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INTEGRATION OF RESPONSIVE LEARNING TECHNOLOGY IN ARABIC LANGUAGE EDUCATION: DEVELOPMENT OF A STUDENT INTERACTION FRAMEWORK

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Abstract

The integration of responsive learning technology has become a crucial component in strengthening student interaction and engagement within higher education, particularly in the context of Arabic language education. The complexity of learning Arabic, which requires continuous practice, interaction, and feedback, demands the presence of a digital learning ecosystem that is adaptive, interactive, and responsive to students' academic needs. In the digital era, higher education institutions are no longer required to provide academic services merely as administrative support, but also as an integral part of the learning process that facilitates communication, interaction, and learning continuity. Customer Relationship Management (CRM) has emerged as a strategic approach that can be adapted to the educational context to support systematic and sustainable student interaction. This study aims to design and develop a responsive learning technology framework based on CRM to enhance student interaction within the Arabic language education ecosystem. The research employed a research and development approach using the ADDIE model, encompassing analysis, design, development, implementation, and evaluation stages. The resulting product is a CRM-based web application implemented in the context of Arabic language education at IAIN Ponorogo. The developed framework integrates multiple interaction touchpoints involving students, lecturers, and study program administrators to support learning-related communication, academic monitoring, and service responsiveness. The effectiveness of the system was evaluated through small-scale and limited large-scale classroom trials. The results of the small-scale trial obtained a score of 79.4, while the limited large-scale trial achieved a score of 83, indicating that the system is categorized as "good." These findings demonstrate that the integration of CRM-based responsive learning technology can effectively support student interaction, enhance learning responsiveness, and contribute to the development of a cohesive digital learning ecosystem in Arabic language education.

Keywords: *Responsive learning technology; Customer Relationship Management (CRM); student interaction framework; Arabic language education; digital learning ecosystem.*

Asbtrak

Integrasi teknologi pembelajaran responsif menjadi komponen penting dalam memperkuat interaksi dan keterlibatan mahasiswa di perguruan tinggi, khususnya dalam konteks pendidikan Bahasa Arab. Karakteristik pembelajaran Bahasa Arab yang menuntut praktik berkelanjutan, interaksi intensif, serta umpan balik yang konsisten memerlukan dukungan ekosistem pembelajaran digital yang adaptif dan responsif terhadap kebutuhan akademik mahasiswa. Di era digital, perguruan tinggi tidak lagi hanya dituntut menyediakan layanan akademik sebagai fungsi administratif, tetapi juga sebagai bagian integral dari proses pembelajaran yang mendukung komunikasi, interaksi, dan keberlanjutan belajar. Customer

Relationship Management (CRM) dapat diadaptasi sebagai pendekatan strategis dalam pendidikan untuk mengelola interaksi mahasiswa secara sistematis dan berkelanjutan. Penelitian ini bertujuan untuk merancang dan mengembangkan framework teknologi pembelajaran responsif berbasis CRM guna meningkatkan interaksi mahasiswa dalam ekosistem pendidikan Bahasa Arab. Penelitian ini menggunakan pendekatan penelitian dan pengembangan dengan model ADDIE yang meliputi tahap analisis, perancangan, pengembangan, implementasi, dan evaluasi. Produk yang dihasilkan berupa aplikasi web berbasis CRM yang diimplementasikan pada konteks pendidikan Bahasa Arab di IAIN Ponorogo. Framework yang dikembangkan mengintegrasikan berbagai titik interaksi antara mahasiswa, dosen, dan pengelola program studi untuk mendukung komunikasi pembelajaran, pemantauan akademik, dan responsivitas layanan. Evaluasi dilakukan melalui uji coba kelas skala kecil dan skala besar terbatas. Hasil uji coba skala kecil memperoleh skor sebesar 79,4, sedangkan uji coba skala besar terbatas memperoleh skor sebesar 83, yang menunjukkan bahwa sistem berada pada kategori "baik". Temuan ini menunjukkan bahwa integrasi teknologi pembelajaran responsif berbasis CRM mampu mendukung interaksi mahasiswa serta memperkuat ekosistem pembelajaran digital dalam pendidikan Bahasa Arab.

Kata Kunci: *Teknologi pembelajaran responsif; Customer Relationship Management (CRM); framework interaksi mahasiswa; pendidikan Bahasa Arab; ekosistem pembelajaran digital.*

Introduction

Arabic language learning in higher education possesses a complexity that is not only related to linguistic aspects, but also demands continuous interaction, intensive practice, and consistent feedback between students and lecturers. The ideal of Arabic language learning that is communicative, contextual, and competency-oriented often confronts the reality of limited interaction, low responsiveness of academic services, and fragmentation of learning support systems. The gap between the theoretical demands of language learning and the practical implementation in the field generates academic concern, particularly in the context of a higher education ecosystem undergoing digital transformation.[1]

In the digital era, the use of information technology in the management and implementation of higher education continues to increase. Various studies have discussed the adoption of information and communication technology (ICT) in the educational ecosystem, such as the development of Learning Management Systems (LMS), academic information systems, online evaluation systems, and learning

[1] Antonella Ghersetti, *Teaching Arabic as A Foreign Language: Origin, Development, and Current Directions* (n.d.).

analytics.[2] The rise of these studies is a response to the shifting patterns of academic interaction in the digital era, which requires higher education institutions to provide online platforms that are easily accessible and capable of supporting the learning process more optimally. In this context, technology is no longer understood merely as an administrative tool, but as an integral part of the learning ecosystem.[3]

From an institutional perspective, building and maintaining sustainable relationships between institutions and students is a key to the success of higher education provision.[4] The rapid digital shift requires higher education management to focus on strengthening relationships with all stakeholders, including students, lecturers, and study program administrators.[5] The quality of the learning process is one of the main indicators of higher education success, thus requiring synergy between human resources and information systems that are able to support learning interactions effectively.[6]

Lecturers and educational staff are human resources who play a direct role in the implementation of the learning process in higher education. Lecturers, as professional educators, have the task of transforming and developing knowledge through education, research, and community service.[7] In the context of Arabic language learning, lecturers play an important role in managing learning interactions through the delivery of materials, the application of communicative methods, and the provision of continuous feedback. On the other hand, educational staff are responsible for carrying out administration, management, development, supervision, and technical services

[2] Youssef M Abu Amuna et al., "Understanding Critical Variables for Customer Relationship Management in Higher Education Institution from Employees Perspective," *Information Technology* 6, no. 1 (2017).

[3] Alina Ciobanu, "The Role of Student Services in the Improving of Student Experience in Higher Education," *Procedia - Social and Behavioral Sciences* 92 (October 2013): 169–73, https://doi.org/10.1016/j.sbspro.2013.08.654.

[4] Te-Ming Chang et al., "An Empirical Study on the E-CRM Performance Influence Model for Service Sectors in Taiwan," *International Conference on E-Learning, E-Business, Enterprise Information Systems, & E-Government*, ahead of print, 2005, https://doi.org/10.1109/EEE.2005.33.

[5] Marie Slabá, "Stakeholder Groups of Public and Private Universities in the Czech Republic – Identification, Categorization and Prioritization," *Review of Economic Perspectives* 15, no. 3 (2015): 305–26, https://doi.org/10.1515/revecp-2015-0022.

[6] Thanasis Daradoumis et al., *CRM Applied to Higher Education: Developing an e-Monitoring System to Improve Relationships in e-Learning Environments*, n.d.

[7] "Permendikbud-Nomor-3-Tahun-2020.Pdf," n.d., accessed January 11, 2026, https://unit.usd.ac.id/lembaga/lpmai/wp-content/uploads/2021/04/Permendikbud-Nomor-3-Tahun-2020.pdf.

to support the educational process as regulated in the National Education System Law.[8]

Students, as the main subjects of learning, have the right to receive quality education services that are responsive to their academic needs.[9] A number of studies show that the Customer Relationship Management (CRM) approach can improve the quality of relationships and customer loyalty in various sectors. The study by Budiono Hardjono and Lai Pooi San (2017), for example, shows a significant relationship between customer orientation, CRM organization, and knowledge management on customer loyalty.[10] In the context of higher education, the concept of CRM can be recontextualized as a student interaction framework that supports learning communication, academic monitoring, and service responsiveness.

Based on preliminary studies and previous research findings, there remains a gap between the ideal of interactive Arabic language learning and the reality of learning support systems that have not been optimally integrated. Therefore, this study considers it important to develop responsive learning technology based on CRM as an effort to build a student interaction framework within the Arabic language education ecosystem. This research is significant in providing both conceptual and practical contributions to the development of Arabic language learning technology that is not only oriented toward administrative services but also toward strengthening interaction and the continuity of the learning process in higher education. As far as the authors' investigation, studies on the utilization of digital technology in Arabic language education have mostly focused on the use of LMS, e-learning, or online classroom platforms, while the integration of the CRM approach as a student interaction framework in the Arabic language education ecosystem in higher education has not been widely explored.

As a distinction from previous research, this study does not merely position Customer Relationship Management (CRM) as a managerial instrument to improve the

[8] UNDANG Undang No. 20 Tahun 2003," n.d., accessed January 11, 2026, https://pusmendik.kemdikbud.go.id/pdf/file-154.

[9] Hugo de Juan-Jordán et al., "Feature Analysis of the 'Customer Relationship Management' Systems for Higher Education Institutions," *Multidisciplinary Journal for Education, Social and Technological Sciences* 5, no. 1 (2018): 30–43, https://doi.org/10.4995/muse.2018.9232.

[10] Budiono Hardjono and Lai Pooi San, "Customer Relationship Management Implementation and Its Implication to Customer Loyalty in Hospitality Industry," *Jurnal Dinamika Manajemen* 8, no. 1 (2017), https://doi.org/10.15294/jdm.v8i1.10414.

general quality of student services, but recontextualizes it as an academic interaction framework specifically designed for the ecosystem of Arabic Language Education in higher education. While most prior studies on educational technology and Learning Management Systems (LMS) in universities have focused on content management, material distribution, and online assessment, the integration of CRM in this research is directed toward mapping, monitoring, and managing all interaction touch points among students, lecturers, and study program administrators on an ongoing basis, from administrative services to thesis supervision. In this context, the present study offers novelty in the form of the development and testing of a CRM-based responsive learning technology framework that not only bridges the gap between the theory and practice of Arabic language learning, but also responds to the challenges of digital transformation through the establishment of an academic interaction ecosystem that is documented, integrated, and adaptive to student needs.

This study therefore offers novelty in the form of the development and testing of a responsive learning technology framework based on CRM that integrates various interaction touch points among students, lecturers, and study program administrators into a coherent digital ecosystem to strengthen interaction and the continuity of Arabic language learning in higher education.

Method

The research method in this study employs a research and development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation).[11] The trial subjects in the implementation stage consisted of students, lecturers, and academic administrators in the Arabic Language Education study program. The small-group trial involved 20 students, 3 lecturers, and 1 administrator, while the limited large-group trial involved 60 students, 6 lecturers, and 2 administrators, selected through purposive sampling based on their active involvement in academic activities and in the use of the program's academic service system. Research data were collected using a questionnaire instrument based on a 4-point Likert scale, a system feature checklist, and brief interviews as supporting data to deepen the quantitative findings. The dimensions measured in the questionnaire

[11] Sugiyono, *Metode Penelitian Dan Pengembangan Untuk Bidang Pendidikan, Manajemen, Sosial, Teknik*, Cetakan ke 5 (Penerbit Alfabeta Bandung, 2022).

included usability (ease of use of the interface), responsiveness (speed and accuracy of service response), ease of communication among students, lecturers, and administrators, academic monitoring (clarity and traceability of study progress), and overall user satisfaction with the system.

The analysis stage was carried out through a preliminary study to identify the needs of Arabic language learning, student interaction patterns, and problems in the existing learning support systems. This analysis includes user needs (students, lecturers, and study program administrators) as well as the context of technology implementation in the higher education environment. According to Branch, the analysis stage is the main foundation in instructional design because it determines the relevance and acceptability of the product being developed.[12] The design stage focuses on designing the student interaction framework and the design of a CRM-based web application system that functions as responsive learning technology. This design refers to instructional design principles that emphasize the integration of learning objectives, activities, and support systems.

The development stage includes the development of a product in the form of a CRM-based web application in accordance with the design that has been formulated. The resulting product integrates various features of learning interaction, academic services, and communication between students, lecturers, and study program administrators. Furthermore, the implementation stage was carried out through limited trials with Arabic language education students by involving small group trials and limited large group trials.

The evaluation stage was conducted formatively and summatively to assess the feasibility and quality of the product. Research data were obtained through questionnaire instruments filled out by system users. The data analysis technique used descriptive quantitative analysis by converting trial scores into product feasibility assessment categories. The evaluation results were used as a basis for revising and refining the product until responsive learning technology that is feasible to support student interaction in Arabic language learning was obtained.[13]

Data analysis was conducted using descriptive quantitative techniques by calculating the mean score of each item and each dimension, then converting them into

[12] Robert Maribe Branch, *Instructional Design: The ADDIE Approach* (Springer, 2009).
[13] Branch, *Instructional Design: The ADDIE Approach*.

product feasibility categories. The final scores were obtained by summing respondents' scores, dividing by the maximum possible score, and multiplying by 100 to obtain a percentage. The categorization of feasibility referred to commonly used conversion guidelines in development research, namely 61–75% = "fair", 76–85% = "good", and 86–100% = "very good". Based on this reference, the score of 79.4% in the small-group trial and 83% in the limited large-group trial were classified as "good", indicating that the CRM-based responsive learning technology developed in this study meets the feasibility standards to be used in supporting students' academic interaction in the context of Arabic Language Education in higher education.

Discussion

Integration of Responsive Learning Technology in the Student Interaction Framework

The integration of responsive learning technology in this study shows a shift in the function of academic service systems from merely administrative instruments to pedagogical media that support continuous academic interaction. The developed web application system not only facilitates service processes but also forms a digital interaction space that enables two-way communication, academic feedback, and systematic student mentoring. In the context of Arabic language education, learning requires continuous interaction, consistent practice, and clarity of academic pathways, so responsive technology becomes an important element in building meaningful learning experiences.[14]

The student interaction framework developed in this study is based on mapping students' academic experiences throughout their period of study. This mapping includes administrative, academic, and pedagogical interactions that previously ran separately. Through technological integration, all these interaction points are unified in a single digital ecosystem that is coherent and easily accessible. This approach is in line with recent research findings which emphasize that the effectiveness of digital learning is highly determined by system integration, clarity of service workflows, and continuity of interaction between users and institutions.[15]

[14] Richter Olaf Zawacki, "The Current State and Impact of Covid-19 on Digital Higher Education in Germany," *Human Behavior and Emerging Technologies* 3, no. 1 (2021): 218–26, https://doi.org/10.1002/hbe2.238.

[15] Terry Anderson and Jon Dron, *Teaching Crowds: Learning and Social Media* (Athabasca University Press, 2014), https://doi.org/10.15215/aupress/9781927356807.01.

The analysis of the needs for developing an academic service system is the initial stage in planning a system that is effective and aligned with institutional needs. At this stage, the researcher collects preliminary data through interviews, observation, and documentation. One of the important data sets analyzed is the graduation rate of students in the Arabic Language Education Study Program (PBA) at UIN Ponorogo, as presented in Table 4.1 below.

Table 1. Student Graduation Rate of the PBA Department

Year of entry	Number of Students	Year of graduation	Number of Graduates
2015	144	2019	49
2016	139	2020	37
2017	142	2021	40
2018	141	2022	43

The data in Table 1 show that the number of students who graduate on time is still relatively low compared to the number of students admitted in each cohort. This condition indicates the presence of problems in the academic process, particularly in the aspects of monitoring and supervising the completion of students' theses. The low rate of on-time graduation has implications for decreasing institutional quality and increasing the likelihood that students will experience an extension of their study period up to the point of Drop-Out. Field findings also show that there is still no integrated academic service system capable of continuously monitoring students' academic progress, including academic data management at the departmental level which remains scattered and not systematically documented. Therefore, based on the results of this needs analysis, the development of an integrated academic service system is considered a strategic solution to improve the effectiveness of academic services and to promote the achievement of on-time graduation among students at UIN Ponorogo.

In Arabic language learning in higher education, academic interaction does not only occur during classroom sessions but also through continuous consultation, guidance, and evaluation processes. The developed system enables all these processes to be well documented and periodically monitored. This condition provides academic certainty for students and at the same time facilitates lecturers in monitoring students' learning progress. Several studies show that documentation and transparency of

academic processes contribute significantly to increasing student engagement and learning responsibility.[16]

The adaptation of the concept of customer touch points into the academic context becomes one of the main characteristics of the developed interaction framework. Each service point -from academic submissions to final evaluations-is positioned as an interaction space that has pedagogical value. This approach shows that academic services can function as part of the learning process, not merely administrative activities. In language education, such interaction-based approaches have been proven to strengthen students' cognitive and affective engagement in the learning process.[17]



Figure 1. Integrated Academic Service CRM System Model

The management of educational activities is a crucial process that requires the support of a reliable system. The implementation of a Customer Relationship Management (CRM) system in educational services can help institutions manage data, activities, and academic services in an integrated manner. The CRM system provides data security through the encryption of sensitive information, is capable of handling large-scale databases, and stores complete data on students and staff with clearly

[16] Melissa Bond et al., "Mapping Research in Student Engagement and Educational Technology in Higher Education: A Systematic Evidence Map," *International Journal of Educational Technology in Higher Education* 17, no. 1 (2020): 2, https://doi.org/10.1186/s41239-019-0176-8.

[17] Martin Florence, "Online Learner Engagement: Conceptual Definitions, Research Themes, and Supportive Practices," *Educational Psychologist* 57, no. 3 (2022): 162–77, https://doi.org/10.1080/00461520.2022.2089147.

defined access rights between administrators and users. Students have their own portal to access academic information, while staff can manage activities, tasks, and working hours in a structured way through a personal dashboard.

In addition, the CRM system is equipped with task management features, staff activity tracking, department management, and a help ticket system that enables rapid responses to student issues. Other supporting features include announcements, automatic reminders, event calendars, goal tracking, knowledge bases, as well as integrated reporting and notifications. The system is also flexible to customize according to the institution's needs and identity through theme settings and custom fields. With these various features, CRM functions as an integrated academic service system that is student-oriented and supports the improvement of effectiveness, efficiency, and the quality of educational services.

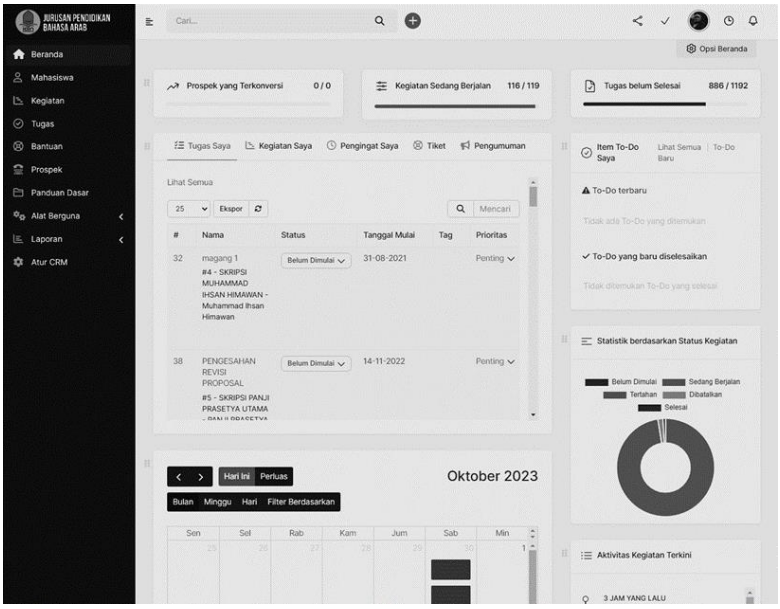


Figure 2. Admin Dashboard

Figure 2 illustrates the appearance of the admin dashboard in the Customer Relationship Management (CRM) system of the Department of Arabic Language Education. The dashboard functions as a control center for administrators to monitor and manage all academic activities, such as ongoing activities, pending tasks, and the progress of students' assignments and theses. Information is displayed concisely and in real time, making it easier for administrators to carry out supervision and make decisions.

The intensive use of the system in students' final project completion process demonstrates that responsive learning technology is able to support more structured and well-directed learning. Students gain clarity regarding academic stages, while lecturers have continuous access to students' progress data. This pattern is in line with research findings which affirm that effective technology-based learning is learning that successfully integrates monitoring, feedback, and reflection functions within a single digital ecosystem.[18]

From the lecturers' perspective, this system functions as a learning support instrument that enables more systematic management of academic supervision. Lecturers can identify students who experience learning difficulties, provide timely interventions, and manage supervision workloads proportionally. Meanwhile, for study program administrators, this system provides an integrated academic database that supports evidence-based policy making. This integration strengthens the governance of Arabic language learning that is more adaptive to student dynamics and needs.[19]

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Overall, the integration of responsive learning technology into the student interaction framework not only increases the efficiency of academic services but also strengthens the quality of interaction as the core of Arabic language learning.[20] The system proves that contextually designed technology can become a bridge between

[18] Charles Hodges, "The Difference Between Emergency Remote Teaching and Online Learning," EDUCAUSE Review, accessed January 11, 2026, https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning.

[19] Yousif A. Alshumaimeri and Abeer M. Alhumud, "EFL Students' Perceptions of the Effectiveness of Virtual Classrooms in Enhancing Communication Skills," *English Language Teaching* 14, no. 11 (2021): 80, https://doi.org/10.5539/elt.v14n11p80.

[20] Covenant University et al., "Customer Relationship Management Approach and Student Satisfaction in Higher Education Marketing," *Journal of Competitiveness* 6, no. 3 (2014): 49–62, https://doi.org/10.7441/joc.2014.03.04.

pedagogical needs, the role of lecturers, and institutional governance within a sustainable learning ecosystem.

Effectiveness of System Development in Supporting the Arabic Language Learning Ecosystem

The effectiveness of integrating responsive learning technology in the student interaction framework in this study was analyzed through staged trials that represent user acceptance, system functionality, and its impact on the quality of academic interaction. Effectiveness evaluation is not merely understood as technical system success, but as the capability of technology to build an interaction ecosystem that is adaptive, sustainable, and centered on student needs in Arabic language learning.

Effectiveness testing was carried out in two stages, namely small group trials and limited large group trials. This staged approach aims to capture variations in user experiences and test the consistency of system performance at different usage scales. The small group trial results showed an effectiveness score of 79.4, while the limited large group trial produced a score of 83. The difference in scores indicates an increase in system effectiveness when used in a more complex interaction ecosystem involving more academic actors.[21]

The increase in the effectiveness score from 79.4 in the small-group trial to 83 in the large-group trial indicates that the responsive learning CRM system actually performs more optimally when placed within a more complex interaction ecosystem involving a greater number of academic actors. In the small-group trial, system use was still focused on introducing basic features and on limited use in certain service contexts (such as initial administrative submissions and early-stage supervision). At the large-group trial stage, the scope of use expanded to more courses, more supervisors, and a wider variety of students' academic needs, so that monitoring functions, automatic reminders, and interaction documentation were utilized more intensively. This is in line with the view that learning technologies will show higher effectiveness when they are fully integrated into academic workflows and not merely used as an administrative add-on.

[21] Olaf Zawacki, "The Current State and Impact of Covid-19 on Digital Higher Education in Germany."

Conceptually, these findings align with the view that the effectiveness of digital learning is not only determined by the availability of technology but by the extent to which the technology is able to enhance student engagement and the quality of learning experiences. In this study, responsive learning technology is realized through a system capable of adjusting academic services to user needs -students, lecturers, and study program administrators- flexibly and in real time.[22]

Table 2. Customer Touch Points in the CRM System

Aspek	Prosentase	Kriteria
Customer Touch points bagi mahasiswa	84%	Baik
Customer Touch points bagi pengelola prodi dan dosen	82%	Baik
Customer Touch points bagi admin	83%	Baik
Rerata	83%	Baik

The score of 84% for student customer touch points shows that, from the end-users' perspective, the system provides clear and easily accessible interaction channels, both for regular academic services and for the final project supervision process. The 82% score from study program managers and lecturers reflects that the system supports the enhancement of lecturers' teaching presence by facilitating the tracking of supervision progress, the provision of feedback, and the scheduling of meetings in a more structured way. Meanwhile, the 83% score for admin customer touch points indicates that data integration and the automation of administrative processes contribute to work efficiency and the reduction of service delays. Overall, the combination of scores 79.4, 83, 84%, 82%, and 83% can be read as an indication that the system successfully brings together three main pillars of a digital learning ecosystem, namely student engagement, teaching presence, and the reliability of academic service infrastructure.

These empirical findings are consistent with student engagement theory, which emphasizes the importance of continuous interaction, clarity of expectations, and access to consistent academic support. The increase in the effectiveness score in the large-group setting can be linked to the rising frequency of student consultations through the system's channels, the reduction of miscommunication related to schedules and academic stages, and the decrease in administrative delays due to

[22] Anderson and Dron, *Teaching Crowds*.

automatic reminders and real-time tracking of service status. From the lecturers' side, the ease of accessing supervision histories and monitoring final project progress enables pedagogical interventions to be carried out more quickly and more precisely. For administrators and study program managers, the availability of integrated data facilitates the preparation of academic reports, the mapping of at-risk students, and data-driven decision making. Thus, these numerical scores are not merely technical indicators but also representations of the strengthening of the quality of academic interaction mediated by the CRM system.[23]

In Arabic language learning, the effectiveness of responsive learning technology becomes even more significant due to the characteristics of language learning that require continuous interaction, intensive feedback, and gradual mentoring. The developed system allows the learning process to take place in a more structured, well documented, and easily monitored manner. This is in line with studies showing that the use of digital platforms can enhance the quality of language learning when designed to support meaningful pedagogical interactions.

From the students' perspective, system effectiveness is reflected in the ease of access to academic services and the continuity of interaction during the learning and study completion processes. The system enables students to be actively involved in academic processes, from title submission, thesis supervision, to the fulfillment of supporting academic requirements. This integrated interaction pattern strengthens the role of students as active subjects of learning, not merely recipients of administrative services. These findings reinforce previous research which states that student engagement is a key indicator of educational technology effectiveness. [24]

From the lecturers' side, system effectiveness is seen in the increased capacity for monitoring and providing academic feedback. Lecturers can systematically monitor student progress, identify academic obstacles earlier, and implement pedagogical interventions in a timely manner. The presence of these features strengthens lecturers' teaching presence in digital learning, which various studies have regarded as a key factor in the success of online learning.[25]

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[23] B Suhasini, *CRM Service Touch Points and Student Perception*, 8, no. 1 (2019).

[24] Bond et al., "Mapping Research in Student Engagement and Educational Technology in Higher Education."

[25] Florence, "Online Learner Engagement: Conceptual Definitions, Research Themes, and Supportive Practices."

Meanwhile, for study program administrators, the effectiveness of integrating responsive learning technology is reflected in the availability of integrated and easily analyzed academic data. Data on students' study progress can be used as a basis for decision-making and academic policy formulation. This approach is in line with global trends in higher education that emphasize the importance of data-based learning management and learning analytics to improve the quality of academic services.[26]

In addition to functional aspects, system effectiveness is also supported by flexibility of access across devices and platforms. The system's ability to be accessed through various digital devices enables students to interact with the learning ecosystem without spatial and temporal constraints. This condition is relevant to the characteristics of the digital generation of students who have high expectations for academic services that are adaptive, fast, and personalized.[27]

Thus, the effectiveness of integrating responsive learning technology in the student interaction framework in this study is not only demonstrated through quantitative scores but also through changes in academic interaction patterns that are more structured, participatory, and sustainable. These findings affirm that the development of learning technology in higher education needs to be directed toward the formation of a holistic interaction ecosystem, rather than merely digitalizing academic services.

Future research needs to examine the long-term impact of CRM implementation on institutional performance, particularly in the context of digital transformation and global competition. Longitudinal studies are required to understand how CRM systems evolve in responding to technological advances and shifts in educational paradigms. In this way, research findings can provide a comprehensive picture of the contribution of CRM in sustainably enhancing competitiveness, operational efficiency, and the quality of educational services.[28]

Conclusion

This study concludes that the integration of responsive learning technology through

[26] Hodges, "The Difference Between Emergency Remote Teaching and Online Learning."

[27] Alshumaimeri and Alhumud, "EFL Students' Perceptions of the Effectiveness of Virtual Classrooms in Enhancing Communication Skills."

[28] Fithriyyah Shalihati et al., "Mapping Customer Relationship Management Research in Higher Education: Trends and Future Directions," *Administrative Science* 15 (2), no. 68 (2025): 1–21, https://doi.org/10.3390/admsci15020068.

the development of a web-based system grounded in a student interaction framework has proven effective in supporting the Arabic language education ecosystem in higher education. The developed system is able to facilitate adaptive academic interaction among students, lecturers, and study program administrators so that learning and academic services can run in a more structured, responsive, and user-centered manner.

The effectiveness test results show that the system falls into the good category in both small group and limited large group trials. These findings indicate that the student interaction framework integrated with responsive learning technology is not only technically feasible but also makes a tangible contribution to improving the quality of academic interaction, learning monitoring, and the efficiency of managing Arabic language education. Therefore, the development of learning technology needs to be directed toward the establishment of a holistic and sustainable interaction ecosystem to support the quality of learning in higher education.

As a closing point, this study provides a new contribution in the form of formulating and testing a CRM-based student interaction framework that is specifically contextualized for the ecosystem of Arabic Language Education in higher education. Based on these findings, study programs and institutions are advised to integrate this CRM system with existing academic information systems, scale its implementation to other programs with similar characteristics, and utilize it as a continuous quality assessment instrument for periodically monitoring academic interaction, student satisfaction, and service performance.

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