to extend the time period during which the FCL was applied to the experimental group.
- To encourage meta-analysis studies and obtain reliable results, researchers may be advised to clearly write values such as mean, standard deviation, and sample size in their studies. Otherwise, excluding studies limits the breadth of the meta-analysis investigation.
- This meta-analysis examined the FCL's influence on academic attainment. However, there is research in the literature that examines the influence of this paradigm on student attitude, motivation, and self-efficacy. Meta-analysis research in these areas may be conducted in the future.

REFERENCES

- *Akdeniz, E. (2019). *The effect of FCL on academic achievement, attitude and permanence*. (Unpublished Master's thesis), Necmettin Erbakan University, Institute of Educational Sciences, Konya.
- *Akgün, M., & Atıcı, B. (2016). The effect of reverse-straight classes on students' academic success and views. *Kastamonu Education Journal*, 25(1), 329-344.
- *Al-Abdullatif, A. M. (2020) Investigating self-regulated learning and academic achievement in an eLearning environment: The case of K-12 FCL, *Cogent Education*, 7(1), 1-18. <https://doi.org/10.1080/2331186X.2020.1835145>
- *Alamri, M. M. (2019). Students' academic achievement performance and satisfaction in a FCL in Saudi Arabia. *Int. J. Technology Enhanced Learning*, 11(1), 103-119.
- *Albahuoth, H. (2020). Effectiveness of FCL in developing 11th graders' grammatical competences in Arabic, *Interactive Learning Environments*, <https://doi.org/10.1080/10494820.2020.1821714>
- Algarni, B. (2018). *A meta-analysis on the effectiveness of FCL in mathematics education*. In proceedings of the 10th international conference on education and new learning technologies, (pp.7970-7976). <https://doi.org/10.21125/edulearn.2018.1852>.
- Alten, D. C. D., Phielix, C., Janssen, J., & Kester, L. (2019). Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis. *Educational Research Review*, 28, 100281. <https://doi.org/10.1016/j.edurev.2019.05.003>.
- *Alsancak Sırakaya, D., & Özdemir, S. (2018). The effect of a FCL on academic achievement, self-directed learning

- readiness, motivation and retention. *Malaysian Online Journal of Educational Technology*, 6(1), 76-91.
- *Al-Sudais, T. A. (2019). The impact of FCL approach on collage students' academic achievement and motivation. *The Educational Journal*, 33(132), 11-26.
- *Aydemir, E. (2019). *The impact of FCL approach on the reading and writing achievement, self-regulated learning, and classroom interaction of pre-service English teachers*. (Unpublished PhD thesis), Bahçeşehir University, Department of English Language Education, Istanbul.
- *Aydın, B. (2016). *The effect of FCL on academic achievement, homework / task stress level and learning transfer*. (Unpublished Master's thesis), Süleyman Demirel University, Institute of Educational Sciences, Computer Education and Instructional Technology Department, Isparta.
- *Aydın, G. (2016). *Investigation of the effect of the FCL on the attitude, self-efficacy perception and success of university students*. (Unpublished Master's thesis), Dokuz Eylül University, Institute of Educational Sciences, Department of Computer Education and Instructional Technology, Computer Education and Instructional Technology Program, Izmir.
- Baker, C. (2012). *FCLs: Turning learning upside down: trend of "flipping classrooms" helps teachers to personalize education*. Deseret news. Retrieved on January 15, 2020, from <http://www.deseretnews.com/article/765616415/Flipped-classrooms-Turning-learning-upside-down.html?pg=all>
- *Bhagat, K. K., Chang, C. N., & Chang, C. Y. (2016). The impact of the FCL on mathematics concept learning in high school. *Educational Technology & Society*, 19(3), 134-142.
- Bolat, Y. (2016). FCL and education information network. *Journal of Human Sciences*, 13(2), 3373-3388.
- *Bolatlı, Z. & Korucu, A. G. (2020). Determining the academic achievement of students who use FCL method supported by a mobile application and their views on collaborative learning. *Bartın University Journal of Faculty of Education*, 9(2), 229-251. <https://doi.org/10.14686/buefad.631835>
- *Bursa, S., & Çengelci Köse, T. (2020). The effect of FCL practices on students' academic achievement and responsibility levels in social studies course. *Turkish Online Journal of Distance Education-TOJDE*, 21(4), 143-159.
- *Cabı, E. (2018). The impact of the FCL on students' academic achievement. *International Review of Research in Open and Distributed Learning*, 19(3), 203-221. <https://doi.org/10.19173/irrodl.v19i3.3482>
- Card, N. A. (2012). *Applied meta-analysis for social science research*. Guilford Publications.
- Chang, C. Y., Lee, D.C. Tang, K. Y. & Hwang, G. J. (2021). Effect sizes and research directions of peer assessments: From an integrated perspective of meta-analysis and co-citation network. *Computers & Education*, 164(2021), 1-15. <https://doi.org/10.1016/j.compedu.2020.104123>
- *Chao, C. Y., Chen, Y. T., & Chuang, K. T. (2014). Exploring students' learning attitude and achievement in flipped learning supported computer aided design curriculum: A study in high school engineering education. *Inch. Comput Appl Eng Educ*, 23, 514-526. <https://doi.org/10.1002/cae.21622>
- Chen, Y., Wang, Y., & Chen, N. S. (2014). Is FLIP enough? Or should we use the FLIPPED model instead? *Computers Education*, 79, 16-27.
- Chen, K. S., Monrouxe, L., Lu, Y. H., Jenq, C. C., Chang, Y. J., Chang, Y. C., et al. (2018). Academic outcomes of FCL: A meta-analysis. *Medical Education*, 52(9), 910-924. <https://doi.org/10.1111/medu.13616>
- Cheng, L., Ritzhaupt, A. D., & Antonenko, P. (2019). Effects of the FCL instructional strategy on students' learning outcomes: A meta-analysis. *Educational Technology Research & Development*, 67(4), 793-824. <https://doi.org/10.1007/s11423-018-9633-7>
- Clark, K. R. (2015). The effects of the flipped model of instruction on student engagement and performance in the secondary mathematics classroom. *Journal of Educators Online*, 12(1), 91-115.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Earlbaum Associates, 2.
- Cohen, L., & Manion, L. (2001). *Research methods in education* (5th ed.). New York: Rotledge Falmer.
- Cumming, G. (2012). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. New York: Routledge.
- *Çakır, E., & Yaman, S. (2018). The effect of FCL on students' science achievement and computer thinking skills. *GEFAD / GUGEF*, 38(1), 75-99.
- *Çalışkan, E. (2020). The outcomes of flipped learning in information technology course in higher education, *International Journal of Education Technology and Scientific Researches*, 5(12), 945-958. ISSN: 2587-0238
- *Çukurbaşı, B. (2016). *The effect of problem-based teaching practices supported by a FCL and lego-logo applications on the success and motivation of high school students*. (Unpublished PhD thesis), Sakarya University,

- Institute of Educational Sciences, Computer Education and Instructional Technology Department, Sakarya.
- Davies, R. S., Dean, D. L., & Ball, N. (2013). Flipping the classroom and integration technology integration in a college-level information systems spreadsheet course. *Education Technology Research Development*, 61, 563–580.
- *Deveci Topal, A., & Akhisar, Ü. (2018). The effect of flipped learning approach on students' academic achievement: Application of microprocessor / microcontrollers II course. *Kocaeli University Journal of Education*, 1(2), 135–148.
- Diñçer, S. (2014). *Applied meta-analysis in educational sciences*. Ankara: Pegem Publishing.
- *Duman, İ. (2019). *The effect of a FCL based on activity-based learning on students'; academic achievement and learning motivation*. (Unpublished PhD thesis), Sakarya University, Institute of Educational Sciences, Computer Education and Instructional Technology Department, Sakarya.
- *Dursunlar, E. (2018). *7th of the FCL on the social studies academic success of students in the living democracy unit*. (Unpublished Master's thesis), Atatürk University Institute of Educational Sciences Department of Turkish and Social Sciences Education Department of Social Studies Education, Erzurum.
- *Elian, S. E. & Hamaidi, D. A. (2018). The effect of using FCL strategy on the academic achievement of fourth grade students in Jordan. *IJET*, 13(2), 110–125. <https://doi.org/10.3991/ijet.v13i02.7816>
- *Erbil, D. G., & Kocabaş, A. (2019). Flipping the 4th grade social studies course in a cooperative way: Effects on academic achievement and motivation. *Studies in Educational Evaluation*, 66. <https://doi.org/10.1016/j.stueduc.2020.100878>
- Field, A. P. (2001). Meta-analysis of correlation coefficients: A Monte Carlo comparison of fixed-and random-effects methods. *Psychological Methods*, 6, 161–180.
- Filiz, O., & Kurt, A. A. (2015). Flipped learning: Misunderstandings and the truth [Flipped learning: Misunderstandings and truths]. *Journal of Educational Sciences Research, Journal of Educational Sciences Research*, 5(1), 215–229.
- *Fraga, L. M. & Harmon, J. (2014). The flipped learning in higher education: an investigation of preservice teachers' perspectives and achievement. *Journal of Digital Learning in Teacher Education*, 31(1), 18–27. <https://doi.org/10.1080 / 21532974.2014.967420>
- Glass, G. V. (1976). *Primary, secondary and meta-analysis of research*. Retrieved from [http:// stat.smmu.edu.cn/uppic/file/pdf/primary.pdf](http://stat.smmu.edu.cn/uppic/file/pdf/primary.pdf). on on 30 November 2020.
- *Göğebakan Yıldız, D., & Kiyıcı, G. (2016). The effect of the FCL on prospective teachers' attainment, metacognitive awareness and epistemological beliefs. *CBÜ Journal of Social Sciences*, 14(3), 406–426. <https://doi.org/10.18026 / cbusos.70886>
- *Gökdas, İ. & Gürsoy, S. (2018). The effect of transformed classroom model in primary schools on academic achievement and motivation in mathematics lesson. *Journal of Mediterranean Education Research*, 12(26), 159–174. <https://doi.org/10.29329 / mjer.2018.172.9>
- *Hajebi, M. (2020). FCL as a supporting plan for Iranian EFL learners' English improvement in super intensive courses. *Theory and Practice in Language Studies*, 10(9), 1101–1105. <https://doi.org/10.17507/tppls.1009.13>
- Hew, K. F., & Lo, C. K. (2018). FCL improves student learning in health professions education: A meta-analysis. *BMC Medical Education*, 18. <https://doi.org/10.1186/s12909-018-1144-z>.
- Higgins, J. P, Thompson, S. G, Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analysis. *British Medical Journal*, 2, 557–560.
- Hu, R., Gao, H., Ye, Y., Ni, Z., Jiang, N., & Jiang, X. (2018). Effectiveness of FCLs in Chinese baccalaureate nursing education: A meta-analysis of randomized controlled trials. *International Journal of Nursing Studies*, 79, 94–103. <https://doi.org/10.1016/j.ijnurstu.2017.11.012>.
- Hughes, H. (2012). *Introduction to flipping the college classroom*. World Conference on Educational Multimedia, Hypermedia and Telecommunications, 2012, (pp. 2434–2438).
- Ioannou, M., & Ioannou, A. (2020). Technology-enhanced embodied learning: designing and evaluating a new classroom experience. *Educational Technology & Society*, 23(3), 81–94.
- *İyitoğlu, O. (2018). *The impact of folded classroom model on EFL learners' academic achievement, attitudes and self-efficacy beliefs: A mixed method study*. (Unpublished PhD thesis), Yıldız Technical University Graduate School of Social Sciences Department of Educational Sciences Curriculum and Instruction Program, İstanbul.
- Johnston, B. M. (2017). Implementing a FCL approach in a university numerical methods mathematics course, *International Journal of Mathematical Education in Science and Technology*, 48(4), 485–498.
- *Kalafat, H. Z. (2019). *Investigation of the effect of the mathematics lesson designed with the FCL on the academic*

- success of 7th grade students. (Unpublished Master's thesis), Marmara University Institute of Educational Sciences, Department of Educational Sciences, Education Programs and Instruction, Istanbul.
- *Kaman, N. (2020). *An experimental study on the effectiveness of the FCL in teaching English*. (Unpublished Master's thesis), Kırşehir Ahi Evran University, Institute of Social Sciences, Department of Educational Sciences, Educational Programs and Instruction, Kırşehir.
- Kang, S., & Shin, I.-S. (2016). *The effect of flipped learning in Korea: Meta-analysis*
<https://www.semanticscholar.org/paper/The-Effect-of-Flipped-Learning-in-Korea-%3A-Kang-Shin/6d9d49af1e74a7b6cf6c6f27c24274e6f645d5d8>.
- Kara, C. O. (2015). Inside out class. *Thoracic Surgery Bulletin*, 9, 224–228.
- *Karabatak, S., & Polat, H. (2019). The effects of the FCL designed according to the ARCS motivation strategies on the students' motivation and academic achievement levels. *Education and Information Technologies*, 25, 1475–1495. <https://doi.org/10.1007/s10639-019-09985-1>
- Karagöl, İ., & Esen, E. (2019). The effect of flipped learning approach on academic achievement: A meta-analysis study. *Hacettepe University Journal of Education*, 34(3), 708–727. <https://doi.org/10.16986/HUJE.2018046755>
- Kaya, D. (2018). The effect of the flipped learning model on the participation of middle school students in mathematics teaching. *Sakarya University Journal of Education*, 8(4), 232–249.
- Kazu, İ. Y., & Kurtoğlu, C. (2020). Research of flipped classroom based on students' perceptions. *Asian Journal of Education and Training*, 6(3), 505-513. <https://doi.org/10.20448/journal.522.2020.63.505.513>
- *Kithinji, M. A. (2020). *Effects of flipped learning facets on primary school pupils' academic achievement in science in Abothuguchi central division Meru country*. (Unpublished Master's Dissertation), University of Nairobi.
- *Koç Deniz, H. (2019). *The effect of game and activity supported FCL on student achievement, problem solving and reflective thinking skills for problem solving in mathematics lesson*. (Unpublished PhD thesis), Firat University, Institute of Educational Sciences, Educational Sciences Department, Educational Programs and Instruction, Elazığ.
- Kozikoğlu, İ. (2019). Analysis of the studies concerning flipped learning model: A comparative meta-synthesis study. *International Journal of Instruction*, 12(1), 851–868.
- Kurtoğlu Yalçın, C., & Kazu, İ. Y. (2020). *A research of flipped classroom: Student engagement-teacher guidance*. Lap Lambert Academic Publishing.
- Lag, T., & Saele, R. G. (2019). Does the FCL improve student learning and satisfaction? A systematic review and meta-analysis. *AERA Open*, 5(3), 1-17 <https://doi.org/10.1177/2332858419870489>
- Lage, M. J., Platt, G., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *Journal of Economic Education*, 31(1), 30–43.
- *Lai, C. L., & Hwang, G. J. (2016). A self-regulated FCL approach to improving students' learning performance in a mathematics course. *Computers and Education*, 100(2016) 126–140. <https://doi.org/10.1016/j.compedu.2016.05.006>
- Latorre-Coscolluela, C., Suárez, C., Quiroga, S., Sobradiel-Sierra, N., Lozano-Blasco, R., & Rodríguez-Martínez, A. (2021). Flipped Classroom model before and during COVID-19: using technology to develop 21st century skills. *Interactive Technology and Smart Education*, 18(2), 189-204. <https://doi.org/10.1108/ITSE-08-2020-0137>
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. California: Sage Publications.
- McLaughlin, J. E, Roth, M. T, Glatt, D. M, Gharkholonarehe, N., Davidson, C. A, Griffin, L. M., Esserman, D. A., & Mumper, R. J. (2014). The FCL: A course redesign to foster learning and engagement in a health professions school. *Academic Medicine*, 89(2), 236–243.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded Sourcebook. (2nd ed)*. Thousand Oaks, California: Sage.
- Miller, A. (2012). *Re: Five Best Practices for the FCL [Edutopia]*. Retrieved from <http://www.edutopia.org/blog/flipped-classroom-best-practices-andrew-miller/> on December 15, 2018.
- *Najmi, A. H. (2020). The effect of FCL approach on students' achievement in English language in Saudi Arabian southern border schools. *International Education Studies*, 13(9), 66–74. <https://doi.org/10.5539/ies.v13n9p66>
- *Nayci, Ö. (2017). *Evaluation of the FCL application in social studies teaching*. (Unpublished PhD thesis), Ankara University Institute of Educational Sciences, Department of Education Programs, Program Development in Education, Ankara.
- Orhan, A. (2019). The effect of flipped learning on students' academic achievement: A meta-analysis study.

- Çukurova University Faculty of Education Journal, 48(1), 368–396. <https://doi.org/10.14812/cufej.400919>.
- *Ök, S. (2019). *Investigation of students' academic achievement and self-regulated learning skills in flipped learning environments*. (Unpublished Master's thesis), Balıkesir University, Institute of Science, Computer Education and Instructional Technologies Department, Balıkesir.
- *Özdemir, A. (2016). *Blended learning-oriented FCL application in middle school mathematics teaching*. (Unpublished PhD thesis), Gazi University, Institute of Education, Ankara.
- *Öztürk, S. Y. (2018). *The impact of FCL on the academic achievement of student teachers of English*. (Unpublished Master's thesis), Gazi University, Department of English Language Teaching, Ankara.
- *Peterson, D. J. (2016). The FCL improves student achievement and course satisfaction in a statistics course: A quasi-experimental study. *Teaching of Psychology*, 43(1), 10–15. <https://doi.org/10.1177/0098628315620063>
- Petitti, D.B. (2001). Approaches to heterogeneity in meta-analysis. *Statistics in medicine*, 20(23), 3625–3633.
- Prasojo, L. D., Habibi, A., Mukminin, A., & Yaakob, M. F. M. (2020). Domains of Technological Pedagogical and Content Knowledge: Factor Analysis of Indonesian In-Service EFL Teachers. *International Journal of Instruction*, 13(4), 593-608. <https://doi.org/10.29333/iji.2020.13437a>
- Prensky, M. (2001). Digital natives, digital immigrants, *On the Horizon*, MBC University Press, 9(5), 1–6.
- *Sağlam, D., & Arslan, A. (2018). The Effect of FCL on the Academic Achievement and Attitude of Higher Education Students. *World Journal of Education*, 8(4), 170–176. <https://doi.org/10.5430/wje.v8n4p170>
- Sağlam, M. & Yüksel, İ. (2007). Meta-analysis and meta-evaluation methods in program evaluation. *Dumlupınar University Journal of Social Sciences*, 18, 175–188.
- *Say, F. S. & Yıldırım, F. S. (2020). FCL implementation in science teaching. *International Online Journal of Education and Teaching (IOJET)*, 7(2), 606–620.
- Schlairet, M. C., Green, R., & Benton M. J. (2014). The FCL: strategies for an undergraduate nursing course. *Nurse Educ.*, 39, 321–325.
- Seitan, W, I, Ajlouni, A. O, & Al-Shra'h, D. A. (2020). The impact of integrating flipped learning and information and communication technology on the secondary school students' academic achievement and their attitudes towards it. *International Education Studies*, 13(2), 1–10. <https://doi.org/10.5539/ies.v13n2p1>
- Shi, Y., Ma, Y., MacLeod, J., & Yang, H. H. (2019). College students' cognitive learning outcomes in FCL instruction: A meta-analysis of the empirical literature. *Journal of Computers in Education*, 7(8), 1-27. <https://doi.org/10.1007/s40692-019-00142-8>.
- Smith, J. S. (2014). Active strategies learning strategies in the physician assistant classroom – the critical piece to a successful FCL. *J Physician Assist Educ.*, 25, 46–49.
- *Söğüt, M., & Polat, S. (2020). The effect of using FCL in teaching effective citizenship learning area on students' academic achievement. *OPUS – International Journal of Society Research*, 15(24), 2472–2504. <https://doi.org/10.26466/opus.658882>
- *Şahin, S. (2019). *The effect of FCL practices on the academic success of middle school students in programming teaching*. (Unpublished Master's thesis), İnönü University, Institute of Educational Sciences, Computer Education and Instructional Technology Department, Malatya.
- *Şahin, Ş. (2020). *The effect of FCL applications on the academic achievement and attitudes of middle school seventh grade students towards social studies lessons*. (Unpublished Master's thesis), Sakarya University, Institute of Educational Sciences, Department of Turkish and Social Sciences Education, Department of Social Studies Education, Sakarya.
- *Talan, T., & Gülseçen, S. (2019). The effect of a FCL on students'; achievements, academic engagement and satisfaction levels. *Turkish Online Journal of Distance Education–TOJDE*, 20(4), 31–60.
- Tamur, M., Juandi, D., & Kusumah, Y. S. (2020). The Effectiveness of the Application of Mathematical Software in Indonesia; A Meta-Analysis Study. *International Journal of Instruction*, 13(4), 867-884. <https://doi.org/10.29333/iji.2020.13453a>
- Thalheimer, W., & Cook, S. (2002). *How to Calculate Effect Sizes from Published Research: A Simplified Spreadsheet*. Retrieved on November 30, 2020 from [http://www.worklearning.com/white_papers/effect_sizes/Effect_Sizes_Spreadsheet.xls].
- *Turan, Z. & Göktaş, Y. (2016). The FCL: instructional efficiency and impact of achievement and cognitive load levels, *Journal of e-Learning and Knowledge Society*, 12(4), 51–62.
- Total, Ö. & Yazar, T. (2021). Flipped classroom improves academic achievement, learning retention and attitude towards course: a meta-analysis. *Asia Pacific Educ. Rev.* 22, 655–673. <https://doi.org/10.1007/s12564-021-09706-9>

- *Ugwuanyi, C. S., Nduji, C. C., Elejere, U. C., & Omeke, N. E. (2020). Effect of FCL and think pair share strategy on achievement and retention among senior secondary school physics students. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 52(2), 136–148. ISSN 2307–4531.
- *Uzun, E. (2019). *7th of the FCL Examination of the effect of applying the classroom social studies course in production, distribution and consumption unit on academic success.* (Unpublished Master's thesis), Aksaray University, Institute of Social Sciences, Department of Social Sciences and Turkish Education, Department of Social Studies Education, Aksaray.
- Üstün, U., & Eryılmaz, A. (2014). A Research Method for Effective Research Synthesis: Meta–Analysis. *Education and Science*, 39(174).
- *Webb, M., & Doman, E. (2016). Does the FCL lead to increased gains on learning outcomes in ESL / EFL contexts? *The CATESOL Journal*, 28(1), 39–67.
- *Wei, X., Cheng, I. L., Chen, N. S., Yang, X., Liu, Y., Dong, Y., Zhai, X., & Kinshuk (2020). Effect of the FCL on the mathematics performance of middle school students. *Education Tech Research Dev*, 68, 1461—1484. <https://doi.org/10.1007/s11423-020-09752-x>
- *Yousefzadeh, M., & Salimi, A. (2015). The effect of flipped learning (revised learning) on Iranian students' learning outcomes. *Advances in Language and Literary Studies*, 6(5), 208–213. [https://doi.org/10.7575 / aiac.all.v.6n.5P209](https://doi.org/10.7575/aiac.all.v.6n.5P209)
- *Yurtlu, S. (2018). *Investigation of the effect of FCL on student achievement and views in science education.* (Unpublished Master's thesis), Muş Alparslan University, Institute of Science, Science Education Department, Muş.
- Zheng, L., Bhagat, K. K., Zhen, Y., & Zhang, X. (2020). The effectiveness of the FCL on students' learning achievement and learning motivation: A meta–analysis. *Educational Technology & Society*, 23(1), 1–15.
- Zhu, G. (2021). Is flipping effective? A meta-analysis of the effect of flipped instruction on K-12 students' academic achievement. *Education Tech Research Dev*, 69, 733–761. <https://doi.org/10.1007/s11423-021-09983-6>

NOTE: References marked with "*" indicate studies included in meta–analysis

Ters Yüz Sınıf Modelinin Öğrencilerin Akademik Başarılarına Etkisi Üzerine Bir Meta-Analiz Çalışması

Doç. Dr. İbrahim Yaşar Kazu
Fırat Üniversitesi -Türkiye
ORCID: 0000-0002-1039-0482
iykazu@firat.edu.tr

Cemre Kurtoglu Yalçın (Dokt.Öğr.)
Fırat Üniversitesi -Türkiye
ORCID: 0000-0002-2148-7466
cemrekurtoglu@hotmail.com

Özet

Ters yüz sınıf modeli, geleneksel eğitim sürecinin tersine işleyen, öğretmenin rehber öğrencinin aktif olduğu, sınıf içi ve sınıf dışı eğitim faaliyetlerinden oluşan teknoloji tabanlı eğitim yaklaşımlarından biridir. Bu çalışmanın amacı, son dönemde popülerliğini artırmış olan ters yüz sınıf modelinin öğrenci başarısına etkisini araştıran yurt içinde ve yurtdışında yayınlanmış nicel çalışmaların meta-analizini gerçekleştirmektir. Çalışma nicel bulguları sistematik olarak inceleyen meta-analiz yöntemiyle yürütülmüştür. Bu kapsamda ters yüz sınıf modelinin başarıya etkisini raporlamış olan makale ve tezler, ERIC, Web of Science, EBSCOHost, Google Scholar, SCOPUS, PROQUEST, YÖKTEZ veri tabanları taranmış, konu ile ilgili 945 çalışmaya ulaşılmış, kriterlere uygun 54 çalışmadan 58 araştırma bulgusu meta-analiz çalışmasına dahil edilmiştir. Yayın türü, yayın yılı, öğretim kademesi ve uygulama süresi moderatör değişken olarak belirlenmiştir. Veriler CMA programı kullanılarak analiz edilmiştir. Araştırma sonucunda, ters yüz sınıf modelinin öğrenci başarısı üzerine etkisi rastgele etkiler modeline göre istatistiksel olarak anlamlı düzeyde yüksek etkiye (Hedges's $g=0,976$) sahip olduğu görülmüştür. Ayrıca, meta-analize dahil edilen çalışmalarda raporlanan etki büyüklüklerinin heterojen dağılım gösterdiği gözlemlenmiştir ($Q_{model}=362,786$; $df(Q)=57$; $p=,000$). Yapılan alt grup analizler ile (Analog ANOVA, Meta-Regresyon) meta-analize dahil edilen çalışmalarda raporlanan etki büyüklüklerinin heterojen dağılımının altında yatan sebepler test edilmiştir. Test edilen değişkenlerden sadece uygulama süresi değişkeninin istatistiksel olarak anlamlı olduğu ($Q_b=9,321$; $p=0,025$) tespit edilmiştir. Ters yüz sınıf modelinin akademik başarı üzerindeki etkisi baz alınarak bu çalışmanın modelin sınıflarda kullanımının artmasını sağlayacağı düşünülmektedir. Çalışmadan elde edilen sonuçlara dayanarak, bu modelin akademik başarı üzerinde etkili olabilmesi için uzun süre uygulanması gerektiği önerilmiştir.

Anahtar kelimeler: Akademik başarı, Eğitim teknolojileri, Etki büyüklüğü, Meta-analiz, Ters yüz sınıf modeli



**E-Uluslararası
Eğitim Araştırmaları
Dergisi**

Cilt: 13, No: 1, ss. 85-102

Araştırma Makalesi

99

Gönderim: 2021-12-07
Kabul: 2022-01-14

Önerilen Atıf

Kazu, İ. Y. ve Kurtoglu Yalçın, C. (2022). Ters yüz sınıf modelinin öğrencilerin akademik başarılarına etkisi üzerine bir meta-analiz çalışması, *E-Uluslararası Eğitim Araştırmaları Dergisi*, 13(1), 85-102. DOI: <https://doi.org/10.19160/e-ijer.1033589>

Genişletilmiş Özet

Problem: Marc Prensky tarafından 2001 yılında literatüre kazandırılan "dijital yerliler" kavramı günümüz nesli çocuklarına uygundur. Çağımızın çocukları eğlenceden oyuna, okumadan araştırmaya kadar her işini teknoloji kullanarak çözmeye alışmış dijital yerlilerdir (Gögebakan Yıldız ve Kıyıcı, 2016). Bu nedenle, bu neslin ders çalışması, ödev yapması, okuması ve birbirleriyle iletişim kurması bir önceki kuşağın alışkanlıklarıyla farklılıklar göstermektedir. Bu farkın en önemli sebeplerinden biri de bu neslin teknolojinin içine doğmasıdır. Bu sebeple, Prensky klasik eğitim-öğretim sürecinin çağımızın nesline uygun olmadığı görüşünü savunmaktadır. Ona göre eğitimin önündeki en büyük engel dijital göçmen öğretmenlerin klasik yöntem ve tekniklerle teknoloji çocuklarına bir şeyler öğretmeye çalışmasıdır. Dijital yerli olarak tanımlanan çağımız çocukları her işini teknoloji aracılığıyla halletmeye alışmış, bilgiye istediği an ve yerde hızla ulaşmaya alışkın, yazılı materyallerden çok görsel materyallerle öğrenmeye odaklı kişilerdir (Prensky, 2001). Eğitimde başarı yakalanabilmesi için, eğitim-öğretim ortamlarının onların ihtiyaçlarına göre yeniden düzenlenmesi gerekir. Öğrenen bireyi merkeze alan 21. yüzyıl eğitim sisteminde her bireyin farklı öğrenme stiline sahip olduğu kabul edilmiş ve bu bilgi doğrultusunda programlar hazırlanmıştır. Öğrenen her bireyin ihtiyaçlarını anlamak ve onları aktif olarak eğitim- öğretim faaliyetlerine dâhil etmek temel amaç olmuştur. Öğretmen merkezli klasik eğitimin tersine işleyen bir süreç olan teknoloji tabanlı ters yüz sınıf modeli bu temel amaca hizmet eden, çağımız neslinin ihtiyaçlarına hitap etmeyi hedefleyen yeni eğitim yaklaşımlarından biridir.

Ülkemizde ve Dünyada farklı kademe ve disiplinlerde ters yüz sınıf modeline dayalı öğretimin öğrencilerin akademik başarısına etkisini araştıran, birbirinden bağımsız ve farklı zamanlarda yapılan çalışmalar literatürde mevcuttur. Fakat bu çalışmaların sonuçlarını sayısal veriler olarak bir araya getiren ve ters yüz sınıf modelinin öğrencilerin akademik başarılarına etkisini ortaya koyan bir çalışmanın Dünyada örnekleri olsa da ülkemizde yok denecek kadar azdır. Bu çalışmanın problemi, farklı kademe ve disiplinlerde ters yüz sınıf modeline dayalı öğretimin öğrencilerin akademik başarılarına etkisini deneysel araştırma modelleriyle ortaya koyan çalışmaların meta-analiz yöntemi ile bir araya getirilip birleştirilmesidir. Hem ülkemizde hem de dünyada büyük ilgi gören ters yüz sınıf modelinin öğrencilerin akademik başarılarına etkisini ortaya koyan birçok çalışma bulunmaktadır. Bu durumda, akademik başarı üzerinde ters yüz sınıf modeli uygulamalarının etkilerinin ve etki düzeylerinin belirlenmesi gereksinimi ortaya çıkmaktadır. Sağlam ve Yüksel'in (2007) de ifade ettiği gibi, bu çalışmaların bir çatı altında toplanarak yeniden analiz süzgecinden geçirilmesi ve yeni kararlara varılması ihtiyacı doğmaktadır. Bu kapsamda, bu çalışmanın amacı, yurt içi ve yurt dışında ters yüz sınıf modeli uygulamalarının öğrencilerin akademik başarıları üzerindeki etkilerini konu alan çalışmaları meta-analiz yöntemiyle incelemek olarak belirlenmiştir.

Yöntem: Bu çalışmada nicel araştırma sentezleme yöntemlerinden meta-analiz yöntemi kullanılmıştır. Meta-analiz, bireysel çalışmalardan elde edilen deneysel bulguların birleştirilmesi, etki büyüklüğü formunda sentezlenmesi ve yorumlanması amacıyla kullanılan istatistiksel bir yöntemdir (Card, 2012). Meta-analiz yöntemi kullanılarak araştırma yapmak için belli aşamalara uyulması gerekmektedir. Bu aşamalar, ilgili çalışmaların toplanması, dâhil edilme ölçütlerinin belirlenmesi, çalışmaların kodlanması, verilerin analizi ve etki büyüklüğünün hesaplanması şeklindedir.

Bu çalışmadaki veriler, Türkiye ve yurtdışında ters yüz sınıf modelinin öğrencilerin akademik başarıları üzerindeki etkisini inceleyen makaleler, yüksek lisans ve doktora tezleri içerisinde gerekli ölçütleri sağlayan çalışmalar içerisinde toplanmıştır. Araştırmaya dahil edilen çalışmaların saptanması için ulaşılabilen tez çalışmalarından ve elektronik ortamda yayın yapan ulusal ve uluslararası veri tabanlarından elde edilen makalelerden yararlanılmıştır. Çalışmanın veri toplama sürecinde, eğitim alanında sıklıkla kullanılan veri tabanları olması sebebiyle ERIC, Web of Science, EBSCOHost, Google Scholar, SCOPUS, PROQUEST, YÖKTEZ veri tabanları taranmıştır. Ayrıca ulaşılan çalışmalarda kaynakça bölümleri de incelenmiştir. Bu çalışmada kaynak tarama için bazı anahtar kelimeler belirlenmiştir. Tarama yapılırken kullanılan tüm veri tabanlarında 'ters yüz sınıf', 'ters yüz sınıf modeli', 'ters yüz öğrenme', 'ters yüz edilmiş sınıflar' ve 'akademik başarı' anahtar kelime gruplarının ikili kombinasyonları 'VE' mantıksal operatörü taranmıştır. Sonrasında aynı kelime gruplarının İngilizce karşılıkları 'flipped classroom', 'flipped learning', 'inversed classroom', 'inversed learning' ve 'academic achievement' anahtar kelime gruplarının tüm kombinasyonları 'AND' mantıksal operatörü ile sınırlandırılarak taranmıştır. Yapılan tarama

sonucunda 945 çalışmaya rastlanmış, aynı olan 358 ve araştırma problemine uygun olmayan 277 çalışma elenmiştir. Dahil edilme kriterleri göz önünde bulundurulduğunda 256 çalışma daha elenerek, 54 çalışma araştırmancının çalışma grubunu oluşturmuş, ancak [Yousefzadeh ve Salimi \(2015\)](#) ters yüz sınıf modelinin başarı üzerindeki etkisini 5 farklı disiplinle çalışarak araştırmada vermiş, 5 farklı etki büyüklüğü hesaplanabilmesine imkân verdiğinden 58 çalışma araştırmaya dahil edilmiştir. Verilerin analiz süreci, her bir çalışma için etki büyüklüğünün hesaplanması, yayın yanlılığının kontrolü, heterojenlik testi ve birleştirilmiş etki büyüklüğünün hesaplanması sürecini içermektedir. Verilerin analizinde Comprehensive Meta Analysis (CMA Version 3) programından yararlanılmıştır.

Bulgular ve Tartışma: Meta-analiz çalışmalarında her bir çalışmanın etki büyüklüğünden yola çıkarak genel bir sonuç çıkarılmaya çalışılır. Ters yüz sınıf modelinin öğrencilerin akademik başarılarına etkisini incelemek amacıyla 58 çalışma meta-analiz sürecine dahil edilmiş, meta-analize dahil edilen tüm çalışmalara yönelik etki büyüklüğü hesaplanmıştır. Örneklem sayısı 20'nin altında olan çalışmalar olması sebebiyle etki büyüklüğü hesaplanırken 'Hedges's g' değerleri kullanılmıştır. Heterojenlik durumu ile ilgili bilgi veren bir diğer değer de I^2 değeridir. I^2 değerinin %75'in üzerinde olması yüksek heterojenliğin bir göstergesi olup ([Higgins ve Thompson, 2003](#)), araştırmada $I^2=84,288$ bulunarak %84 yüksek düzeyde heterojen olduğu yorumu yapılabilmektedir. Elde edilen veriler incelendiğinde sabit etki modeli etki büyüklüğünün 0,808 ve rastgele etki modeli etki büyüklüğünün 0,976 olduğu ve anlamlı olduğu ($p=.00<0.5$) görülmektedir. Etki büyüklüğü değeri 0,20 ila 0,49 arasında olduğunda küçük düzeyde bir etki, 0,50 ila 0,79 arasında ise orta düzeyde bir etki, 0,80'den daha büyük değerlerde ise geniş düzeyde bir etki olduğunu göstermektedir. Hesaplanan rastgele etki büyüklüğü 0,976'tır. Bu sonuç etki büyüklüğü sınıflamasına göre "geniş bir etki" değerine karşılık gelmektedir [Cohen \(1988\)](#). Ülkemizde ters yüz sınıf modelinin başarı üzerindeki etkisine yönelik yapılan meta-analiz çalışmasında [Karagöl ve Esen \(2018\)](#), ortalama etki büyüklüğünü $d=.56$ bulmuş, [Cohen \(1988\)](#)'in sınıflamasına göre orta düzeyde bir etki olduğuna ulaşılmıştır. Yurtdışında bu konuda yapılan meta-analiz çalışmaları incelendiğinde, [Zheng vd. \(2020\)](#) etki büyüklüğünü .66 bulurken, [Lag ve Saele \(2020\)](#) etki büyüklüğünü .35 bularak küçük etki bulunduğunu raporlamıştır. Buna göre, son dönemde ülkemizde ters yüz sınıf modelinin akademik başarı üzerindeki etkisini ölçen deneysel çalışmaların daha çok başarıya ulaştığı ve olumlu etki yaptığı yorumunu yapmak mümkündür.

Moderatör değişkenlerin etki büyüklüğü üzerinde etkisi araştırılmak istenmiş, Analog ANOVA yapılmıştır. Meta-analize dahil edilen çalışmalar en az bir jüri veya hakemin onayından geçtiği için tez ve makalelerden seçilmiştir. Meta-analize dahil edilen çalışmalardan 38'i makale türünde, 20'si ise tezdur. Araştırmaların yayın türüne göre etki büyüklüklerine bakıldığında, en yüksek etki büyüklüğünün makale türüne ($EB=0,994$) sahip olduğu, tez türünün ($EB=0,917$) makale türüne nazaran daha düşük etki büyüklüğüne sahip olduğu sonucuna varılmıştır. Meta-analize alınan araştırmaların yayın türüne göre oluşan gruplar arası etki büyüklüklerine bakıldığında ($Q_b=0,207$; $p=0,649>.05$) araştırmaların yayın türüne göre anlamlı bir farklılık olmadığı, yayın türünün ortalama etki büyüklüğü üzerinde etkili olmadığı saptanmıştır.

Meta-analize dahil edilen çalışmalar ilköğretim, ortaokul, ortaöğretim ve yükseköğretim kademelerinde gerçekleştirilmiş çalışmalardan oluşmaktadır. Öğretim kademesi moderatör değişkeninin ortalama etki büyüklüğü üzerindeki etkisine bakılmış, ancak anlamlı bir farklılığa ulaşılamamış, öğretim kademesinin ters yüz sınıf modelinin akademik başarıya etkisini açıklayamadığı sonucuna ulaşılmıştır ($Q_b=1,528$; $p=0,676>.05$). [Karagöl ve Esen \(2018\)](#), [Hew ve Lo \(2018\)](#), [Cheng et al. \(2019\)](#), [Lag ve Saele \(2019\)](#), [Orhan \(2019\)](#), [Alten et al. \(2019\)](#) de ters yüz sınıf modelinin akademik başarıya etkisi üzerine bir meta-analiz yapmış, öğretim kademesini moderatör değişken olarak belirlemiştir. [Karagöl ve Esen \(2018\)](#)'in bulguları çalışmanın bu sonucunu destekler niteliktedir.

Ters yüz sınıf modelinin başarıya etkisi üzerine yapılan bu meta-analiz çalışmasında, söz konusu modelin deney grubuna uygulanma süresi bir diğer moderatör değişken olarak belirlenmiştir. Analizi kolaylaştırmak adına uygulama süreleri '2-5 hafta', '6-9 hafta', '10-13 hafta' ve '14 hafta ve üzeri' şeklinde kategorize edilmiştir. En yüksek etki büyüklüğüne ($EB=1,766$) 10-13 hafta arası uygulanan çalışmalar sahipken, en düşük etki büyüklüğüne ($EB=0,726$) 14 hafta ve üzeri uygulanan çalışmaların sahip olduğu sonucuna varılmıştır. Meta-analize alınan araştırmaların uygulama sürelerine göre oluşan gruplar arası etki büyüklüklerine bakıldığında ($Q_b=9,321$; $p=0,025<.05$) araştırmaların deney grubuna ters yüz sınıf

modelini uygulama sürelerine göre anlamlı bir farklılık olduğu anlaşılmıştır. Diğer bir ifadeyle, ters yüz sınıf modelinin deney grubuna uygulanma süresinin farklılaşmasıyla ters yüz sınıf modelinin akademik başarı üzerindeki etki büyüklüğünün de farklılık gösterdiği sonucu Zheng vd. (2020)'nin bulgularıyla örtüşmektedir. Zheng vd. (2020) de çalışmasında orta düzeyde uygulama süresinin en yüksek etki büyüklüğüne sahip olduğu sonucuna ulaşmış, yapılan meta-analiz çalışmasında da 10-13 hafta arası yapılan uygulama süresinin en yüksek etki büyüklüğüne sahip olduğu anlaşılmıştır.

Öneriler: Bu meta-analiz çalışmasına, ters yüz sınıf modelinin eğitim alanında akademik başarıya etkisini ölçen çalışmalar dahil edilmiştir. Ancak alanyazın tarandığında, ters yüz sınıf modelinin tıp, mühendislik, doğa bilimleri gibi bilim dallarında da akademik başarıya etkisinin ölçüldüğü çok sayıda çalışmaya rastlanmaktadır. Araştırmacılara, bu çalışmalarını da dahil edecek geniş kapsamlı meta-analiz yapmaları önerilebilir. Yapılan analiz sonucunda ters yüz sınıf modelinin öğrencilerin akademik başarıları üzerinde geniş düzeyde bir etkiye sahip olduğu anlaşılmıştır. Bu sebeple, eğitim öğretim ortamlarında ters yüz sınıf modeli kullanılması teşvik edilmeli, gerekli altyapı ve imkanlar sağlanmalıdır. Uygulama süresinin ters yüz sınıf modelinin akademik başarı üzerinde ayırt edici bir değişken olduğu anlaşılmıştır. Ters yüz sınıf modelinin deney grubuna 10-13 hafta arası bir süre uygulanan çalışmaların daha yüksek etki büyüklüğüne sahip olduğu tespit edilmiştir. Bu sebeple araştırmacılara, deney grubuna ters yüz sınıf modeli uyguladıkları süreyi uzun tutmaları önerilebilir. Meta-analiz çalışmalarını teşvik etmek ve güvenilir sonuçlara ulaşmak adına, araştırmacılara çalışmalarında ortalama, standart sapma, örneklem büyüklüğü gibi değerleri açık bir şekilde yazmaları önerilebilir. Aksi halde kapsam dışı bırakılan çalışmalar meta-analiz çalışmasının kapsamını daraltmaktadır. Bu meta-analiz çalışması ters yüz sınıf modelinin akademik başarıya etkisi üzerine odaklanmıştır. Ancak alanyazında, söz konusu modelin, öğrenci tutumuna, motivasyonuna, öz yeterliğine etkisini araştıran çalışmalar da mevcuttur. Ters yüz sınıf modelinin bu açılardan etkisine yönelik meta-analiz çalışmaları gerçekleştirilebilir.