Gamification of Faraid Science: Development of Digital Teaching Materials to Improve Inheritance Calculation Skills

[1]Saefudin Zuhri, [2]Sholeh Hidayat, [3]Fadlullah
[1]UIN Sultan Maulana Hasanuddin Banten, Indonesia, [1,2,3]Universitas Sultan Ageng Tirtayasa, Indonesia
[1]saefudin.zuhri@uinbanten.ac.id, [2]sholeh.hidayat@untirta.ac.id, [3]fadlullah@untirta.ac.id

ABSTRACT

This study seeks to create and enhance educational game-based teaching learning material on Islamic inheritance law via HIWAR, intended as supplementary resources and learning media for students specializing in Islamic Education. This study was undertaken in 2025 with a cohort of students majoring in Islamic Education at UIN Sultan Maulana Hasanuddin Banten, recruited using selective sampling. This study was incorporated into the Dick and Carey Research and Development framework. The validation results from experts, including media, learning material, and language specialists, indicated that the Indonesian language game-based teaching learning material is valid for use, with average validation scores of 91.5% from media experts, 92.5% from learning material experts, and 92% from language experts. The one-to-one evaluation phase yielded an average score of 4.6, the small group average was 4.8, and the field test average also reached 4.8, all classified as very good. The effectiveness test of the instructional learning material, involving 30 students, utilized the N-Gain Score Test, yielding an N-Gain Score of 0.7515 for the experimental class and 0.6450 for the control class. An Independent Sample t-Test revealed a significant difference in the enhancement of understanding the concept of heredity between students exposed to conventional teaching learning material and those utilizing interactive teaching learning material The findings suggest that readers utilize "HIWAR" game-based inheritance teaching learning material as an alternative to enhance inheritance calculating abilities and comprehension of inheritance concepts in Islamic higher education courses on inheritance. These developmental outcomes can be further enhanced by educators or other stakeholders.

Keywords: *Gamification; Faraid Science; Inheritance Calculation-Skills; Educational Game.*

INTRODUCTION

Learning is a system consisting of components that interact with each other to achieve goals (Sipone et al., 2025; W. Zhang et al., 2025; Eapen et al., 2025). The essence of learning is for students to learn, so that there will be a process of interaction between students and learning resources to achieve the expected goals. During learning, students not only interact with lecturers as one of the learning resources, but also interact with all learning resources used to achieve the desired results (Wen et al., 2025; H. Zhang et al., 2025; Rivaz, 2025).

The learning resources known in current learning are technology and media-based (Özergun-köse, 2025; Hadžiomerović et al., 2025; Istiyono & Perdana, 2025). Technology- and media-based learning resources are a component of learning that

needs attention. This is because technology-and media-based learning resources make it easier for students to absorb learning materials (Yen et al., 2025).

The convenience offered by technology- and media-based learning resources in absorbing learning materials is the main reason why this component is very important. Technology and media are able to present information and learning materials in a more attractive, interactive, and accessible format. This certainly helps students in understanding abstract and complex concepts. In addition, technology- and media-based learning resources also enable more personalized and flexible learning. Learners can study at their own pace and according to their own learning styles. They can also access learning materials anytime and anywhere, making the learning process more efficient and effective. Therefore, as educators, we need to recognize the importance of technology- and media-based learning resources in improving the quality of learning. We need to continue to strive to develop and utilize technology- and media-based learning resources that are relevant, innovative, and tailored to the needs of students. By doing so, we can create a more engaging, interactive, and effective learning environment, enabling students to achieve optimal learning outcomes.

The function of learning media is as a teaching aid, namely to support the teaching methods applied and used by lecturers (Supriadi, 2025 Bossetta & Bossetta, 2025; Roe et al., 2024). One of them is game-based learning media, in which case mobile phones and computers can be used as complementary media for more interactive learning. To make it more enjoyable, educators must be able to package learning materials into interesting teaching materials. By applying technology in the world of education, game-based learning media can be created (Toan et al., 2025; Zviel-girshin, 2025; Ghavami et al., 2025).

Learning media has transformed significantly, going beyond its role as a mere visual aid. Learning media has now become a dynamic ecosystem, a place where information flourishes, interactions are formed, and knowledge develops. Learning media also serves as a bridge connecting learners with unlimited learning resources. Online learning opens access to a variety of information, knowledge, and perspectives that were previously difficult to reach. Learners can learn from experts around the world, collaborate with peers from various backgrounds, and explore topics that interest them. In short, learning media in the latest era has a very vital role in the world of education.

Faraid is generally considered by students to be a subject that is not too difficult to understand. Students often categorize it as a subject that is not as difficult as mathematics, physics, English, and others because Faraid is a fiqh science like other fiqh sciences. However, in reality, students' learning outcomes in Islamic inheritance law are no better than those in subjects that are considered difficult for

students (Studi et al., 2021). This problem arises not only because of a lack of learning ability and motivation, but also because of an unsupportive learning environment. In this case, the creativity of educators in managing learning has a significant influence on improving learning outcomes (Holstein & Cohen, 2025), (Dayan & Tsybulsky, 2025; Vuichard & Puozzo, 2024). This is the background for the urgency of research on the gamification of inheritance law: the development of digital teaching materials to improve inheritance calculation skills.

METHODS

Subjects of Research

The subjects of the trial in the development of this learning package consisted of: (a) Subjects who were experts, consisting of two learning material experts, two media (design) experts, and two language experts, (b) Individual trials consisting of 3 students from Staisman Pandeglang, (c) Small group trials consisting of 9 students from IAIB Kota Serang, and (d) Field testing consisting of 30 students and 3 lecturers teaching the subject of Faraid/Fiqh Mawaris at UIN Sultan Maulana Hasanuddin Banten, IAIB Kota Serang, and Staisman Pandeglang.

The population is the area of generalization consisting of objects or subjects that have certain quantities and characteristics determined by the researcher to be studied and then conclusions are drawn. The population in this study is all even semester students of the PAI Study Program at UIN Sultan Hasanuddin Banten who took the Faraid/Fiqh Mawaris course at the four universities. Sampling was conducted using purposive sampling, which is a technique of taking samples not based on randomness, area, or strata, but based on considerations focused on specific objectives. In this study, the samples were class A and class E of the PAI study program at UIN Sultan Maulana Hasanuddin Banten.

Instruments and Interview Questions

This study is a development study of the Dick and Carey Model, which is one of the instructional design models with a systems approach. Several research questions raised in this study are: (1) How is the "HIWAR" Faraid teaching material development model in Islamic Higher Education Institutions (PTKI)? (2) How feasible are Faraid teaching materials at Islamic Higher Education Institutions (PTKI)? (3) How practical are Faraid teaching materials at Islamic Higher Education Institutions (PTKI)? (4) How interesting are Faraid teaching materials at Islamic Higher Education Institutions (PTKI)? (5) How effective are the Faraid teaching materials at Islamic Higher Education Institutions (PTKI)? (6) What is the impact of using Faraid teaching materials at Islamic Higher Education Institutions (PTKI)?

Data Collection

The techniques used for data collection in this study were as follows: (1) Observation, observation was conducted to observe the implementation of learning using HIWAR teaching materials in the Faraid Science Course. This activity was carried out during the trial of game-based teaching materials in one-to-one, small group, and field tests with the aim of seeing how inheritance calculation skills impacted students. (2) Interviews. The researcher conducted interviews with the aim of obtaining data on the circumstances or situations and problems of learning Faraid Science in the classroom. These interviews included identifying the needs of lecturers and students regarding the use of Faraid teaching materials. In this case, the researcher conducted interviews to gather input related to suggestions from users or users of game-based teaching materials. (3) Product Validation Scale The scale in this assessment was obtained from the results of questionnaires by media experts, learning material experts, and language experts. In this research and development, the researcher used a Likert scale to develop instruments used to measure perceptions of an object or process of creating a product that has been developed or created. The answers to each instrument that used the Likert scale were.

RESULTS AND DISCUSSION

Product Development

The application development process involves implementing or developing applications using the Dart programming language with the Flutter framework. Flutter was chosen as the primary technology because it offers several significant advantages, particularly its cross-platform development capabilities, which allow developers to write a single codebase that can be compiled into native applications for various platforms such as Android, iOS, Web, and even Desktop. This is highly advantageous in terms of time efficiency, development costs, and consistency of experience across platforms, making it ideal for projects with limited timelines or budgets that need to be optimized without compromising quality.

During the development process, Visual Studio Code (VS Code) was used as the main code editor because it is lightweight, flexible, and has extensive plugin ecosystem support for Flutter and Dart, such as debugging tools, syntax highlighting, and direct integration with Git. Meanwhile, Android Studio was used as an emulator to run and test applications during the development stage. This emulator simulates various types of Android devices with different operating system versions, allowing developers to ensure consistent application appearance and performance across various device conditions without requiring physical devices.

The development process begins with setting up a good environment and project structure, including version control configuration using Git and determining

the architecture pattern to ensure that the code is organized and easy to maintain. Developers then begin implementing application features based on the approved User Interface design and the compiled requirement specifications. Flutter provides a rich and customizable widget library, allowing developers to build pixel-perfect User Interfaces according to the design while maintaining optimal performance.

During the development phase, the team will apply best practices in software engineering such as clean code principles and code review to ensure code quality and minimize bugs. Testing is carried out continuously and iteratively—starting from unit tests to test individual functions, widget tests to verify User Interface components, to integration tests to ensure that various components work harmoniously together. Developers will also perform performance optimization such as lazy loading, caching, and code splitting to ensure the application is responsive and does not overload the user's device.

Once all features have been implemented and have gone through a rigorous quality assurance (QA) process, including user acceptance testing (UAT) with the client, the application will enter the deployment preparation stage, which includes code obfuscation for security, optimization for release builds, and preparation of assets and metadata for submission to the Google Play Store. After receiving final approval from the client and passing the platform store review, the application is ready to be launched to end users, followed by monitoring, maintenance, and development literacy based on user feedback to support continuous improvement.

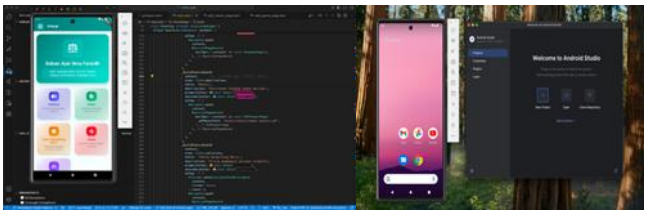

Figure 1. Flutter framework and Architecture pattern

Product Display

On the initial display, you will see the front cover showing all the features that are included in the HIWAR teaching materials, consisting of four options, namely: Guide to using teaching materials, inheritance learning materials that emphasize the basic theories of inheritance in Islam, inheritance calculation procedures which are the main menu in the automatic inheritance distribution calculation process, and a game menu containing problem-solving quizzes on inheritance cases. Users of this module simply click on the menu they wish to access, and to proceed to the next menu, they click accordingly. Below is the interface of the HIWAR Inheritance Law instructional material:

Figure 1. Initial display of Faraid teaching materials

Figure 2. Initial step in the inheritance calculation process, filling in information about the inheritance assets

Figure 3. Second step in the inheritance calculation, filling in information about the spouse of the deceased

Figure 4. Third step, filling in information about the children of the deceased

Figure 5. Fourth step: filling in information about the grandchildren of the son

Figure 6. Fifth step: filling in information about the parents of the deceased

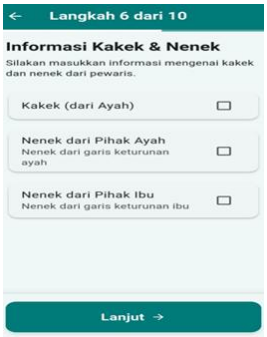

Figure 7. Sixth step: filling in information about the grandparents of the deceased

Figure 8. Seventh step: filling in information about siblings

Figure 9. Step eight: Entering information about the male nephews

Figure 10. Step nine: Entering information about the uncles.

Figure 11. Step ten: Entering information about the cousins, then clicking "Calculate Inheritance" to view the final result

Product Suitability

The teaching materials that have been developed have been validated by several experts consisting of subject matter experts, media experts, and language experts. This validation test aims to produce teaching materials and learning tools that are good and suitable for use. The validity test from the experts obtained an average score of 4.62. The average percentage obtained was 92%. Based on the interpretation of the Likert scale percentage presented by Dewi, et.al, 2018, this falls into the highly feasible category. The validation results from the experts are presented in the following table:

Table 1. Summary of Experts' Findings

No.	Validator	Average Score	Pe
1	Subject Matter Expert	4.65	
2	Media Expert	4.68	
3	Language Expert	4.55	
	Total Rata-rata Penilaian	4.62	

Product testing

After product feasibility testing by validators, the next step is to refine or revise the product according to expert recommendations. Then, the teaching materials are loaded onto Android Studio and tested by students. This testing begins with individual testing, small group testing, and field testing. From the data recapitulating student responses, the percentage of individual trials was 82%, small group trials 93%, and field trials 91%. Thus, the learning material in the game-based "HIWAR" Faraid teaching material developed by researchers can foster interest in learning

the basic concepts of inheritance law and solve inheritance problems. This is because the appearance of the teaching materials developed is attractive and different from textbooks. Students also believe that the "HIWAR" teaching materials are more efficient because they do not have to buy expensive textbooks, are practical because they are easy to learn, and can be downloaded on Android devices connected to the internet. The results of the product trial can be seen in the following table:

Table 2. Summary of Individual, Small Group, and Field Trials

No	Test	Percentage (%)
1	Individual	82
2	Small Group	93
3	Field	91

Pre-test and Post-test

Group Statistics

	Kelas	N	Mean	Std. Deviation	Std. Error Mean
Hasil	Eksperimen	30	85.07	9.652	1.762
	Kontrol	30	76.07	13.099	2.392

The results of the inheritance calculation test on the pretest and posttest of the two classes showed that the average pretest score for the control class was 50, with a minimum score of 30 and a maximum score of 65, while the experimental class had an average score of 53.5, with a minimum score of 35 and a maximum score of 70. The average post-test score for the control class was 76.07, with a minimum score of 50 and a maximum score of 100, while the experimental class had an average score of 85.07, with a minimum score of 70 and a maximum score of 100.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hasil	Equal variances assumed	3.126	.082	3.030	58	.004	9.000	2.971	3.054	14.946
	Equal variances not assumed			3.030	53.322	.004	9.000	2.971	3.042	14.958

Based on the table above, the p-value obtained is smaller than the alpha value, namely (0.004<0.050). Thus, Ho is rejected, so it can be concluded that the average post-test data between the experimental class and the control class are not significantly different. If we look at the descriptive statistics of the two classes, we can see that the average post-test data between the experimental class and the

control class is 85.07 > 76.07. This shows that the experimental class's ability to calculate inheritance is better than the control class. Therefore, it can be said that the treatment given was successful.

Discussion

Product Feasibility and Usability

The validation phase confirmed that the **"HIWAR" Faraid Science teaching material**, based on educational games, is highly feasible for use. Expert validation yielded consistently high scores: 92.5% from subject matter experts, 91.5% from media experts, and 92% from language experts, averaging 92% and categorized as *very feasible*. Furthermore, user acceptance tests—including individual (82%), small group (93%), and field tests (91%)—demonstrated high readability and viability for improving inheritance problem-solving skills. User evaluations from both students (92%) and lecturers (88.25%) further classified the product as of **good quality**. This high feasibility score indicates that the development process successfully integrated content validity, technical design standards, and linguistic clarity, making the materials suitable for higher education courses.

Practicality and Attractiveness of the Game-Based Material

The development of the interactive, game-based teaching material demonstrated high practicality, particularly from the user's perspective. The medium simplifies complex inheritance distribution concepts through visual and simulation approaches, facilitating understanding and addressing technical challenges often found in formal learning environments (Peña & Cassany, 2024). Practicality is evident in its flexible digital accessibility (laptops/smartphones), time efficiency, and intuitive navigation. More importantly, the interactive features, such as quizzes and case simulations, enhance student involvement and motivation, overcoming the non-interactive nature of conventional textbooks (Mata et al., 2024).

Attractiveness testing, a crucial indicator of learning quality, also yielded very positive results, aiming to ensure student engagement and motivation (Sadiman et al., 2010; Arsyad, 2011). The overall attractiveness score from student responses was 91% (categorized as *very attractive*), driven by high scores in visual appearance (94.3%), relevance (95.4%), and interactivity (85.6%). This confirms that the aesthetic and functional design effectively arouses curiosity and emotional involvement, making the learning atmosphere fun and meaningful, and making the material more inclusive across diverse learning styles (Jiang et al., 2025; Satıcı et al., 2025).

Effectiveness and Impact on Inheritance Calculation Skills

The effectiveness of the "HIWAR" teaching material was rigorously tested using a True Experimental Design (One-Group Pretest-Posttest Design) involving

experimental and control classes (Sugiono, 2015). The analysis focused on achieving learning objectives, specifically improving student competence in inheritance calculation. The results strongly confirm the effectiveness of the game-based material: (1) The average N-Gain Score for the experimental class was 0.7415 (High Category), while the control class scored 0.6450 (Medium Category). (2) An Independent Sample t-Test revealed a significant difference ({Sig. (2-tailed)} = 0.024 < 0.05) in the increase of inheritance calculation skills between students using the "HIWAR" educational game and those using conventional teaching materials.

These findings validate that the interactive educational game is highly effective in achieving cognitive improvement and stimulating interest in learning the material (Li et al., 2025; Hsu et al., 2025). Educational games are a type of game that attempts to provide educational value in a game so that games that initially only function as a medium of entertainment can also be used as a medium for learning or training (Kantorski et al., 2025; Pratama, 2025).

The game's simulation-based approach allows students to directly experiment with various inheritance distribution scenarios, strengthening their comprehension of complex and abstract concepts beyond rote memorization (Connolly & Beg, 2015). The "HIWAR" game thus provides a powerful alternative to enhance both inheritance calculation skills and conceptual understanding in Islamic higher education.

CONCLUSION

This research successfully developed the "HIWAR" digital teaching material for Faraid Science, confirming its high feasibility through rigorous expert and practitioner validation, thereby establishing it as a viable resource for enhancing inheritance calculation skills. The materials' appeal lies in their ability to present complex inheritance distribution concepts in a visual, dynamic, and enjoyable gamified format, significantly capturing student attention and interest from the outset. Furthermore, the teaching material demonstrates high practicality, supporting the learning process through flexibility in time and place, allowing students to access content anytime and anywhere, which fosters dynamic independent learning. Crucially, effectiveness tests conducted using a True Experimental Design revealed a significant difference between the pretest and posttest results in favor of the experimental group, indicating that the game-based material is highly effective in improving students' understanding of inheritance calculation concepts compared to conventional methods.

REFERENCES

Bossetta, M., & Bossetta, M. (2025). Element Design for Active Learning : A Design

Thinking Approach to Assignment Development for Political Science , Media , and Communication Education Element Design for Active Learning : A Design Thinking Approach to Assignment Development for Political Science , Media , and Communication Education. *Journal of Political Science Education*, *0*(0), 1–21. https://doi.org/10.1080/15512169.2025.2547856

Dayan, E., & Tsybulsky, D. (2025). Digital Curation for Teachers : Beyond Collecting to Achieving Science Teachers ' Professional Growth Digital Curation for Teachers : Beyond Collecting to Achieving Science Teachers ' Professional Growth. *Journal of Science Teacher Education*, *00*(00), 1–20. https://doi.org/10.1080/1046560X.2025.2561731

Eapen, N., Thundiyil, N., Shenai, S., Somaskandan, K., Parayitam, S., & Cristofaro, M. (2025). *Unfolding the Relationship Between Dialogue and Inquiry , Empowerment , and Employee Commitment in Healthcare Industry : Evidence from India*. 1–22.

Ghavami, B., Pour, H., & Karimian, Z. (2025). *A narrative review of advancing medical education through technology : the role of smart glasses in situated learning*. *7*.

Hadžiomerović, N., Avdić, R., Muminović, A. J., Muftić, A., Pandžić, A., & Tandir, F. (2025). *Enhancing student performance with multicolored 3D printed neuroanatomical models in veterinary education*.

Holstein, S., & Cohen, A. (2025). Scratch teachers ' perceptions of teaching computational thinking with school subjects in a constructionist approach. *Thinking Skills and Creativity*, *56*(January), 101772. https://doi.org/10.1016/j.tsc.2025.101772

Hsu, W., Hung, Y., Chen, H., Fuh, L., & Liao, S. (2025). *Enhancing dental students ' motivation and legal knowledge via courtroom role- playing*. 1–10.

Istiyono, E., & Perdana, R. (2025). *A systematic literature review of computational thinking study in physics learning*. *14*(4), 2698–2709. https://doi.org/10.11591/ijere.v14i4.29632

Jiang, Q., Liang, J., Xiong, W., & Zhao, W. (2025). *Roles of programming self-ef fi cacy, cognitive styles, and self-regulated learning strategies on computational thinking in computer programming*. 1–12.

Kantorski, B., Bruzdewicz, K., Will, S., & Pollock, J. A. (2025). Cards , cubes , and collaboration : a case study of the development of an educational board game. *Discover Education*. https://doi.org/10.1007/s44217-025-00472-z

Li, Y., Wu, J. G., Zhang, D., & Chen, Y. (2025). *The efficacy of virtual reality flipped learning with collaborative role-playing in nursing education*.

Mata, P., Informatika, P., Nggilu, R., Novian, D., Kadim, A. A., & Ashari, S. A. (2024). *Perancangan Media Pembelajaran Berbasis Game Edukasi*. *4*(2).

Özergun-köse, I. (2025). *Identifying the needs of middle school students with autism for an interactive e-book designed to improve their sustainable development awareness : insights from teachers ' perspectives*.

Peña, I. A. De, & Cassany, D. (2024). *Student podcasting for foreign language teaching–learning at university*. *14*(1), 123–141.

Pratama, R. A. (2025). *Effectiveness of research and development (R & D) of android - based educational games to improve students ' mathematical reasoning : a meta - analysis approach*.

Rivaz, M. (2025). *The effects of flipped classroom and jigsaw teaching strategies on learning , retention of course content , and satisfaction among nursing students : a quasi-experimental study*. 1–10.

Roe, J., Mike, A., & Furze, L. (2024). *Deepfakes and Higher Education : A Research Agenda and Scoping Review of Synthetic Media*.

Satıcı, S., Saçlı, Y., Bal, N., Çiprut, A. A., Yumuşakhuylu, A. C., & Batman, Ç. (2025). The effects of learning styles and attention control on P300 test in young adults. *The Egyptian Journal of Otolaryngology*. https://doi.org/10.1186/s43163-025-00786-7

Sipone, S., Abella, V., Rojo, M., & Moura, J. L. (2025). Gamification and player type : Relationships of the HEXAD model with the learning experience. *Journal of New Approaches in Educational Research*, 1–17. https://doi.org/10.1007/s44322-024-00021-w

Software, T., Improving, O., Academic, P. C., Service, A., Ampel, S., Eliyana, A., & Sridadi, A. R. (n.d.). *Implementing SWOT analysis in engineering education Implementing SWOT analysis in engineering education*. 7–12. https://doi.org/10.1088/1757-899X/830/3/032066

Studi, P., Pendidikan, M., Islam, A., & Dahlan, U. A. (2021). *Kata kunci: 7*(1), 25–36.

Supriadi, D. (2025). *Implementation of Artificial Intelligence Technology-Based Learning Media at SD Negeri Kotagede 1 Yogyakarta*. *5*(1), 51–56.

Toan, H. T., Thi, N., Hang, T., Hai, T. T., Nguyen, P., & Ngu, H. (2025). *Context-based learning in higher education 1992-2023 : trends and outstanding research areas from Scopus database*. *14*(5), 4050–4065. https://doi.org/10.11591/ijere.v14i5.33259

Vuichard, A., & Puozzo, I. C. (2024). When creativity wakes up emotions : an illustration of a creative course for pre - service teacher training. *Discover Education*. https://doi.org/10.1007/s44217-024-00314-4

Wen, J., Lee, Y., Xiang, L., Low, T., Ong, D. W., Bello, F., Chee, R., & Soh, C. (2025). *An activity theory approach to analysing student learning of human anatomy using a 3D-printed model and a digital resource*.

Yen, M., Mishra, N., Luo, W., & Lin, C. (2025). *A Novel Proactive AI-Based Agents*

Framework for an IoE-Based Smart Things Monitoring System with Applications for Smart Vehicles. https://doi.org/10.32604/cmc.2025.060903

Zhang, H., Du, L., Luo, S., Xun, H., Yang, A., & Tang, Y. (2025). *Unlocking EFL achievement through informal digital learning : the mediating roles of anxiety and enjoyment among school - age students in the Chinese mainland*.

Zhang, W., Shi, H., & Peng, J. (2025). *A diagnostic model for sepsis using an integrated machine learning framework approach and its therapeutic drug discovery*.

Zviel-girshin, R. (2025). *Enhancing Early STEM Engagement : The Impact of Inquiry-Based Robotics Projects on First-Grade Students ' Problem-Solving Self-Efficacy and Collaborative Attitudes*. 1–22.