



**DIGITAL COMPETENCE AND CLASSROOM ENGAGEMENT AS PREDICTORS OF ACADEMIC PERFORMANCE: AN EMPIRICAL STUDY OF MUSLIM FEMALE SECONDARY STUDENTS IN JEDDAH, SAUDI ARABIA**

BY

**Rafia Rehman: Al-Hukma International School, Jeddah, Saudi Arabia**

**&**

**Muraina Kamilu Olanrewaju: Faculty of Education, Prince Abubakar Audu University Anyigba, Nigeria;  
E-mail: muraina.olanrewaju@iou.edu.gm**

**Abstract**

*In recent years, digital technologies have experienced a paradigm shift in secondary schools, changing the way students learn and are being taught. This review article delves into 210 Muslim female secondary students in Jeddah, Saudi Arabia, and examines how digital literacy and classroom engagement relate to academic performance. Using a quantitative correlational design, the research found that most students displayed moderate levels of digital literacy (58.1%), classroom engagement (56.2%), and academic performance (59.0%). Significant positive correlations emerged between digital literacy and academic performance ( $r=0.338$ ), classroom engagement and academic performance ( $r=0.287$ ), and between digital literacy and engagement ( $r=0.836$ ). Regression analysis revealed that both variables jointly explained 15.6% of variance in academic performance ( $R^2=0.156$ ), with digital literacy ( $\beta=0.256$ ) being a slightly stronger predictor than classroom engagement ( $\beta=0.198$ ). The review article indicates that digital literacy and classroom participation are related predictors of success in school. The recommendations related to practice are that digital literacy should be more fully incorporated into the curriculum, teacher training should include more specific instruction to engage students with technology, more specific monitoring of at-risk learners, and pedagogies should focus on engaging students. Future direction suggests experiments to assess causal relationships between digital literacy and digital engagement.*

**Keywords: Digital literacy, Classroom engagement, Academic performance, Secondary education, Saudi Arabia and Correlational design**

**Introduction**

Academic performance is a central measure of educational effectiveness globally, reflecting the degree to which students achieve in higher education and participate in the future workforce (Al-Abyadh & Abdel Azeem, 2022). At the secondary school level, strong academic achievement opens pathways to university admission and better career opportunities, motivating continuous investigation into the factors that promote or inhibit student success (Almulla, Alismail, & Daraghme, 2025). Global education trends indicate that developed and emerging economies have adopted some form of technology-assisted instruction, and student exposure to digital platforms has grown substantially, a trend further accelerated by the transition to online and hybrid teaching models during the COVID-19 pandemic (Amiri, 2025).

In Saudi Arabia, the educational landscape is undergoing a significant transformation under the national Vision 2030 strategic framework. The government aims to build a diversified, knowledge-based economy by equipping young people with digital and critical thinking skills. Substantial investments have been made in technological infrastructure, including smart boards, e-learning management systems, tablets, and high-speed internet connectivity, to foster collaborative, student-centered learning environments comparable to those in developed nations (Alhazmy, 2025). Despite these considerable investments, student academic performance on standardized international assessments remains below expectations. Among the student-centered factors that have emerged as critical predictors of academic success, digital literacy and classroom engagement have garnered significant scholarly attention. Digital literacy is conceptualized as more than the basic ability to operate devices. It



encompasses a constellation of competencies, including the capacity to search for, critically evaluate, interpret, synthesize, and ethically use digital information for academic purposes (Taylor, 2011).

Students posit that strong digital academic rigor can leverage digital learning resources more effectively, complete technology-based assignments more efficiently, and experience reduced cognitive load associated with technical difficulties, thereby incur less mental resources for higher-order learning. Digital literacy is defined as more than merely using devices. It involves a cluster of skills, such as the ability to search, evaluate, interpret, synthesize, and responsibly use digital information, for academic competency (Culver, Braxton, & Pascarella, 2021). In today's secondary education classrooms, as students conduct web searches, design multimedia projects, connect and collaborate with peers via digital platforms, and upload assignments via learning management systems, digital literacy has become a critical academic skill. Digitally literate students can better access and use online learning resources, complete technology-rich assignments more efficiently, and are consistently more cognitively involved in their learning, consistently outperforming their disengaged counterparts (Culver et al., 2021).

Classroom engagement has long been recognized as one of the most robust predictors of educational performance. Engagement is a multidimensional construct that encompasses behavioral participation such as attendance, effort, and on-task behavior; emotional investment such as interest, motivation, and sense of belonging; and cognitive involvement such as strategic thinking, persistence, and deep processing of information (Kong, 2021). There is a large body of research supporting that engaged students achieve academically at a higher level than those who are not engaged, have greater retention, and achieve superior academic outcomes. Academically engaged students who are behaviorally, emotionally, and cognitively engaged in their learning outperform their peers, who lack the same attributes. In addition, they have a better understanding of how digital literacy and engagement play a role in effective, evidence-based designs for instructional interventions (Appleton, Christenson, & Furlong, 2008).

In private international secondary schools in Saudi Arabia, there is an exciting opportunity to observe how gender segregation, advances in technology, and a focus on digital transformation are interconnected under Saudi Arabia's Vision 2030. We need to examine how these factors influence both digital literacy and engagement to develop evidence-based strategies for teaching students with disabilities (Amerstorfer & Frein Von Münster-Kistner, 2021). In this study, we bridge the gap between understanding the separate and combined effects of digital literacy and classroom engagement on the academic performance of Muslim female students enrolled in private international secondary schools in Jeddah, Saudi Arabia. By analyzing the data, we will use conceptual frameworks such as Social Cognitive Theory and Student Engagement Theory to illustrate how digital literacy enhances student self-efficacy and technical skills, therefore increasing student engagement with learning activities and ultimately improving their academic performance. Furthermore, empirical testing validates these relationships, informing educational practice and policy and enabling educators, administrators, and policymakers to maximize the educational benefits of technology investments.

### **Statement of the Problem**

Digital technologies have been integral to secondary education in Saudi Arabia for two decades and around the world. The government has been giving a lot of attention to educational technology, such as smart boards, learning management systems, tablets, and high-speed Internet, as part of Saudi Vision 2030, and has provided schools with smart boards, learning management systems, tablets, and high-speed Internet. These investments are focused explicitly on improving the quality of education and equipping students for the competitive knowledge-based digital economy. (Fenollar, Román, & Cuestas, 2007). Despite this substantial infusion of technology, student academic performance has not improved commensurately. Saudi secondary students consistently perform below the global average on international assessments in core academics. The disparity between their performance and international standards is about two years of learning (Elsayed, Clerkin, Pitsia, Aljabri, & Al-Harbi, 2022). The educational records from Jeddah indicate that many secondary school students are not proficient in key subjects like Mathematics, Science, and English Language Skills. Jeddah's education records



show that there is a high proportion of secondary school students who fail to achieve proficiency in key subjects, including Mathematics and Science, as well as English Language Skills (Binothman, Alhabbash, Al Mohammadi, & Ibrahim, 2024). Examples of below-average student performance in Jeddah include: very wide ranges in GPAs both between and among schools, different levels of student achievement across subjects, and numerous reports from teachers that a large number of students do not participate or only minimally complete their assigned work; students also struggle with the use of digital tools or the use of technology to complete an assignment independently (Jamjoom, 2012).

### Research Hypotheses

The following null hypotheses were tested at the 0.05 significance level:

**H01:** There is no significant relationship between digital literacy and academic performance of secondary school students.

**H02:** There is no significant relationship between classroom engagement and academic performance of secondary school students.

### Methodology

A quantitative, non-experimental, descriptive correlational research design was used for this study. The research design was appropriate because the research purpose was to describe the levels of digital literacy, classroom engagement, and academic performance of the population of interest, and to examine the relationships among these variables without manipulating any independent variables. A retrospective research design was appropriate since both independent variables, digital literacy and classroom engagement, were investigated as naturally occurring characteristics that could not be experimentally manipulated. Students' GPAs were used to determine their academic performance, based on official GPAs established by the institution's processes before the study. The descriptive component gives the researcher the distribution of how well each of the three variables is scored.

The target population for this research was all Muslim female students attending private international secondary schools in Jeddah, Saudi Arabia (10–14 years old) during the 2025-2026 school year. From this target population, two private international secondary schools were purposively selected based on accessibility, administrative approval to participate, and the availability of digital learning facilities necessary for measuring digital literacy and classroom engagement (Assiri, 2026). Hence, the accessible population for this investigation was 210 students, 110 from School A (55 grade nine students and 55 grade 10 students) and 100 from School B (50 grade nine students and 50 grade 10 students).

Census sampling was used, thus including all 210 eligible students from each of the two selected schools in the study, eliminating sampling error within schools and ensuring that all students eligible to participate in the target population were included. The researcher developed a structured questionnaire to gather information based on two scales: the Digital Literacy Scale and the Classroom Engagement Scale. Basic computer operation, utilizing different software programs, conducting online research, simple troubleshooting, using technology independently to finish academic assignments, evaluating online information sources, communicating & working together digitally with others, and navigating through learning management systems (LMS) were among the 10 items on the Digital Literacy Scale (Hughes et al., 2005). The Classroom Engagement Scale also included 10 items to measure behavioral engagement (participation and focus), emotional engagement (interest and motivation), and cognitive engagement (persistence and strategic learning). Both scales used a five-point Likert scale format from 1 (Strongly Disagree) to 5 (Strongly Agree), with a higher score representing a higher level of the respective construct. The dependent variable was academic achievement, which was measured in the students' official cumulative Grade Point Average (GPA) in the core subjects (English, Mathematics, Science, and Arabic) directly from the school records.



Content validity was developed through an expert review by the experts in the field of educational technology and measurement. The items were assessed in terms of item clarity, item relevance, alignment to operational definitions of digital literacy, and item representation, and alignment to classroom engagement. Experts also revised the wording and structure of the items for conceptual clarity and contextual appropriateness and gave feedback. (Carmines & Woods, 2005). Exploratory Factor Analysis was used to determine construct validity. The Kaiser-Meyer-Olkin measure of sampling adequacy was computed before running the factor analysis, and the value obtained was 0.82, which is within the acceptable range (Sood & Mehendale). The Bartlett's Test for Sphericity ( $p < 0.001$ ) was significant, which meant that the data were appropriate for factor analysis. All item-factor loadings were greater than 0.50, thus supporting the scales' dimensional structure. Internal consistency reliability of the Digital Literacy Scale was evaluated using Cronbach's  $\alpha$ . The Digital Literacy Scale and the Classroom Engagement Scale both attain the accepted level of 0.70, indicative of good internal-consistency reliability. Correlations between items and total scale scores indicated that all items were well within acceptable limits, demonstrating that each item was a meaningful contributor to its respective scale. The use of standardized institutional grading and recordkeeping practices across schools contributed to the reliability of the measure of academic performance.

Permission for data collection was obtained from the school administration. The researcher collected the paper surveys in a normal class, with standardized background instructions to each participant on survey administration. All participants were informed about the voluntary nature of study participation and confidentiality regarding all survey responses. (Raspberry et al., 2018). The researcher provided each participant with a unique identification code that could link survey responses to the students' GPA documents within the school records, yet still be non-identifiable. In total, 210 questionnaires were distributed and returned filled in, reflecting a response rate of 100%. Statistical software was used for data analysis. Before inferential analysis, the assumptions of Pearson's Product-Moment Correlation were tested; skewness and kurtosis statistics were used to assess normality, with all values falling within acceptable limits. Significance level for all hypotheses tested was set at a  $p < 0.05$ .

Data Collection Required Institutional Approval and Informed Consent. Students, whether adult or minor, must have given their voluntary consent before participating. All Names, Email Addresses, and any other identifiers were stripped from the data as a means of identifying anonymous values in accordance with Generally Accepted Research Guidelines. Data must be stored in a secure place and used only for Academic Research, in compliance with University and International Ethical Standards for Research with Human Subjects.

## Results

### Hypotheses Testing

Hypothesis 1: There is no significant relationship between Digital Literacy and Academic Performance. The Pearson Product-Moment Correlation was performed to test the Null Hypothesis ( $H_0$ ) that there is no significant relationship between digital literacy and Academic Performance. The analysis yielded a statistically significant  $r$  of 0.338 ( $p < .001$ ), indicating a positive correlation. This is a moderate, positive relationship. As a result, the null hypothesis was rejected. Researchers found that students with higher digital literacy scores were also more likely to do well in their studies.

Table 1: Pearson Correlation between Digital Literacy and Academic Performance

| Variable             | Mean  | SD   | r     | p      |
|----------------------|-------|------|-------|--------|
| Digital Literacy     | 36.85 | 5.12 | 0.338 | <0.001 |
| Academic Performance | 72.46 | 8.94 |       |        |



**Hypothesis 2:** There is no significant relationship between Classroom Engagement and Academic Performance

Testing the null hypothesis that no significant relationship exists between classroom engagement and academic performance, the Pearson correlation yielded a coefficient of  $r$  equal to 0.287, statistically significant at  $p$  less than 0.001. This represents a moderate, positive correlation. There is a small positive correlation. Hence, the null hypothesis is rejected. The more engaged the students, the better they performed academically.

*Table 2: Pearson Correlation between Classroom Engagement and Academic Performance*

| Variable             | Mean  | SD   | $r$   | $p$    |
|----------------------|-------|------|-------|--------|
| Classroom Engagement | 35.42 | 5.68 | 0.287 | <0.001 |
| Academic Performance | 72.46 | 8.94 |       |        |

**Discussion of the Findings**

The moderate positive correlation ( $r = 0.338$ ) between digital literacy and academic achievement indicates a positive relationship between the two, with students who are more digitally literate performing higher in academic achievement. This result is supported by learning theories. Highly literate students become more confident in their technological skills and less avoidant of technology-based assignments, resulting in lower anxiety. Moreover, digitally literate students will be able to use online resources to search for and assess information online, create digital products of a higher quality, and access learning management systems with greater ease, all of which have an impact on students' academic achievement. A moderate association between digital literacy and performance, however, indicates that digital literacy is a necessary condition, but not a sufficient one to predict performance, as other factors such as prior academic achievement, quality of teaching, and the intelligence of students all have a profound influence on student performance (Amerstorfer & Freiin Von Münster-Kistner, 2021). The most intriguing result of this study is the high positive correlation between digital literacy and classroom engagement ( $r = 0.836$ ). This level of correlation (also known as a large effect size) suggests a high degree of overlap between these constructs and that they are not independent. This correlation can be attributed to several factors. Digitally literate students participate more in class discussions and are more willing to engage in class activities, indicating behavioral engagement. They view their learning experience and their ability to learn more favorably, reflecting emotional engagement. They also adopt more metacognitive strategies for learning because they can focus on the learning task rather than on the technology, which represents cognitive engagement (Taylor, 2011).

Similarly, the positive correlation between classroom engagement and academic performance ( $r = 0.287$ ) is consistent with many studies that have established the relationship between classroom engagement and academic achievement ( $r = 0.289$  in this study). This means that classrooms with active participation, emotional involvement in learning, cognitive involvement in learning, and persevering with learning will improve the grade that their learners will achieve compared to those who are not involved in the learning process. This association is slightly lower than for digital literacy in this sample, which is logical given the low levels of engagement; this relationship would likely be stronger if students were more engaged with their learning (Fenollar et al., 2007). Further, the single-sex education system in Saudi Arabia might influence how engagement manifests and is measured, potentially affecting the size of the correlation. Still, the strong correlation suggests that schools should prioritize engagement as a goal to improve academic performance (Alhazmy, 2025). On the other hand, students with low digital literacy may experience frustration, cognitive load, and anxiety when using technology, which harms all aspects of engagement. These results have significant implications for education, as strategies that promote digital literacy are likely to increase engagement, and vice versa. Education should not treat digital literacy and engagement as separate goals, but rather focus on holistic strategies that enhance digital literacy through meaningful, engaging learning activities (Culver et al., 2021).





### Recommendations

The following recommendations were made:

1. Schools and school districts should integrate digital literacy skills (i.e., evaluating a source, searching/creating using appropriate keywords) into real-world (project-based) tasks (online research and creating multimedia) using differentiated instruction.
2. Educational developers should create real-world examples of what students can do (digital portfolios, collaborative web-based projects, inquiry-based tasks) using digital literacy skills while assisting the students to succeed with their individual learning process by creating individual pathways for success.
3. Teacher education programs should teach teacher candidates how to incorporate digital citizenship and technology to enhance student engagement, pair them with more experienced teachers for mentoring purposes, and provide ongoing in-service professional development through the use of multiple modes of learning (i.e., direct instruction, demonstration of effective teaching/learning strategies).

### Conclusion

There is a strong correlation between digital literacy and engagement. Results show 15.6% of the variance in grades, and the regression analysis of a marginal one-predictor digital literacy model was superior to engagement. Digital literacy and engagement are strongly correlated: digitally literate students are more engaged in education. This highlights the need to integrate complementary, not parallel, approaches, that is, to develop digital skills through realistic, practical tasks. This underscores the value of digital literacy and engagement programs to support the Saudi Arabia transformation agenda under the Vision 2030, as well as the investment case. A unified approach to digital literacy and digital engagement is more likely to establish conditions for success for students in technologically driven classrooms and schools, as well as for educators and policymakers.

### References

- Ai, L., Hoon, T. S., Wang, Q., & Mohamad, S. N. A. (2025). The relationship between digital literacy, perceived usefulness, and learning satisfaction among medical students in blended learning: the mediating role of learning engagement. *BMC Medical Education*, 26(1). doi:10.1186/s12909-025-08370-6
- Al-Abyadh, M. H. A., & Abdel Azeem, H. A. H. (2022). Academic Achievement: Influences of University Students' Self-Management and Perceived Self-Efficacy. *Journal of Intelligence*, 10(3), 55. doi:10.3390/jintelligence10030055
- Alhazmy, E. A. (2025). Education reform and vision 2030 in Saudi Arabia: challenges and pathways. *Discover Education*, 5(1). doi:10.1007/s44217-025-01005-4
- Almulla, M. O., Alismail, A. M., & Daraghme, H. (2025). Exploring academic motivation across university years: a mixed-methods study at King Faisal University. *BMC Psychology*, 13(1). doi:10.1186/s40359-025-03448-8
- Amerstorfer, C. M., & Freiin Von Münster-Kistner, C. (2021). Student Perceptions of Academic Engagement and Student-Teacher Relationships in Problem-Based Learning. *Frontiers in psychology*, 12. doi:10.3389/fpsyg.2021.713057
- Amiri, S. M. H. (2025). Digital Transformations in Education: Research Insights for 21st-Century Learning. *SSRN Electronic Journal*. doi:10.2139/ssrn.5194886
- Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(5), 369–386.
- Assiri, F. (2026). *The factors impacting secondary school teachers' continuance intention to use Madrasati platform in Saudi Arabia*. University of Glasgow,
- Binothman, M., Alhabbash, M., Al Mohammedi, N., & Ibrahim, A. (2024). Unraveling high-school students' learning experiences in English, Science, and Math: a mixed methods study. *Cogent Education*, 11(1), 2351243.
- Carmines, E. G., & Woods, J. A. (2005). Validity Assessment. In (pp. 933–937): Elsevier.



- Culver, K., Braxton, J. M., & Pascarella, E. T. (2021). What we talk about when we talk about rigor: Examining conceptions of academic rigor. *The Journal of Higher Education*, 92(7), 1140–1163.
- Elsayed, M. A., Clerkin, A., Pitsia, V., Aljabri, N., & Al-Harbi, K. (2022). Boys' underachievement in mathematics and science: An analysis of national and international assessment data from the Kingdom of Saudi Arabia. *Large-scale Assessments in Education*, 10(1), 23.
- Fenollar, P., Román, S., & Cuestas, P. J. (2007). University students' academic performance: An integrative conceptual framework and empirical analysis. *British Journal of Educational Psychology*, 77(4), 873–891.
- Hughes, S., Zweifler, J., Schafer, S., Smith, M. A., Athwal, S., & Blossom, H. J. (2005). High school census tract information predicts practice in rural and minority communities. *The Journal of Rural Health*, 21(3), 228–232.
- Jamjoom, M. (2012). *Secondary and intermediate female Islamic studies teachers in Jeddah, Saudi Arabia: understanding their teaching*. Oxford University, UK,
- Kong, Y. (2021). The role of experiential learning on students' motivation and classroom engagement. *Frontiers in psychology*, 12, 771272.
- Pina, D., Pérez-Albéniz, A., Díez-Gómez, A., Pérez-Esteban, A., & Fonseca-Pedrero, E. (2025). Validation of the Multidimensional Scale of Perceived Social Support (MSPSS) in a Representative Sample of Adolescents: Links with Well-being, Mental Health, and Suicidal Behavior. *Psychosocial Intervention*, 34(2), 79–87. doi:10.5093/pi2025a7
- Rasberry, C. N., Rose, I., Kroupa, E., Hebert, A., Geller, A., Morris, E., & Lesesne, C. A. (2018). Overcoming Challenges in School-Wide Survey Administration. *Health Promotion Practice*, 19(1), 110–118. doi:10.1177/1524839917733476