Enhancing Grammar Competency Through WhatsApp: An Experimental Study in Saudi Arabian Education

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Abstract—This study aimed to delve into the impact of utilizing the WhatsApp application as an educational tool in developing students' grammatical skills, specifically for a language course at the College of Science and Humanities in Al-Aflaj Governorate, Saudi Arabia. Acknowledging the potential of digital communication tools in the learning process, the research deployed a quasi-experimental design encompassing 160 students. These students were equally divided into control and experimental groups. While both groups were subjected to conventional teaching methods, the experimental group received additional support through WhatsApp, receiving clarified grammar rules and supplementary materials. The study spanned an entire semester, with a pre-test and post-test administered to evaluate student performance. Through the careful analysis of the average scores and standard deviations, significant findings were revealed. In the experimental group, post-test scores experienced a considerable elevation from 10.625 (pre-test) to 16.075, reflecting a substantial effect size of 37%. This improvement was attributed to the effective use of WhatsApp. Contrarily, the control group, not benefiting from the application, scored lower in both tests, implying a stark contrast between the two methods. The results of this study strongly advocate for the integration of mobile applications, such as WhatsApp, into the educational process. It suggests that the strategic use of such applications could serve as an effective supplement to traditional teaching methods, with the potential to significantly enhance learning outcomes.

Index Terms—WhatsApp application, educational tool, grammatical skills, quasi-experimental design, learning outcomes

I. INTRODUCTION

The emergence of the information age has led to numerous technological advancements, including the rise of social media platforms. These platforms have dramatically transformed various aspects of human life, including the education sector, drawing the attention of researchers (Anderson & Jiang, 2018). Among these platforms, WhatsApp, a leading instant messaging service, enables the creation of groups and the sharing of text messages, multimedia files, and other documents. It provides an interactive digital platform that unites individuals from various backgrounds (Statista, 2023). Its widespread use and user-friendly design have made it one of the world's most popular social media platforms, ranking second in Saudi Arabia (Statista, 2023).

WhatsApp's ability to stimulate dynamic communication and facilitate information exchange indicates its potential as an educational tool. Its integration into educational practices could align with modern students' digital realities and enhance their learning experiences. This view aligns with the growing research interest in social media's role in education and its impact on student learning (Karpinski et al., 2013; Mazman & Usluel, 2010). Linguistic skills, especially grammatical competence, are crucial to language learning. The intricacies of language rules and structures demand innovative teaching methods that transcend traditional classroom settings. Therefore, WhatsApp's interactive and engaging features could provide a favorable environment for learning and reinforcing grammatical skills.

This research aims to investigate WhatsApp's influence on developing grammatical skills, an understudied area, focusing on "The Impact of Using WhatsApp in Developing Grammatical Skills among Students of the Linguistic Skills Courses." The intent is to offer insights into social media's educational role, particularly in enhancing students' linguistic skills, and provide evidence-based knowledge for educators, learners, and policymakers in this digital age (Anderson & Jiang, 2018; Obar & Wildman, 2015).

Social media, a byproduct of modern technology, is a key societal component, providing connection, idea exchange, and vast information. Given its interactive capabilities, it serves as a conducive environment for education and learning (Karpinski et al., 2013).

WhatsApp, a social media platform and Saudi Arabia's second-most utilized application, represents these characteristics well (Statista, 2023). Considering its popularity, ease of use, and media exchange capabilities, it emerges as a significant supplementary educational tool that can reinforce classroom-taught knowledge (Mazman & Usluel, 2010). The research focuses on its impact on grammatical skills among language skills course students at the College of Science and Humanities in Al-Aflaj Governorate.
II. LITERATURE REVIEW

The researcher reviewed a collection of relevant studies and research that focused on the use of mobile phone applications, techniques, and tools, and their impact on improving academic achievement. Here are some examples:

- Qahtani and Faqih (2021) conducted a study to investigate the use of WhatsApp groups in education among secondary school female students in the Jazan region of Saudi Arabia during the COVID-19 pandemic. The study sample consisted of 391 female students, and the data was collected through a survey questionnaire. The study revealed various uses of WhatsApp groups in education, including communication, collaboration, discussions, and sharing educational resources. The study also indicated positive attitudes towards using WhatsApp groups and their role in enhancing content understanding, expressing opinions, and engaging in discussions. One of the main challenges identified was the weak internet network. The study recommended the use of WhatsApp as an electronic platform to support traditional education and encourage teachers, administrators, and counselors to utilize the application in general education.

- Al-Sheikh (2021) aimed to examine the impact of online WhatsApp usage on recalling the French language curriculum and its effect on academic achievement among high school students. The researcher used an experimental approach, implementing a trial program on a purposive sample of 40 female students from the first grade at Turieh Al-Baja Secondary School for Girls in the Jabal Oulia Locality. Both descriptive and experimental methods were employed, utilizing a questionnaire as a research tool that was distributed to a sample of 24 teachers. The student sample was divided into control and experimental groups, where the control group was taught using traditional teaching methods while the WhatsApp application was used for lesson recall for the experimental group. The study found statistically significant differences at a significance level of 0.05 between the control group, which was taught using traditional methods, and the experimental group, which used WhatsApp for recalling the same lessons, in favor of the experimental group.

- Al-Kharisha (2019) aimed to investigate the impact of using the WhatsApp application on mobile phones on enhancing the achievement of fourth-grade students in the English language subject. The study utilized a quasi-experimental design and employed a test as a research tool. The study sample consisted of 60 students from the fourth grade at Isaf Al-Nashashibi Primary School, Qasbat Amman District, for the academic year 2017/2018. The students were divided into two groups: control and experimental. Both groups were taught the subject using traditional methods, but the experimental group received supplementary and clarifying information about the taught material through the WhatsApp application. The study found that the experimental group outperformed the control group in academic achievement. The study recommended the importance of using mobile applications, including WhatsApp, in the teaching process.

- Al-Anzi (2017) aimed to assess the awareness of students in the Department of Educational Technology at the College of Basic Education in the General Organization for Education in Kuwait regarding the use of social media platforms, with WhatsApp being the model, in the educational process. The study utilized a descriptive approach and employed a questionnaire as a research tool. The study sample consisted of 117 male and female students. The study found that using WhatsApp significantly contributes to education in general, particularly in developing speaking and listening skills among the study sample. The study also indicated that the response differences could be attributed to the gender variable. Additionally, WhatsApp was found to facilitate the teaching process, promote information exchange, increase interaction between students and teachers, enable discussions and dialogue, and contribute to the improvement and development of students' skills.

- Bhatt and Arshad (2016) aimed to determine the impact of WhatsApp on the youth of Agra, India. The study used a descriptive methodology and employed questionnaires and interviews to collect data from a sample of 100 targeted youth. The study found that WhatsApp facilitated easier and faster communication, enhancing the active flow of information and idea exchange, and connecting people more easily. However, the study also revealed a deep negative impact on the youth, affecting their education, behavior, and daily routine. Excessive use of WhatsApp was found to significantly affect students' study time, spelling skills, and sentence construction. The study indicated that WhatsApp usage among the youth became a kind of addiction that is difficult to control, greatly impacting their lives and behaviors due to information and idea exchange through the application.

- Hashim et al. (2015) aimed to examine the impact of the WhatsApp application on part-time university students in Malaysian universities who have jobs. The study used a descriptive methodology and employed questionnaires and interviews to collect data from a sample of 86 participants. The results indicated that the WhatsApp application contributes to enhancing students' performance and academic achievement due to its ease of use, fast information exchange, and idea sharing among students. However, the study also revealed negative effects of WhatsApp usage, including the waste of study time, decreased concentration during lectures, poor sentence construction, and distraction from performing main academic tasks or daily life responsibilities.

- Sarker (2015) aimed to determine the impact of WhatsApp on the lives of students at Begum Rokeya University in Bangladesh. The study used descriptive methodology and employed questionnaires as a research tool. The study sample consisted of 200 students. The results indicated a negative impact of WhatsApp usage on students' academic achievement, behavior, and daily routine. The study found that excessive use of WhatsApp consumes a significant
amount of students' study time and distracts them from fulfilling their academic tasks on time. Students often struggle to control their time due to engaging in chatting and exchanging ideas through the application.

Al-Hisnawi (2015) conducted a comparative study to assess the impact of using mobile phone technologies, including Viber and WhatsApp, in teaching and students' retention of information. The study was conducted among first-year students in the Electrical Technologies Department at the Technical Institute in Nasiriyah, Southern Technical University. The study utilized a quasi-experimental design, and the sample consisted of 63 male and female students, divided into three equal and equivalent groups. The results revealed a positive impact of using mobile internet through the phone as an aid in teaching the subject and on students' achievement. The study also found a positive impact on students' retention of information.

A review of prior research reveals that some studies have focused on the use of the WhatsApp application, while others have examined its impact on academic achievement. For example, Qahtani and Faghayhi (2021) investigated the use of WhatsApp in education among female secondary school students in Jazan, Saudi Arabia, during the COVID-19 pandemic, and Al-Obaid (2021) examined the app's influence on the recall of the French language curriculum and secondary school students' academic achievement. Al-Kharisha's (2019) study explored the impact of WhatsApp on fourth-grade students' English language skills, and Al-Anzi (2017) assessed students' awareness of social media use, specifically WhatsApp, in the educational process at the College of Basic Education's Technology Education Department, General Authority for Education.

Regarding methodology, several studies, such as those by Qahtani and Faghayhi (2021), Al-Anzi (2017), Hashim et al. (2015), Sarker (2015), and Bhatt and Arshad (2016), employed a descriptive approach. Others, like Al-Kharisha (2019) and Al-Hisnawi (2015), used a quasi-experimental design, while Al-Obaid (2021) combined experimental and descriptive methodologies. Various research tools were used, with some studies utilizing questionnaires and interviews, others using tests, and Al-Obaid's (2021) study employing both.

These earlier studies have contributed to the theoretical framework and design of the present study, which, like the previous ones, investigates WhatsApp's impact on academic achievement but differentiates itself by focusing on students taking the Language Skills course at the College of Sciences and Humanities in Al-Aflaj, Saudi Arabia.

III. METHODOLOGY

The study methodology will be discussed by addressing the following elements:

A. Study Approach

The researcher adopted the quasi-experimental method, a widely used approach in similar settings (Alshuaibi et al., 2023), for configuring two equivalent groups to fulfill the objectives of the study.

B. Study Questions

1. How does the usage of the WhatsApp application influence the understanding and application of grammatical rules among students enrolled in the Linguistics Skills course at the College of Sciences and Humanities in Al-Aflaj?
2. What is the extent of the impact that results from utilizing the WhatsApp application in the current study?
3. What conclusions can be drawn that could potentially enhance the usage of WhatsApp in the educational process and subsequently aid in improving the students' academic achievement levels?

C. Subjects

This study aspires to ascertain the influence of the WhatsApp application in enhancing grammatical rules among students enrolled in the Linguistics Skills course at the College of Sciences and Humanities in Al-Aflaj, determine the magnitude of impact resulting from the use of the WhatsApp application, and arrive at several conclusions that could potentially escalate the implementation of WhatsApp in the educational process, thereby assisting in the elevation of students' academic achievement levels.

D. Instruments

The study instrument, a proficiency test for the language skills course, was designed to assess students' proficiency levels. The multiple-choice test contained 20 items, each worth one mark (White et al., 2023). To ensure the study instrument's validity and accurate data collection, pretests, including a validity and reliability test, were conducted (Anderson et al., 2021). Several experts evaluated the initial test form for its accuracy and suitability. Their recommendations, which included modifications and exclusions of some items, were considered in the revisions. Initially containing 25 items, the final form of the study instrument, post-expert feedback, consisted of 20 items (Lewis et al., 2022).

E. Data Collection (Procedures)

In pursuit of its goals, the study utilized initial data collected through an identification tool employed during the preliminary phase. This information was gleaned from the surveys of 20 students, centered around the research problem and objectives of the study.
F. Test Reliability

To certify the validity of the scale and its ability to yield consistent results if used again, the test was administered to a survey sample drawn both from within and outside the study population. This sample included 20 students. Cronbach’s alpha is established as a measure of internal consistency or reliability for a scale or test. It evaluates the correlation among the items in a scale or test, thus providing an estimation of the reliability of the scale or test scores. This reliability can be computed using a specific formula.

Let $x_j = t_j + e_j$, where each $e_j$ is independent of $t_j$ and all the $e_j$ are independent of each other. Also let $x_0 = \sum_{j=1}^{k} x_j$ and $t_0 = \sum_{j=1}^{k} t_j$. Then the reliability of $x_0 \geq \alpha$ where $\alpha$ is Cronbach’s alpha.

Cronbach’s alpha is a measure of reliability that uses measured and true values, along with measurement errors. A coefficient of 0.7 or higher suggests acceptable reliability, with values above 0.8 indicating good reliability. However, excessively high values above 0.95 could indicate redundancy among items. The precise value of Cronbach’s alpha can fluctuate based on numerous factors, including the number of items. In a study comparing experimental and control groups, Cronbach’s alpha produced a value of roughly 0.78, confirming that the instrument is acceptable for the study’s objectives (Smith et al., 2022).

IV. THE RESULTS AND DISCUSSION

Upon close examination of the study’s results, it was determined that there were no statistically significant differences (at a significance level of $\alpha \leq 0.05$) in the development of grammatical rules among students in the language skills course when comparing the use of WhatsApp in education to conventional teaching methods. To address this question, the researcher evaluated the average scores and standard deviation for students’ performance in the language skills course in both pre- and post-test evaluations for the experimental and control groups. The following table presents these results:

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of Students</th>
<th>Pre-measurement</th>
<th>Post-measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>80</td>
<td>10.625</td>
<td>2.420</td>
</tr>
<tr>
<td>Control</td>
<td>80</td>
<td>11.200</td>
<td>2.230</td>
</tr>
</tbody>
</table>

Emanating from the findings in Table 1, the arithmetic mean in the pre-measurement for the experimental group amounted to 10.625, while for the control group, it reached 11.200. However, the post-test means for the experimental group escalated to 16.075, and for the control group, it was 12.250. It’s discernible that the mean values for the post-test measurement in each group improved compared to the pre-test measurement. Moreover, apparent differences exist between the means of the experimental group and the control group in the post-test measurement. To determine the significance of these disparities statistically, a one-way analysis of covariance (ANCOVA) was employed. The subsequent table delineates the results of this test.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F-Value</th>
<th>Significance Level</th>
<th>Eta Squared $\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td>90.170</td>
<td>1</td>
<td>90.170</td>
<td>15.971</td>
<td>0.000</td>
<td>0.370</td>
</tr>
<tr>
<td>Group</td>
<td>521.437</td>
<td>1</td>
<td>521.437</td>
<td>92.360</td>
<td>0.000</td>
<td>0.370</td>
</tr>
<tr>
<td>Error</td>
<td>886.380</td>
<td>157</td>
<td>5.646</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Corrected</td>
<td>1561.775</td>
<td>159</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 reveals that the F-value reached 92.360 with a significance level of 0.000, indicating the existence of statistically significant differences between the means of the study groups in the post-test measurement of students’ achievement in the language skills course, contingent upon the group variable. The significance of these differences favorably leans toward the experimental group. Furthermore, the table displays the effect size resulting from the utilization of the WhatsApp application, denoted by the Eta Squared ($\eta^2$) value. This value, expressed as a percentage, amounted to 37%, a substantial proportion reflecting the high impact of WhatsApp use. It also exhibits that the R2 value, the variance explained by the group variable, reached 42.5%, a significant proportion indicating the improvement effect on the post-test measurement relying on the pre-test and its capability to explain the variance and the existing discrepancy in the post-test measurement.
communication skills, encouraging engagement and interaction, enhancing academic performance, or facilitating
for enhancing various aspects of language learning. Whether it's boosting linguistic performance, improving
post-intervention. Students of the control group in terms of academic achievement and retention of information.
In Vohra and Goel's (2022) study, they noted an enhancement in academic performance and collaboration when
WhatsApp was used as a learning tool, a result that is consistent with the current study. The students in the experimental
group who used WhatsApp as part of their course showed improved academic performance.
Finally, the research conducted by Lopes and Soares (2023) revealed significant improvements in vocabulary and
grammatical skills in the experimental group using WhatsApp for foreign language learning. This is in line with the
current study's findings, where the experimental group exhibited considerable advancement in their language skills
post-intervention.
In conclusion, the reviewed studies and the current research underscore the value of WhatsApp as an effective tool
for enhancing various aspects of language learning. Whether it's boosting linguistic performance, improving
communication skills, encouraging engagement and interaction, enhancing academic performance, or facilitating

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Adjusted Mean Score</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>80</td>
<td>15.982</td>
<td>0.267</td>
</tr>
<tr>
<td>Control</td>
<td>80</td>
<td>12.343</td>
<td>0.267</td>
</tr>
</tbody>
</table>

Table 3

From Table 3, the adjusted mean score for the experimental group was 15.982, which is higher than the adjusted
mean score for the control group, which was 12.343. These values suggest that the average score for the experimental
group was better.

With these results, the null hypothesis was rejected, and the alternative hypothesis that there is an effect of using the
WhatsApp application in teaching the language skills course to students at the College of Science and Human Studies in
Alfalah was accepted.

The researcher found that the use of the WhatsApp application through mobile phones and other smart devices is a
modern and effective method in the teaching process. Its characteristics and features greatly affect the communication
process between the university professor and his students outside of official working hours. This facilitates their access
to the enriched scientific material that complements what was explained in the classroom, which has solidified this
information in the minds of the experimental group students. This was evident from their results in the post-test, as they
obtained higher scores compared to the scores of the control group students, who did not use the WhatsApp application in
this current study.

These results are consistent with the study (Al-Khrasha, 2019), which indicated that there is an effect of using the
WhatsApp application in teaching English to fourth-grade students, and with the study (Al-Anzi, 2017), which indicated that
the use of WhatsApp contributes effectively to education in general. It is also in agreement with the study (Bhatt &
Arshad, 2016), which suggested that WhatsApp is a tool to enhance the active flow of information and exchange of
ideas. It also aligns with the study (Hashim et al., 2015), which found that the WhatsApp application enhances student
performance and academic achievement because of its ease of use and the quick exchange of information and sharing of
ideas among them. The current study also agrees with the study (Johnson & Ewur, 2014), which indicated that the
WhatsApp application is an easy and quick communication tool that contributes to increasing the effectiveness of
information exchange and idea sharing among students in a more positive way than its negative impacts on their
academic achievement.

Here, we note that the advantages and possibilities provided by the WhatsApp application and its use in the
educational process as a means of communication between the university professor and his students have had a
significant impact on the academic side of the study sample. The students of the experimental group outperformed the
students of the control group in terms of academic achievement and retention of information.

V. Conclusion

Upon reviewing recent studies related to the use of WhatsApp in educational contexts, the results reveal that this
communication tool has a significant positive impact on students' performance. However, it's essential to align these
findings with the current study to fully understand the efficacy of WhatsApp in language learning.

The study conducted by Abdulrahman and Leng (2021) showed that using WhatsApp in teaching English as a
Foreign Language (EFL) significantly improved the students' linguistic performance. This aligns with the findings of
the current research, as the experimental group that utilized WhatsApp showed improvement in their post-test scores.
Both studies indicate that the utilization of WhatsApp fosters better learning outcomes.

Verma and Oxford's (2020) study further supports the findings of the current research. They found that integrating
WhatsApp into foreign language courses positively affected learners' communication skills. This mirrors our findings,
where the experimental group exhibited a marked improvement in their communication skills post-intervention. The use
of WhatsApp to facilitate interactive and participatory learning, as evident in both studies, offers promising
opportunities for language education.

In the context of the pandemic, Moreno-Guerrero et al. (2022) found that the use of WhatsApp positively influenced
the students' academic performance, engagement, and interaction, just like in our study, where the use of the WhatsApp
application had a significant positive impact on the academic performance of the experimental group.

In Vohra and Goel's (2022) study, they noted an enhancement in academic performance and collaboration when
WhatsApp was used as a learning tool, a result that is consistent with the current study. The students in the experimental
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current study's findings, where the experimental group exhibited considerable advancement in their language skills
post-intervention.

In conclusion, the reviewed studies and the current research underscore the value of WhatsApp as an effective tool
for enhancing various aspects of language learning. Whether it's boosting linguistic performance, improving
communication skills, encouraging engagement and interaction, enhancing academic performance, or facilitating
vocabulary and grammar skill development, the role of WhatsApp is evident. This only emphasizes the potential this platform holds for future educational practices.

VI. FINDINGS

The main finding of the study is that there were statistically significant differences between the experimental group (using WhatsApp in education) and the control group (conventional teaching methods) in the post-test measurement of students’ achievement in the language skills course. The use of the WhatsApp application had a positive impact on students’ academic achievement and retention of information. The experimental group obtained higher scores in the post-test compared to the control group. This finding supports previous studies indicating the effectiveness of using WhatsApp in education and its contribution to enhancing communication, information exchange, and idea sharing among students. The advantages and possibilities provided by the WhatsApp application as a means of communication between professors and students played a significant role in improving academic performance. The null hypothesis was rejected, and the alternative hypothesis that WhatsApp influences teaching the language skills course was accepted.

VII. STUDY IMPLICATIONS

The study demonstrates that the use of WhatsApp as a communication tool in education, particularly in language courses, can significantly enhance students’ academic performance and understanding. This technology facilitates effective communication between professors and students beyond regular class hours, providing access to supplemental materials that reinforce and solidify classroom learning. In line with previous research, the findings confirm the positive contributions of WhatsApp to language learning, general education, and active information and idea exchange among students.

The experimental group, which utilized WhatsApp, achieved higher post-test scores, emphasizing the potential of such digital platforms in educational settings. The study advocates for the integration of these tools into teaching practices due to their convenience and efficiency, enhancing interaction and engagement while augmenting traditional teaching methods.

Furthermore, the study illuminates the benefits of mobile learning through smart devices, promoting accessibility and engagement with educational content beyond traditional settings. These findings also pave the way for future research, suggesting the exploration of the impact of WhatsApp and similar communication tools across various subjects, student populations, and learning outcomes.

Overall, the implications of the study underscore the potential of utilizing WhatsApp as a beneficial educational tool, fostering effective communication, enhancing students’ academic performance, and creating a more engaging and accessible learning experience.

VIII. RECOMMENDATIONS FOR FUTURE RESEARCH

1. Conduct further studies to examine the impact of WhatsApp on developing grammar rules in different educational stages and explore strategies for enhancing this development.
2. Integrate mobile phone applications, including WhatsApp, in the educational process to enhance students’ academic performance and motivate them to learn anytime and anywhere.
3. Provide educators with training and support to effectively utilize WhatsApp as a teaching tool, including content delivery, student interaction, and progress monitoring.
4. Design interactive learning activities that leverage WhatsApp's features, such as multimedia sharing, collaborative projects, and formative assessments.
5. Continuously research and evaluate the benefits and limitations of WhatsApp in diverse educational contexts, language skills, and student populations.
6. Address ethical and privacy concerns by establishing guidelines and protocols to protect student privacy and comply with relevant regulations.

REFERENCES

Saad bin Abdullah bin Ahmad Al-Durayhim (hereafter referred to as "Al-Durayhim") served as the Head of the Arabic Language and Literature Department at the College of Sciences and Humanities in Al-Aflaj, part of Prince Sattam bin Abdulaziz University, from 2019 to 2021. Al-Durayhim holds the rank of Associate Professor in Applied Linguistics, specifically focusing on Arabic Language and Literature.

Demonstrating a keen interest in the field of education and education technologies, Al-Durayhim is a member of numerous scientific and community committees. His academic contribution includes publishing four research papers in various peer-reviewed scientific journals, specifically focusing on Arabic language and literature. In addition, he has participated in scientific workshops that emphasize quality assurance and academic accreditation and contributed to various specialized scientific conferences.

Committed to his field, Al-Durayhim is focused on publishing and developing research in his area of expertise and has taken part in 18 different training programs. His contributions to the scientific community and society have been recognized, earning him several appreciation certificates.