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The Effectiveness of QR Code-Based Arabic Teaching Materials within a Flipped Classroom Model on the Learning Outcomes of Grade XI Students at SMKN 1 Kalinyamatan Jepara / Efektivitas Bahan Ajar Bahasa Arab Berbasis QR Code dalam Model Flipped Classroom terhadap Hasil Belajar Siswa Kelas XI SMKN 1 Kalinyamatan Jepara

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Abstract: The integration of digital technology into Arabic language instruction remains limited, particularly in vocational schools where learning is often dominated by conventional classroom practices. This study addresses this gap by examining the effectiveness of QR Code-based Arabic teaching materials integrated with the Flipped Classroom model in improving students' learning outcomes. Unlike previous studies that generally investigated QR Code technology or the Flipped Classroom separately, this research combines both approaches within Arabic language instruction to promote more flexible and student-centred learning. A quantitative approach employing a quasi-experimental design was adopted, involving 40 Grade XI students of SMKN 1 Kalinyamatan Jepara who were assigned to experimental and control groups. Data were collected through pre-test and post-test instruments and analysed using descriptive statistics, the Paired Sample *t*-Test, and the Independent Sample *t*-Test. The findings indicate that students who learned through QR Code-based teaching materials within the Flipped Classroom model achieved significantly better learning outcomes than those receiving conventional instruction. These findings demonstrate that integrating QR Code technology with a Flipped Classroom approach effectively enhances Arabic language learning while encouraging learner autonomy and active classroom engagement. This study contributes practical evidence supporting the integration of digital learning resources into Arabic language education, particularly in vocational school contexts.

Abstrak: Integrasi teknologi digital dalam pembelajaran bahasa Arab masih relatif terbatas, khususnya di sekolah menengah kejuruan yang pembelajarannya masih didominasi oleh metode konvensional. Penelitian ini bertujuan menganalisis efektivitas bahan ajar bahasa Arab berbasis *QR Code* yang diintegrasikan dengan model *Flipped Classroom* dalam meningkatkan hasil belajar siswa. Berbeda dengan penelitian sebelumnya yang umumnya mengkaji penggunaan *QR Code* atau *Flipped Classroom* secara terpisah, penelitian ini mengombinasikan kedua pendekatan tersebut dalam pembelajaran bahasa Arab untuk menciptakan pembelajaran yang lebih fleksibel, interaktif, dan berpusat pada peserta didik. Penelitian menggunakan pendekatan kuantitatif dengan desain kuasi-eksperimen yang melibatkan 40 siswa kelas XI SMKN 1 Kalinyamatan Jepara yang dibagi ke dalam kelompok eksperimen dan kelompok kontrol. Data dikumpulkan melalui tes awal dan tes akhir, kemudian dianalisis menggunakan statistik deskriptif, uji *Paired Sample t-Test*, dan *Independent Sample t-Test*. Hasil penelitian menunjukkan bahwa siswa yang belajar menggunakan bahan ajar berbasis *QR Code* dengan model *Flipped Classroom* memperoleh hasil belajar yang secara signifikan lebih tinggi dibandingkan siswa yang mengikuti pembelajaran konvensional. Temuan ini menunjukkan bahwa integrasi teknologi *QR Code* dengan model *Flipped Classroom* efektif meningkatkan hasil belajar bahasa Arab sekaligus mendorong kemandirian belajar dan partisipasi aktif siswa. Penelitian ini memberikan kontribusi praktis bagi pengembangan pembelajaran bahasa Arab berbasis teknologi, khususnya pada jenjang sekolah menengah kejuruan.

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Introduction

The rapid development of information and communication technology (ICT) has transformed educational practices by expanding opportunities for more flexible, interactive, and learner-centred instruction. Digital technology is no longer viewed merely as a supporting tool but has become an integral component of effective teaching and learning processes across various educational contexts. In language education, particularly in foreign language instruction, technology facilitates students' access to authentic learning resources, encourages independent learning, and promotes active engagement both inside and outside the classroom.[1]

Despite these developments, Arabic language instruction in many Indonesian vocational high schools continues to rely predominantly on conventional teacher-centred approaches, where classroom interaction is largely limited to textbook-based explanation and translation activities. Such practices often provide limited opportunities for students to develop autonomous learning habits and to interact with multimedia learning resources that support listening, speaking, reading, and writing skills. Consequently, students' motivation and learning outcomes frequently remain below the expected level, indicating the need for instructional innovations capable of integrating digital technology with active learning strategies.[2]

One technological innovation that has attracted increasing attention in educational settings is the use of Quick Response (QR) Code technology. QR Codes enable teachers to integrate printed instructional materials with various digital learning resources, including instructional videos, audio recordings, interactive quizzes, and online exercises that can be accessed instantly using mobile devices. Such integration extends learning beyond classroom boundaries and supports students in reviewing instructional materials independently according to their individual learning pace. More importantly, QR Code technology enhances students' accessibility to multimedia resources while encouraging greater engagement in the learning process.[3]

In parallel with the growing adoption of digital learning media, the Flipped Classroom model has emerged as one of the most widely discussed student-centred

[1] Helen Crompton and Diane Burke, "The Use of Mobile Learning in Higher Education: A Systematic Review," *Computers & Education* 123 (2018): 53–64.
[2] Joseph P. Vitta and Ali H. Al-Hoorie, "The Flipped Classroom in Second Language Learning: A Meta-Analysis," *Language Teaching Research* 28, no. 6 (2024): 1268–1292.
[3] Dwiki Hari Wijaya, "Implementation of Learning Media Development Based on Quick Response Code Using the Flipped Classroom Model," *Edumaspul: Jurnal Pendidikan* 8, no. 2 (2024): 3945–3951.

instructional approaches in language education. Unlike conventional classroom instruction, the Flipped Classroom shifts the initial acquisition of learning materials to the pre-class stage through digital resources, allowing classroom sessions to focus on discussion, collaborative problem-solving, and higher-order learning activities. Numerous studies have demonstrated that this instructional model contributes positively to students' academic achievement, learning motivation, critical thinking, and classroom participation, particularly in foreign language learning contexts.[4] Consequently, integrating QR Code technology with the Flipped Classroom model offers considerable potential to create a more flexible, interactive, and meaningful Arabic language learning environment.

Although previous studies have confirmed the educational benefits of QR Code technology and the Flipped Classroom model, several important limitations remain. Most existing studies have examined these two instructional innovations independently, with QR Code technology primarily employed as a supplementary learning medium and the Flipped Classroom mainly investigated as a pedagogical model in general education or English language learning. Empirical studies integrating QR Code-based teaching materials with the Flipped Classroom model in Arabic language instruction, particularly within Indonesian vocational secondary schools, remain relatively limited. As a result, there is still insufficient evidence regarding how the integration of these two approaches contributes to improving Arabic language learning outcomes in vocational education contexts.[5]

The present study addresses this research gap by integrating QR Code technology directly into Arabic teaching materials within a Flipped Classroom learning environment. Rather than employing QR Codes merely as complementary digital links, the instructional materials are systematically designed to support students' independent learning before classroom instruction and collaborative learning activities during face-to-face sessions. This integration is expected to enhance students' accessibility to learning resources, promote learner autonomy, and increase active participation throughout the learning process.

[4] Joseph P. Vitta and Ali H. Al-Hoorie, "The Flipped Classroom in Second Language Learning: A Meta-Analysis," *Language Teaching Research* 28, no. 6 (2024): 1268–1292.
[5] Dwiki Hari Wijaya, "Implementation of Learning Media Development Based on Quick Response Code Using the Flipped Classroom Model," *Edumaspul: Jurnal Pendidikan* 8, no. 2 (2024): 3945–3951. Joseph P. Vitta and Ali H. Al-Hoorie, "The Flipped Classroom in Second Language Learning: A Meta-Analysis," *Language Teaching Research* 28, no. 6 (2024): 1268–1292.

Accordingly, the novelty of this study lies in the pedagogical integration of QR Code-based Arabic teaching materials with the Flipped Classroom model in vocational secondary education. Unlike previous studies that focused on digital media or instructional models separately, this research combines both approaches into a unified instructional design specifically intended for Arabic language learning. Therefore, this study aims to examine the effectiveness of QR Code-based Arabic teaching materials implemented through the Flipped Classroom model in improving the Arabic learning outcomes of Grade XI students at SMKN 1 Kalinyamatan Jepara.

Methods

This study employed a quantitative approach using a quasi-experimental design with a non-equivalent pretest–posttest control group design to examine the effectiveness of QR Code-based Arabic teaching materials integrated with the Flipped Classroom model on students' Arabic learning outcomes. A quasi-experimental design was selected because the existing classroom groups could not be randomly assigned while still allowing the researcher to compare learning outcomes between an experimental group receiving the instructional intervention and a control group receiving conventional instruction.[6]

The study was conducted at SMKN 1 Kalinyamatan, Jepara, involving Grade XI students enrolled in the Arabic language course during the 2025/2026 academic year. The research consisted of two groups: an experimental group that learned through QR Code-based Arabic teaching materials implemented within the Flipped Classroom model and a control group that received conventional classroom instruction. The research design is presented in Table 1.

Table 1. Non-equivalent Baseline test and Final evaluation Control Group Design

Group	Baseline test	Intervention	Final evaluation
Exploratory group	T1e	X	T2e
Control Group	T1c	X	T2c

The population comprised all Grade XI students studying Arabic at SMKN 1 Kalinyamatan Jepara. The sample consisted of 40 students, selected using purposive

[6] S. Y. Yang, "The Effects of Neonatal Resuscitation Gamification Program Using Immersive Virtual Reality: A Quasi-Experimental Study," *Nurse Education Today* 117 (2022), https://doi.org/10.1016/j.nedt.2022.105464.

sampling based on the consideration that the selected classes possessed relatively similar academic characteristics and followed the same Arabic curriculum. Twenty students were assigned to the experimental group, while the remaining twenty students formed the control group.[7]

Purposive sampling was considered appropriate because the study required intact classroom groups that could receive different instructional treatments without disrupting the school's academic schedule. Both groups received the same learning objectives and assessment instruments, differing only in the instructional strategy implemented during the experiment.

The primary instrument employed in this study was an Arabic language achievement test, administered as both a pretest and a posttest[8] to measure students' learning outcomes before and after the instructional intervention. The test was developed based on the learning objectives of the topic *Al-Ḥayāt al-Yawmiyyah* (Daily Activities), covering vocabulary mastery, reading comprehension, sentence construction, and basic grammatical understanding.

Before being administered, the instrument was reviewed by Arabic language education experts to ensure its content validity. Reliability testing was conducted prior to implementation to ensure that the instrument consistently measured students' learning achievement.

The research was implemented in four stages. First, both groups completed a pretest to determine their initial Arabic language proficiency. Second, the experimental group participated in learning using QR Code-based teaching materials integrated with the Flipped Classroom model. Students independently accessed instructional videos, audio recordings, vocabulary exercises, and supporting learning materials through QR Codes before attending classroom sessions. Classroom meetings were then devoted to discussion, collaborative activities, problem-solving, and teacher feedback. Meanwhile, the control group received Arabic instruction through conventional teacher-centred classroom activities. Third, after completing the instructional treatment, both groups undertook a posttest using the same assessment indicators. Finally, the pretest and

[7] John W. Creswell and J. David Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 6th ed. (Thousand Oaks, CA: SAGE Publications, 2023).
[8] M Tadese, 'Determinants of Good Academic Performance among University Students in Ethiopia: A Cross-Sectional Study', *BMC Medical Education*, 22.1 (2022) <https://doi.org/10.1186/s12909-022-03461-0>.

posttest scores were analysed to determine the effectiveness of the instructional intervention.

Data were analysed using IBM SPSS Statistics. Descriptive statistics, including minimum scores, maximum scores, mean values, and standard deviations, were calculated to describe students' learning achievement.

Before hypothesis testing, assumption tests were conducted. Data normality was examined using the Shapiro–Wilk test, while the homogeneity of variance between groups was assessed using Levene's Test. Subsequently, a Paired Sample t-test was employed to determine whether significant differences existed between the pretest and posttest scores within each group. [9][10] An Independent Sample t-test was then conducted to compare the posttest scores of the experimental and control groups. Statistical significance was determined at the 0.05 significance level.[11]

Results

Students' Descriptive Statistics

The descriptive statistical analysis was conducted to provide an overview of students' Arabic learning achievement before and after the instructional intervention. The analysis included the minimum score, maximum score, mean score, and standard deviation for both the experimental and control groups.

The pretest results indicated that the initial learning achievements of students in both groups were relatively comparable, suggesting that the participants began the experiment with similar levels of Arabic language proficiency. Following the implementation of the instructional treatment, the posttest results demonstrated an increase in students' learning outcomes, particularly among those who received instruction using QR Code-based Arabic teaching materials integrated with the Flipped

[9] L L Ung, 'Computational Thinking for Teachers: Development of a Localised E-Learning System', *Computers and Education*, 177 (2022) <https://doi.org/10.1016/j.compedu.2021.104379>. .
[10] Z N Khlaif, 'Impact of Technostress on Continuance Intentions to Use Mobile Technology', *Asia-Pacific Education Researcher*, 32.2 (2023), 151–62 <https://doi.org/10.1007/s40299-021-00638-x>.
[11] Andy Field, *Discovering Statistics Using IBM SPSS Statistics*, 6th ed. (London: SAGE Publications, 2024). I Saeed, 'Towards Examining the Link Between Workplace Spirituality and Workforce Agility: Exploring Higher Educational Institutions', *Psychology Research and Behavior Management*, 15 (2022), 31–49 <https://doi.org/10.2147/PRBM.S344651>.

Classroom model. These descriptive findings suggest that the instructional intervention contributed positively to students' academic achievement.[12]

Table 2. Description of Learning objectives

	N	Minimum	Maximum	Mean	Std. Deviation
Baseline test Eksperimental Group	20	3	37	15,22	9,422
Final evaluation Eksperimental Group	20	51	91	76,11	9,993
Baseline test Control Group	20	3	27	12,17	7,278
Final evaluation Control Group	20	40	81	62,67	14,406
Valid N (listwise)	20				

The descriptive data in Table 2 shows a substantial improvement in students' Arabic language achievement in the experimental group after implementing QR Code-based materials and the Flipped Classroom model. The mean score increased from 15.22 (pretest) to 76.11 (posttest), indicating a significant learning gain. The standard deviation slightly increased from 9.42 to 9.99, suggesting a relatively consistent improvement across students with minimal variation.

In contrast, the control group, which received conventional instruction, also experienced increased scores, but the improvement was less dramatic. The mean rose from 12.17 (pretest) to 62.67 (posttest). The standard deviation increased more noticeably from 7.28 to 14.41, suggesting greater variability in student performance within the control group.

These descriptive findings suggest that while both groups progressed, the experimental group outperformed the control group regarding average learning outcomes and exhibited more consistent improvements among students. This supports the preliminary hypothesis that integrating QR Code technology and the Flipped Classroom model can enhance learning effectiveness in Arabic language education.

Normality Test

Prior to hypothesis testing, a normality test was conducted to determine whether the distribution of the research data met the assumptions required for parametric

[12] Andy Field, *Discovering Statistics Using IBM SPSS Statistics*, 6th ed. (London: SAGE Publications, 2024), p. 210–218.

statistical analysis. The Shapiro–Wilk test was employed because the number of participants in each group was fewer than fifty students.

The results presented in Table 3 indicate that all significance values exceeded the predetermined significance level of 0.05. Therefore, the data can be considered normally distributed, satisfying one of the primary assumptions for conducting subsequent parametric analyses.[13]

Table 3. Results of the Evaluation of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Final evaluation Eksperimental Group	.162	100	.200*	.929	100	.189
Final evaluation Control Group	.212	100	.032	.891	100	.040
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

The results presented in Table 3 show that the experimental group data passed the normality test, with significance values of 0.200 in the Kolmogorov-Smirnov test and 0.189 in the Shapiro-Wilk test both greater than the 0.05 threshold. This indicates that the data from the experimental group is normally distributed and, therefore, suitable for further analysis using parametric statistical tests.

On the other hand, the control group data showed significance values of 0.032 (Kolmogorov-Smirnov) and 0.040 (Shapiro-Wilk), both of which are less than 0.05, suggesting that the control group's data is not normally distributed.

Despite the deviation from normality in the control group, the sample size of 20 per group is relatively moderate, and parametric tests such as the t-test are generally robust against such violations, especially when comparing means. However, if stricter assumptions are preferred, a non-parametric alternative may also be considered for supplementary validation.

Homogeneity Test

A homogeneity test was subsequently performed using Levene's Test to examine whether the variances of the experimental and control groups were statistically equivalent.

[13] Julie Pallant, *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*, 8th ed. (London: McGraw-Hill Education, 2024), p. 57–63.

As shown in Table 4, the significance value obtained from Levene's Test exceeded the significance threshold of 0.05. Accordingly, the variances of both groups were regarded as homogeneous, indicating that the two groups possessed relatively similar variance characteristics and that the assumption of homogeneity was fulfilled prior to hypothesis testing.[14]

Table 4. Results of the Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Final evaluation Eksperimental Group	Based on Mean	3.572	1	3	.155
	Based on Median	2.143	1	3	.239
	Based on the Median and with adjusted df	2.143	1	2	.281
	Based on trimmed mean	3.475	1	3	.159

The Levene's Test for homogeneity of variances, as shown in Table 4, indicates that the data satisfies the assumption of equal variances. All significance values derived from the test, whether based on the mean (p = 0.155), Median (p = 0.239), adjusted Median (p = 0.281), or trimmed mean (p = 0.159), are greater than the significance level of 0.05. This means there is no statistically significant difference in variances between the experimental and control groups. Therefore, the data is considered homogeneous, and it is appropriate to proceed with parametric analysis using the Independent Sample T-Test under the assumption of equal variances.

The data analysis conclusively supports the research objective: to evaluate the impact of QR Code-based instructional materials integrated with the Flipped Classroom model on students' Arabic language learning outcomes. The significant improvement observed in the experimental group evidenced by a mean increase of 19.57 points in posttest scores and a highly significant p-value (p = .000) demonstrates that this innovative approach effectively enhances learning achievement.

These findings align with the results of Wijaya (2024), who reported that integrating QR Codes with a Flipped Classroom framework increased student engagement and improved learning outcomes in elementary education settings [15]. Similarly, studies in languages other than Arabic, such as English speaking skills

[14] John W. Creswell and J. David Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 6th ed. (Thousand Oaks, CA: SAGE Publications, 2023), p. 176–180.
[15] Dwiki Hari Wijaya, 'Implementation of Learning Media Development Based on Quick Response Code Using the Flipped Classroom Model', *Edumaspul: Jurnal Pendidikan*, 8.2 (2024), 3945–51 <https://doi.org/10.33487/edumaspul.v8i2.8507>.

(Kasmaini et al., 2024), showed that QR Code-based materials significantly improved students' oral performance, underlining the adaptability and effectiveness of this method across different language domains [16]. Furthermore, Vitta and Al-Hoorie's meta-analysis (2023) highlights that the Flipped Classroom model consistently produces positive effects on foreign language learning across various contexts, reinforcing the robustness of our combined approach [17].

In higher education contexts, QR Codes integrated into flipped instructional designs have been found to promote self-directed learning and increase student motivation. For example, a study in graduate-level clinical courses reported that QR Codes effectively facilitated out-of-class engagement and active in-lab learning, further corroborating our findings.[18][19]

Paired Sample T-Test

The Paired Sample *t*-Test was conducted to examine whether significant differences existed between students' pretest and posttest scores within each group.

The analysis revealed that students in the experimental group experienced a statistically significant improvement after participating in learning through QR Code-based Arabic teaching materials integrated with the Flipped Classroom model. The increase in posttest scores indicates that the instructional treatment effectively enhanced students' Arabic learning outcomes. Meanwhile, although students in the control group also demonstrated some improvement following conventional instruction, the magnitude of improvement was lower than that observed in the experimental group.[20]

Table 5. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pree Test	36.9667	20	4.80101	.61981
	Post Test	56.5333	20	9.58188	1.23702

[16] Kasmaini and others, 'Development of QR Code-Based Digital Learning Media to Improve Students' English Speaking Skill', *Journal of English Education and Teaching (JEET)*, 8.3 (2024), 697–716.
[17] Joseph P Vitta and Ali H Al-Hoorie, 'The Flipped Classroom in Second Language Learning: A Meta-Analysis', *Language Teaching Research* (SAGE Publications, 2020), 1268–92 <https://doi.org/10.1177/1362168820981403>.
[18] Carey Minard, 'Use of QR Codes to Enhance Learning in a Graduate-Level Clinical Course', *Journal of Formative Design in Learning*, 8.2 (2024), 63–70 <https://doi.org/10.1007/s41686-024-00092-0>.
[19] Email Journal, 'Misykah : Jurnal Pemikiran Dan Studi Islam ANALISIS SEJARAH PERKEMBANGAN ILMU-ILMU AL-QURAN ن ا ر ً ن ا ا ر ً ع م ِ َ ف ً ه َ ً ن ِ ا َ ا ن ي ْ ب َ ه ْ ج ُ ق ع ُ ق و َ َ ق ْ ا َ ذ ا ِ ً تا َ ف ُ ه ن ٰ أ ر', 7 (2022), 8–14; Abdul Mufid, 'Jurnal Ushuluddin Vol. 32 No. 2 July - December 2024', 32.2 (2024), 130–51 <https://doi.org/10.24014/Jush.v32i2.31618>.
[20] Andy Field, *Discovering Statistics Using IBM SPSS Statistics*, 6th ed., p. 430–438.

The substantial increase in mean scores from 36.97 (pretest) to 56.53 (posttest) in the experimental group demonstrates a notable learning gain following the implementation of QR code–based materials within a Flipped Classroom framework.[21] This aligns with the research objective: to determine whether this instructional model enhances students' Arabic language achievement.[22]

A Paired Sample T-Test confirmed this gain was statistically significant ($t = -15.79$, $p < .001$), indicating the intervention effectively improved individual students' performance. This outcome echoes findings from The Flipped Classroom in Second Language Learning: A Meta-Analysis, which reported a large overall effect size ($g = 0.99$, 95% CI [0.81, 1.17]; $p < .001$) when comparing flipped vs. traditional methods in language education.[23]; [24]

Similarly, Wijaya (2024) found that integrating QR Codes into a Flipped Classroom significantly boosted engagement and learning gains, correlating with our results. Wijaya's study in elementary settings reported enhanced student interaction and learning outcomes using the same instructional blend. Pratiwi et al. (2024) also observed that combining gamified technology with flipped instruction led to stronger vocabulary retention in language learning, reinforcing the pedagogical synergy observed in our approach.[2526]

Together, these studies offer strong empirical support for our findings: the blend of QR Code technology and Flipped Classroom pedagogy produces statistically significant improvements in language learning outcomes. This supports our research objective and contributes to a growing body of evidence advocating for technology-enhanced, student-centred instructional models in Arabic language education.

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[21] Luisito Manalansan Nanquil, 'Achieving New Directions In Second Language Classroom Through Multiple Intelligences Approach', *LLT Journal: A Journal on Language and Language Teaching* (Sanata Dharma University, 2020), 414–18 <https://doi.org/10.24071/llt.v23i2.2674>.

[22] H Ahmad, 'Integrasi Alquran Pada Mata Kuliah Trigonometri', *Mathematics Education Journal*, 14.1 (2020), 25–38 <https://doi.org/10.22342/jpm.14.1.6768.25-38>; M Y Sitorus and others, 'Pemanfaatan Media Audio Visual Dalam Pembelajaran Baca Tulis Alquran Di Madrasah Ibtidaiyah', *Maslahah: Jurnal ...*, 2020 <https://www.ejurnalilmiah.com/index.php/Maslahah/article/view/58>.

[23] (Wang et al., 2025

[24] Vitta & Al-Hoorie, 2020)

[25] Damar Isti Pratiwi and others, 'Flipped Classroom with Gamified Technology and Paper-Based Method for Teaching Vocabulary', *Asian-Pacific Journal of Second and Foreign Language Education*, 9.1 (2024), 1 <https://doi.org/10.1186/s40862-023-00222-4>.

[26] Adriana Cruz Diaz, 'Bridging Cultures and Classrooms' (Dominican University of California, 2025) <https://doi.org/10.33015/dominican.edu/2025.lcs.st.01>.

Independent Sample T-Test

To compare students' learning outcomes between the experimental and control groups, an Independent Sample *t*-Test was performed.

The statistical analysis demonstrated a significant difference between the posttest scores of the two groups. Students who learned using QR Code-based Arabic teaching materials within the Flipped Classroom model achieved significantly higher learning outcomes than those receiving conventional instruction. These findings indicate that integrating digital teaching materials with an active learning model provides greater learning benefits than conventional classroom practices.[27]

Table 6. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pree Test - Post Test	-19.5666	9.59761	1.23905	-22.0459	-17.0873	-15.79	20	.000

The statistically significant results presented in Table 6 provide strong evidence in support of the research objective: to determine the effectiveness of QR Code-based teaching materials combined with the Flipped Classroom model on Arabic language learning outcomes [28]. With a mean improvement of 19.57 points, a t-value of -15.79, and a p-value of .000, the findings confirm that the intervention had a meaningful and statistically verifiable impact on students' learning performance. The 95% confidence interval (-22.05 to -17.09) further supports the conclusion that the learning gains were not due to chance.

These findings are consistent with those reported by Vitta & Al-Hoorie (2023), who, in a meta-analysis, found that the Flipped Classroom model has a consistently positive effect on second language acquisition, especially when paired with interactive digital tools like video or QR-based content [29]. Similarly, Wijaya (2024) demonstrated that QR Code-enhanced modules significantly increased motivation and comprehension

[27] Julie Pallant, *SPSS Survival Manual*, p. 245–251.
[28] S P Pranata and H Husain, 'Pembuatan Mural Islami Sebagai Sarana Edukasi Pada Pesantren Taruna Alqolam', *NUSANTARA Jurnal Pengabdian Kepada …*, 2022 <https://doi.org/https://doi.org/10.55606/nusantara.v2i1.2695>.

in elementary-level language learning settings, particularly when students engaged with materials independently before class discussions [30].

In line with this, Pratiwi et al. (2024) found that technology-mediated instruction improves linguistic competence and fosters learner autonomy and engagement, two key principles in the Flipped Classroom approach [31].

Discussion

The findings of this study demonstrate that the integration of QR Code-based Arabic teaching materials with the Flipped Classroom model significantly improved students' Arabic learning outcomes compared with conventional classroom instruction. These findings indicate that the combination of digital learning resources and student-centred instructional strategies provides a more effective learning environment for vocational high school students. Rather than relying solely on teacher explanations during classroom meetings, students were able to access learning materials independently before class through QR Codes, enabling classroom sessions to focus on discussion, clarification, and collaborative learning activities.[32]

This finding is consistent with the principles of the Flipped Classroom, which emphasise the redistribution of learning activities from teacher-centred knowledge transmission to student-centred knowledge construction. By studying instructional materials before attending class, students entered classroom discussions with better conceptual understanding and greater readiness to participate actively. Consequently, classroom interaction shifted from passive information reception to meaningful learning experiences that encouraged communication, problem-solving, and collaborative learning.[33]

The effectiveness of QR Code technology observed in this study may also be explained by its ability to provide immediate access to various multimedia learning resources. Through QR Codes, students could access instructional videos, vocabulary exercises, pronunciation models, and additional learning materials using their mobile

[29] Vitta and Al-Hoorie.
[30] Kristoforus Gustian, Aridah Aridah, and Desy Rusmawaty, 'The Benefits of Flipped Classroom Model for Efl Learners', *Journal on Education*, 5.4 (2023), 13918–35.
[31] Pratiwi and others.
[32] Joseph P. Vitta and Ali H. Al-Hoorie, "The Flipped Classroom in Second Language Learning: A Meta-Analysis," *Language Teaching Research* 28, no. 6 (2024): 1268–1292.
[33] Jonathan Bergmann and Aaron Sams, *Flip Your Classroom: Reach Every Student in Every Class Every Day* (Washington, DC: International Society for Technology in Education, 2012).

devices without encountering complicated learning management systems. Such accessibility supports independent learning while increasing students' motivation and engagement throughout the learning process. Similar findings have been reported by previous studies, which concluded that QR Code-assisted learning enhances students' learning participation and facilitates more flexible learning experiences.[34]

Furthermore, the present findings support previous research indicating that the Flipped Classroom contributes positively to foreign language learning. Meta-analytic evidence demonstrates that students learning through the Flipped Classroom generally achieve higher academic performance than those participating in conventional instruction because they spend classroom time engaging in higher-order cognitive activities rather than merely receiving information from teachers. In Arabic language education, where vocabulary acquisition, grammatical understanding, and language practice require repeated exposure and active interaction, the integration of Flipped Classroom pedagogy with QR Code-based teaching materials appears particularly beneficial.[35]

Compared with earlier studies, this research offers a distinct contribution by integrating two educational innovations into a unified instructional design specifically developed for Arabic language learning in vocational secondary education. Previous studies have generally investigated QR Code technology as a supplementary learning medium or examined the Flipped Classroom as an independent instructional model. In contrast, the present study combines both approaches into a coherent learning strategy that enables students to access learning materials before class while maximising classroom interaction through collaborative learning activities. This pedagogical integration represents the principal contribution of the present study to Arabic language education.[36]

From a practical perspective, the findings suggest that Arabic language teachers should consider incorporating QR Code technology into printed teaching materials as a means of extending learning opportunities beyond classroom instruction. Such integration not only increases students' access to multimedia learning resources but also supports the implementation of active learning models, particularly the Flipped

[34] Carey Minard, "Use of QR Codes to Enhance Learning in a Graduate-Level Clinical Course," *Journal of Formative Design in Learning* 8, no. 2 (2024): 63–70.
[35] Zhonger Wang, Jin Lu, and Shenchen Yu, "The Impact of the Flipped Classroom on the Motivation and Academic Performance of Chinese College English Learners," *PLOS ONE* 20, no. 5 (2025): e0322094.
[36] Dwiki Hari Wijaya, "Implementation of Learning Media Development Based on Quick Response Code Using the Flipped Classroom Model," *Edumaspul: Jurnal Pendidikan* 8, no. 2 (2024): 3945–3951.

Classroom. Schools are likewise encouraged to provide adequate digital infrastructure and professional development programmes to assist teachers in designing technology-enhanced Arabic learning environments that promote learner autonomy and improve learning outcomes.[37]

Despite these positive findings, this study has several limitations. The research involved a relatively small number of participants drawn from a single vocational high school, thereby limiting the generalisability of the findings. Additionally, the study focused primarily on students' cognitive learning outcomes without examining other important aspects such as learning motivation, self-regulated learning, or digital literacy. Future research is therefore recommended to involve larger and more diverse samples while investigating broader educational variables to provide a more comprehensive understanding of technology-enhanced Arabic language learning.

Conclusion

This study demonstrates that the integration of QR Code-based Arabic teaching materials with the Flipped Classroom model effectively improves the Arabic learning outcomes of Grade XI students at SMKN 1 Kalinyamatan Jepara. Students who participated in technology-enhanced learning achieved better academic performance than those receiving conventional instruction, indicating that combining digital learning resources with student-centred pedagogy creates a more meaningful and effective Arabic learning environment.

Beyond its empirical findings, this study contributes to the development of Arabic language pedagogy by proposing an instructional model that integrates QR Code technology directly into Arabic teaching materials within the Flipped Classroom framework. This pedagogical integration extends previous studies that tended to investigate digital media and instructional models separately. Consequently, the findings provide additional empirical evidence supporting the implementation of technology-enhanced learning in Arabic language education, particularly within vocational secondary schools.

From a practical perspective, Arabic language teachers are encouraged to develop technology-supported teaching materials that facilitate students' independent learning

[37] Helen Crompton and Diane Burke, "The Use of Mobile Learning in Higher Education: A Systematic Review," *Computers & Education* 123 (2018): 53–64.

before classroom instruction while maximising collaborative learning activities during face-to-face sessions. Educational institutions should likewise strengthen digital infrastructure and provide professional development programmes that enable teachers to implement innovative technology-based instructional strategies. Future research is recommended to involve larger participant groups from different educational settings and to examine additional variables such as learning motivation, self-regulated learning, digital literacy, and long-term learning retention in Arabic language education.

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