# CHAPTER II REVIEW OF RELATED LITERATURE

## Related Studies

Discuss at least 10, local and foreign literature and studies, combined. Do not forget to cite the references where these are taken. These should be within a five-year validity from the date of the project proposal.

**Foreign Literature studies**

1. **E-Logic Trainer Kit : Development of an Electronic Educational Simulator and Quiz Kit for Logic Gate Combinational Circuit by using Arduino as Application (2019).**

Reference: <https://online-journals.org/index.php/i-joe/article/view/11410>

1. **Development and Evaluation of an Educational Game to Practice the Truth Tables of Logic (2019).**

Reference: <https://ieeexplore.ieee.org/abstract/document/8820859>

1. **Learning Logic Gate through 7-Gates (2020)**  
   Reference: <https://lamintang.org/journal/index.php/ijmari/article/view/70/51>
2. **Interactive M-Learning Media Technology to Enhance the Learning Process of Basic Logic Gate Topics in Vocational School and Engineering Education(2020)**

Reference:  
<https://www.researchgate.net/publication/350016075_Interactive_M-Learning_Media_Technology_to_Enhance_the_Learning_Process_of_Basic_Logic_Gate_Topics_in_Vocational_School_and_Engineering_Education>

1. **Construction of a Web Game for the Teaching-Learning Process of Electronics during the COVID-19 Pandemic (2022)**

Reference: <https://eric.ed.gov/?id=EJ1356743>

1. **Teaching Digital Circuit Design With a 3-D Video Game: The Impact of Using In-Game Tools on Students’ Performance (2021)**

Reference: <https://ieeexplore.ieee.org/document/9130891>

1. **DESIGNING AN EDUCATIONAL ANDROID APPLICATION TO IMPROVE LEARNING QUALITY AND STUDENTS' ATTITUDES TOWARDS IT (2022)**

Reference: <https://www.jlls.org/index.php/jlls/article/view/4249>

1. **The Development of Educational Game Based Learning Media Increases Computer System Learning Motivation in Vocational High Schools (2024)**

Reference: <https://www.atlantis-press.com/proceedings/veic-23/125997720>

1. **Exploring the Fusion of Mixed Reality and Digital Game-Based Learning: The Case of Puzzle Box Games for Education (2023)**

Reference: <https://ieeexplore.ieee.org/abstract/document/10398389>

1. **A Multiplayer Learning Game Design to Improve Online Learning Experiences (2022)**

Reference: <https://www.proquest.com/openview/b49f2b2c7aab071ed6df0ff8c80ce8f3/1?pq-origsite=gscholar&cbl=18750&diss=y>

**Local Literature studies**

1. **LogIO: An Adaptive Gamification Learning Approach on Digital Logic Gates** (2020)  
   Reference: <https://iopscience.iop.org/article/10.1088/1757-899X/803/1/012008/pdf>
2. **A Gamified Approach on Learning Logic Gates to Improve Student's Engagement** **(2019)**

Reference: <https://iopscience.iop.org/article/10.1088/1757-899X/803/1/012007/meta>

## Synthesis

**Foreign Literature Studies**

1. **E-Logic Trainer Kit : Development of an Electronic Educational Simulator and Quiz Kit for Logic Gate Combinational Circuit by using Arduino as Application (2019).** This study discusses the integration of new technology in education, moving beyond traditional methods to include simulators and quiz kits in classrooms. These tools enhance teaching by offering real-life examples and improving test administration. The focus is on the development of the e-logic trainer kit (e-kit), utilizing Arduino technology to teach logic gates. The kit allows students to practice building various logic circuits and observe their functionality.
2. **Development and Evaluation of an Educational Game to Practice the Truth Tables of Logic (2019).** This study discusses the struggle of Computer Science students with understanding logic concepts, leading to procrastination and a lack of comprehension. Researchers developed an educational game, derived from a card game and adapted for proposition logic as a mobile app, to address this issue. Through iterative improvements and feedback, the game was found effective and suitable for students, potentially replacing traditional exercises. However, integration into the course was deemed necessary to ensure universal student engagement with the game.
3. **Learning Logic Gate through 7-Gates**

An educational game called "7 Gates Digital World" uses a future adventure setting to teach Logic Gates. In order to advance through the stages and fuel the virtual world engine, players must use Logic Gates algorithms. Players must gather switches in challenging platform maps in order to progress in this puzzle-platform game. The game is essentially a teaching tool, offering material levels dependent on the player's comprehension and promoting memory of gate formulas, despite its difficult genre.

1. **Interactive M-Learning Media Technology to Enhance the Learning Process of Basic Logic Gate Topics in Vocational School and Engineering Education(2020).** This study introduces BLG-LeMed, a mobile learning application developed to help vocational high school students learn the fundamentals of logic gates. Extreme Programming (XP) was used in the development of the program, while usability assessments, alpha testing, and user acceptability tests (UAT) were used in testing. 38 students participated in the study, which watched them utilize BLG-LeMed in class. The findings show that BLG-LeMed is well-liked by users, functions as an engaging educational tool, inspires students to learn, and produces good learning results.
2. **Construction of a Web Game for the Teaching-Learning Process of Electronics during the COVID-19 Pandemic (2022).** This study created a digital game, DGE version 3.0, to teach combinational circuits during the COVID-19 pandemic. Fifteen engineering students participated. Results indicate the game positively impacted students' understanding and skills in electronics. The study highlights the effectiveness of web gaming for remote learning.
3. **Teaching Digital Circuit Design With a 3-D Video Game: The Impact of Using In-Game Tools on Students’ Performance (2021)**. This study examines how engineering students' performance in a digital circuit design course is impacted by in-game tools. They examined three different kinds of tools: productivity tools, scaffold, and instructional help. The findings indicate that while productivity tools had no discernible impact, guidance and scaffolding aids enhance learning performance.
4. **DESIGNING AN EDUCATIONAL ANDROID APPLICATION TO IMPROVE LEARNING QUALITY AND STUDENTS' ATTITUDES TOWARDS IT (2022)**

The aim of this project is to create an Android application for education that will improve learning outcomes and replicate computer logic gates. It aims to solve the problems with traditional education by improving the accessibility, interest, and error-reduction of learning logical gates. The results demonstrate that the experimental group's comprehension of logic gates significantly improved when compared to the control group, demonstrating the efficacy of the instructional mobile application.

1. **The Development of Educational Game Based Learning Media Increases Computer System Learning Motivation in Vocational High Schools (2024).** This study focuses on developing educational game-based learning media to increase student motivation in Computer Systems subjects. It addresses the lack of student engagement with traditional text-based learning materials. Following the ADDIE model (Analyze, Design, Development, Implementation, Evaluation) the study found that the developed educational game-based media was feasible and positively impacted students' learning motivation. The results indicate increased motivation among students after using the educational game-based media, highlighting its effectiveness in enhancing learning experiences.
2. **Exploring the Fusion of Mixed Reality and Digital Game-Based Learning: The Case of Puzzle Box Games for Education (2023).** This study discusses the disadvantages of online learning as well as the difficulties experienced by conventional offline teaching techniques during the COVID-19 pandemic. Inspired by the idea of a puzzle box, the study explores the merging of digital game-based learning and mixed reality technologies to address these problems. The goal of the study is to improve learning outcomes and student engagement through the design of virtual digital puzzles with an emphasis on user-centered human-computer interaction. The ease of use and gameplay aspects of mixed reality puzzle box games encourage students to use them for instructional reasons, according to the results, which enhances the learning process.
3. **A Multiplayer Learning Game Design to Improve Online Learning Experiences (2022).** The challenges of lacking social connection in online learning and its detrimental effects on cognitive and motivational elements are discussed in this study. It explores studies on online learning to find optimal approaches for creating a solution. The goal is to develop a cooperative, multiplayer learning game that teaches principles related to digital electronics. Based on secondary and primary research, the study creates an entertaining two-player web game to support group learning and practice of digital circuits.

**Local Literature Studies**

1. **LogIO: An Adaptive Gamification Learning Approach on Digital Logic Gates** (2020)  
   This study investigates the impact of game design elements on learners' motivation, performance, and learning experience in a gamified e-learning model for digital logic gates. Thirty learners evaluated the LogIO application, revealing high levels of motivation and usability, with a performance and learning experience level of 81%. The results underscore the importance of tailored design elements in gamified learning to enhance motivation, performance, and learning experience.
2. **A Gamified Approach on Learning Logic Gates to Improve Student's Engagement** **(2019).** This study aims to propose a framework for developing a gamified learning application for digital logic gates to enhance student engagement. It explores existing research and design principles to identify relevant parameters for measuring student engagement. The framework serves as a guide for game developers, aiming to standardize the development process of gamified learning in digital logic subjects, ultimately improving student engagement.

Therefore, All the related literature studies there some features are not available to improve the learner’s knowledge and interest to learn logic gates like Customizable Matches for the users can create personalized matches with specific objectives or rules to target particular concepts or skills, Assessment Tools including pre-and post-test evaluations, will be incorporated into the game to assess students' comprehension and monitor their advancement, Educator Resources for the game will offer resources for educators, such as lesson plans and guides on effectively incorporating the game into their curriculum.

Table 2: Synthesis

**Foreign Literature Studies**

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| **Feature** | **Study 1** | **Study 2** | **Study 3** | **Study 4** | **Study 5** | **Study 6** | **Study 7** | **Study 8** | **Study 9** | **Study 10** | **Proposed Study** |
| 1. Mobile App | **🗸** | **🗸** |  | **🗸** |  |  | **🗸** |  |  |  | **🗸** |
| 1. Learning Modules | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** |  | **🗸** | **🗸** | **🗸** | **🗸** |
| 1. Real-time challenges |  | **🗸** | **🗸** |  | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** |
| 1. Visualization | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** |
| 1. Collaborative Learning |  | **🗸** | **🗸** |  |  | **🗸** |  |  |  | **🗸** | **🗸** |
| 1. Customizable Matches |  |  |  |  |  |  |  |  |  |  | **🗸** |
| 1. Educator Resource |  |  |  |  |  |  |  |  |  |  | **🗸** |
| 1. Customization Options |  |  |  |  |  |  |  |  |  |  | **🗸** |
| 1. Progressive Difficulty Levels |  | **🗸** | **🗸** |  |  | **🗸** | **🗸** | **🗸** |  |  | **🗸** |
| 1. Assessment Tools |  |  | **🗸** |  |  | **🗸** | **🗸** | **🗸** | **🗸** |  | **🗸** |
| 1. Saving Progress |  |  |  |  |  | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** |
| 1. Time Constraints |  |  | **🗸** |  |  |  | **🗸** |  |  |  | **🗸** |
| 1. Rules and Instructions | **🗸** |  | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** | **🗸** |  | **🗸** |
| 1. Proactive Feedback |  |  | **🗸** |  |  |  |  |  |  |  |  |
| 1. Story board |  |  | **🗸** |  |  |  |  | **🗸** |  |  | **🗸** |
| 1. Tutorial with Video Demonstration |  |  |  |  |  |  |  |  |  |  | **🗸** |

**Local Literature Studies**

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| 1. Mobile App | **🗸** |  |  |  |  |  |  |  |  |  |  |
| 1. Learning Modules | **🗸** | **🗸** |  |  |  |  |  |  |  |  |  |
| 1. Real-time challenges | **🗸** | **🗸** |  |  |  |  |  |  |  |  |  |
| 1. Collaborative Learning |  | **🗸** |  |  |  |  |  |  |  |  |  |
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