

## THE VIRTUAL REALITY OF THE AUTOMATED LIBRARY CIRCULATION SYSTEM AS A PRACTICUM LEARNING MEDIA

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Library circulation services have grown rapidly. At this time circulation services can be carried out independently, especially in borrowing and returning books. The circulation service uses RFID to detect books that are borrowed or available. But not many libraries have implemented this system, due to the high investment costs. To provide a real student experience, it is necessary to compile media that students can use to understand library services independently with the implementation of RFID, especially during a pandemic that causes students not to be able to practice directly in the library. This study aims to arrange virtual reality in library circulation with self-service as a learning medium. The system development method uses the SDLC method. From the results of reviews from media experts, library automation experts, and users, it is stated that virtual reality can be used as a learning medium, especially for Library Work Practice Courses, and several courses on library management. Users feel that virtual reality can provide a fairly real experience of implementing RFID in library circulation with self-service.

Keywords: automated library circulation system; virtual reality; practicum learning media; self-service library

### **1 INTRODUCTION**

Work practice is training held in the field or outside the classroom as learning activities and an integral part of the training program (Hamalik, 2001). Work practice is a learning system in an industry or agency relevant to students' competency skills for some time. Work practice provides an opportunity for students to hone the skills they already have. So that students could have sufficient capital and better preparation to enter the working environment. In addition, the choice of place for work practice also influences the skills that will be mastered. Work practice significantly impacts students' readiness to enter the working environment (Cahyaning et al., 2019).

Noting the positive impact of work practices, planning and placement of practical courses are expected could provide students with experience following the working environment. Getting a suitable place that meets students' competence requires cooperation with agencies or institutions. There are often obstacles to the student's placement. There is a limited number of agencies for work practices. Besides, workplace agencies sometimes have an inconducive working environment.

The Library Work Practice Course is one of the courses in the Library Science and Information Science Study Program. The Library Work Practice Course aims to improve prospective library staff's quality by applying theory to the working environment. The Work Practice Course is expected to enhance the student experience. With such increased experience, students it expected to have improved abilities so that they are ready to enter the working environment as a librarian (Wahyuningsih et al., 2021).

Students frequently have difficulties finding a place for library work practice, especially during the COVID-19 pandemic when many agencies do not consent to work practice. In a way, using technology is an alternative to learning, including practical learning (Aji et al., 2020; Almeida & Simoes, 2019). However, there will be a gap between online and offline learning (Sari & Karawang, 2021) as academic problems cannot be communicated remotely, especially with practical courses (Hendaryati & Faridah, 2019).

Libraries have been experiencing developments in management and media use. Library automation makes library management easier. Technologies applied include Self Check-in/out, Shelf Management, Anti-Theft Detection, DropBox, Tagging, check-in/out Service, Automated storage and retrieval system. This technology has not been widely implemented in Indonesian libraries because of the high equipment cost. The limited number of libraries with automation technology results in smaller opportunities for work practice on library automation technology. Hence, alternatives are needed so students can still practice using the library automation technology.

Virtual reality is one of the technologies that can be used to experience real life. It can provide experiences that resemble the original environment. This technology can strengthen people's understanding; for example, humans can enter cyberspace through professional equipment and interact with things in cyberspace. Some high-end devices can create realistic environments in virtual scenes using sound, light, electricity, and other technologies and directly affect sight, hearing, taste, touch, and more, providing an immersive experience (Fang, 2021). The virtual reality technology environment can give a more direct and intuitive experience to deepen the user's impression, improve information identification, and reduce cognitive user load.

Virtual reality technology has high user adaptability. When people enter the "virtual world", they do not passively receive the scene provided by the virtual world. They can choose the set they want. For example, the VR Web Library positioning system developed by the library can display

the bookshelves inside the library on the user's mobile device, and the user can move around the virtual library on the mobile device (Fang, 2021).

Virtual reality-based simulators are essential to modern education (Roy et al., 2017). Users can perform activities in the virtual environment, such as activities in the real world. For example, students can read books in the library. So in the virtual environment, if the user enters the library room, the user can access and read the information needed through the information pop-up available in the VR application (Sudiarno & Maulana, 2021).

## 2 METHODOLOGY

Virtual reality design applies the System Development Life Cycle (SLDC) method. SLDC has six phases: initial investigation, system analysis, system design, system development, system implementation and system maintenance (Williams & Sawyer, 2007).

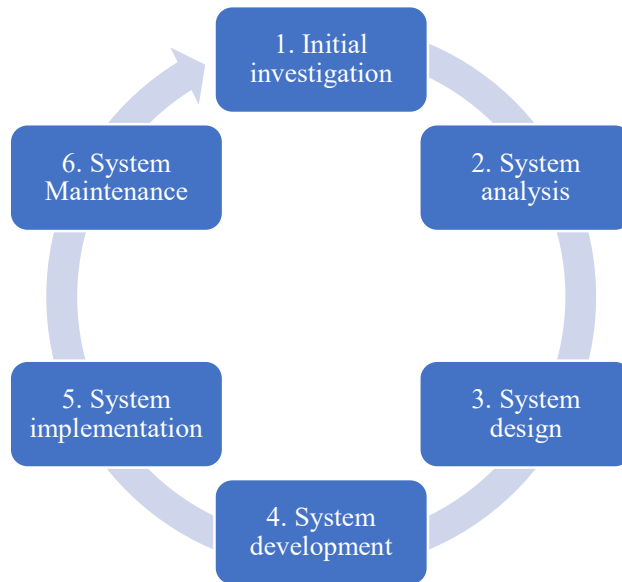


Figure 2. the System Development Life Cycle (SLDC)

### SDLC phases

- a. The initial investigation includes preliminary analysis, proposing alternative solutions, describing costs and benefits and submitting initial plans.
- b. Systems analysis includes collecting data, analyzing data, and writing reports.
- c. System design includes making initial designs, detailed designs, and writing reports.
- d. System development includes software development, hardware acquisition and system testing.

- e. System implementation includes converting to a new system and training users.
- f. System maintenance aims to keep the system running by conducting periodic audits and evaluations.

Software testing is an essential part of the software development process. Software testing aims to ensure system quality is as expected. The most important aspects of choosing a test methodology are effectiveness and economy. The effectiveness means that the designed test uncovers the maximum number of errors in the software. Economic factors are related to the time and resources involved in testing (Shi, 2010).

One type of software testing is defect testing. Defect testing aims to identify the presence of latent defects in the software. This test differs from validation testing, which strives to show that the system has met its specifications. The system's flaws are identified by entering test data that cause deviations.

Functional testing or black-box testing is a testing approach whose tests are derived from program or component specifications. This test is only used to uncover software functionality. Testing is done by inputting test data into components or systems and examining the output. If the output is as expected, then the test is considered successful in finding errors in the software. The key in functional testing is the selection of input with a high probability of being a set member ( $I_e$ ). Functional testing is depicted in Figure 2.

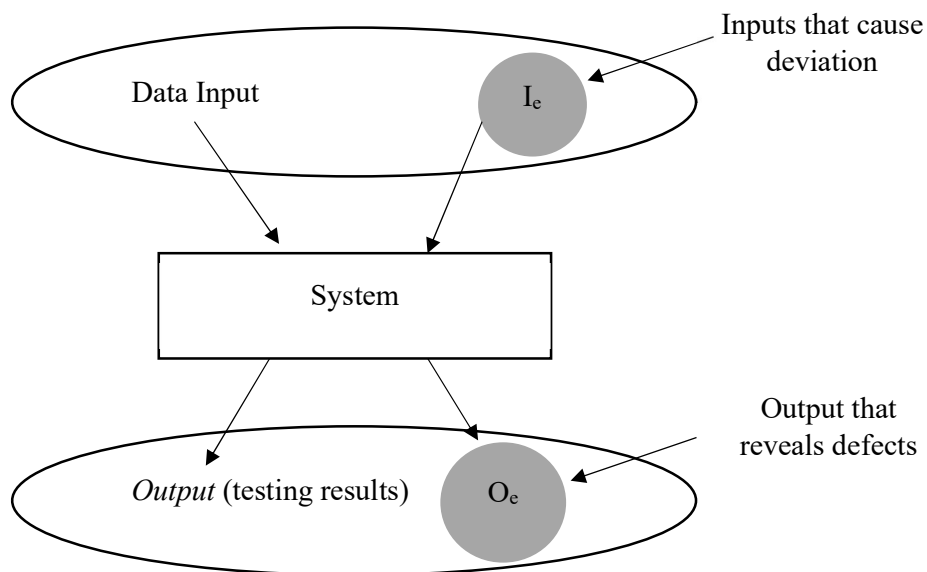


Figure 3. Functional testing

### 3 FINDINGS AND DISCUSSION

Virtual Reality Library Automation is designed to run in a browser. The programming language used is HTML5. The Virtual Reality Library Automation was prepared through the workflow stage of application development, 3D design using 3D Blender design software, DropBox UI Design and UI Self Check Design.

#### 3.1 3D Desain

The 3D design used software, namely blender. At this stage, a 3D library design has been compiled, which includes the design of the building, bookshelf, drop box, self-check, reading table, service desk and computer equipment.

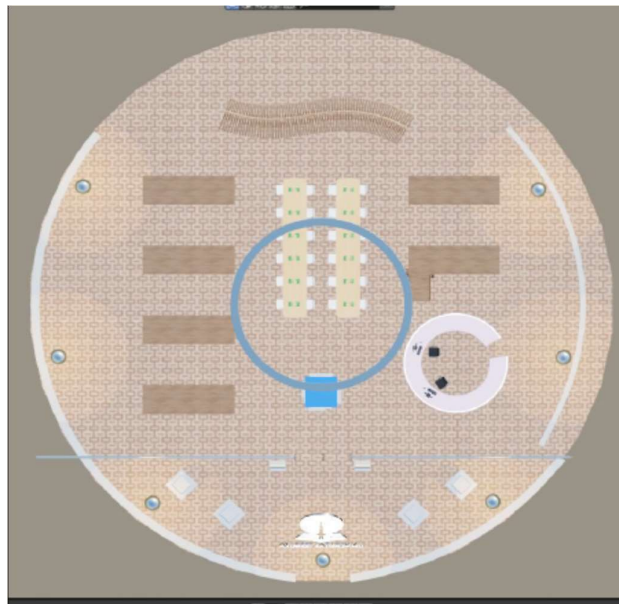
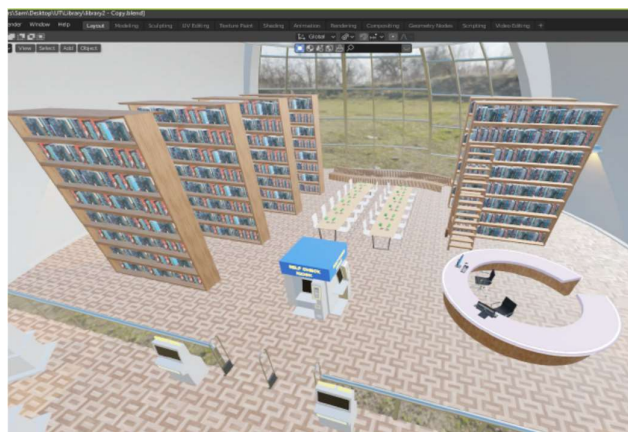


Figure 4. Top view



*Figure 5. Side view*



*Figure 6. Front view*



*Figure 7. Back view*

We received several inputs from FGDs with multimedia experts and librarians. The room design is still too empty. It needs to be equipped with various accessories, such as posters, adding library identity. Bookshelves' positions should not be aligned but follow the circle radius to improve the rendering results. It needs to add a sign like a library in general so that it will be easier for users to find the position of a particular room. The glass divider needs to be redesigned not to reflect, showing outdoor shadows. Library room design requires standardization following library standards. DFD must first prepare the design of the library building, and the design needs to be more efficient to contain more library materials, including lighting.

### **3.2 UI Drop Box Design**

The drop box UI design follows some of the designs in the cited library. The front page shows the library identity; the ID scanning menu will appear. At this stage, the user will put the ID Card to be scanned in the drop box. After being read by the device, the user ID will be read and visible on the Drop Box layer. Next, the Return Book, Extend Boo, Profile and History menus will appear.

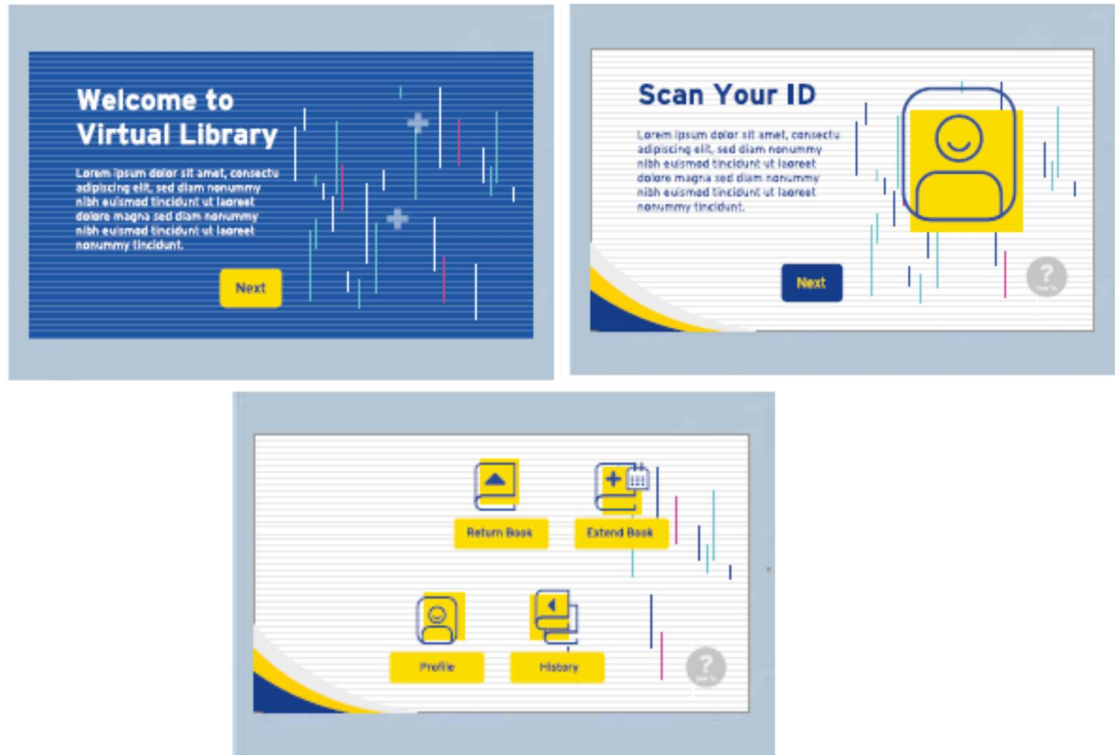
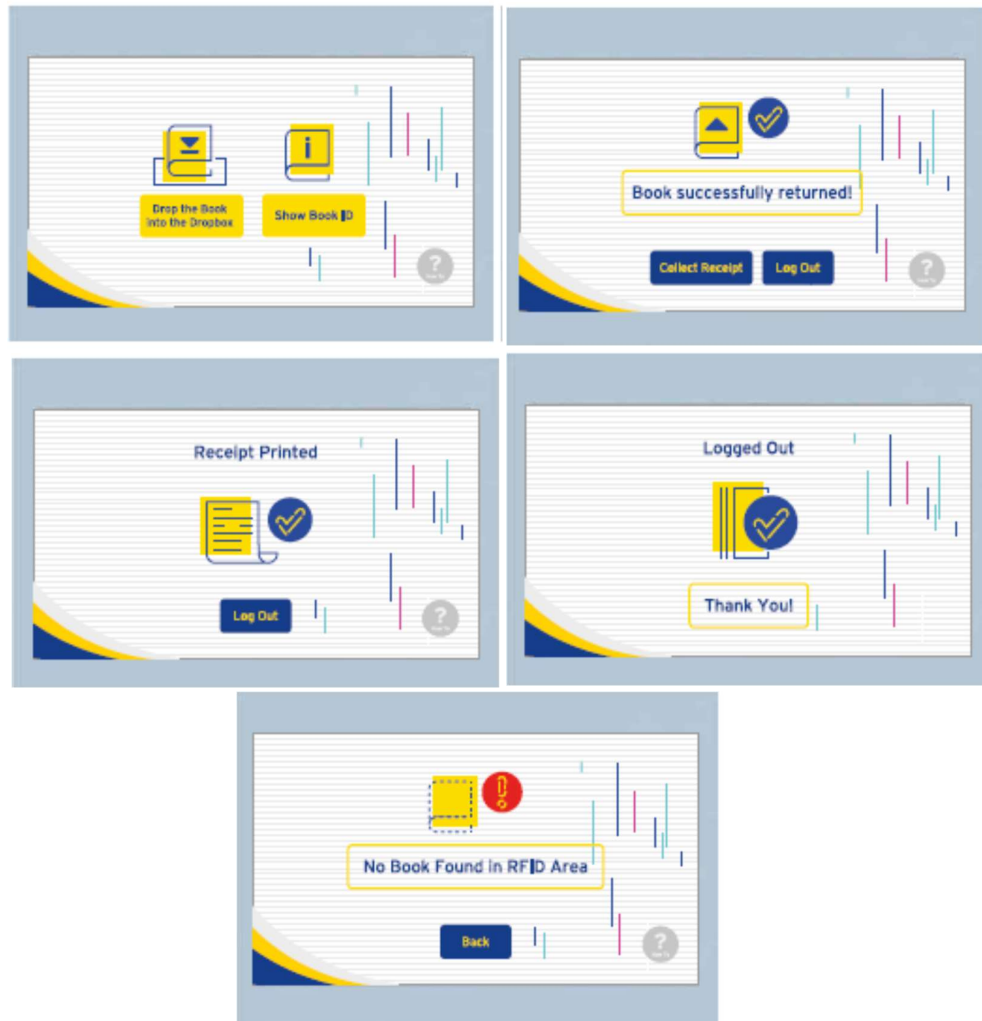


Figure 8. UI Menu Login Drop Box Design

After the user selects the return book, the user is asked to place the book to be returned. After the book is placed in the drop box booth, the book data will be read. Then an option will appear, "to print or not" a book return receipt. Then, the user will log out immediately after selecting the print receipt option. If the borrowed book is not read or there is an error in scanning the book data, the screen will appear that the book data is not detected.



*Figure 9. UI design for book return on Drop Box*

The Extend Book menu is used to extend book lending. After selecting the menu, the user is asked to place the book in the drop box booth. After the book is entered, it will read the book data that will be extended the loan. After being extended, an option will appear to print or not print an extension receipt. After the user selects it, it will immediately log out of the system. Another menu is the user profile which contains user data, including data on library materials that have been borrowed, data on books borrowed, and fines.



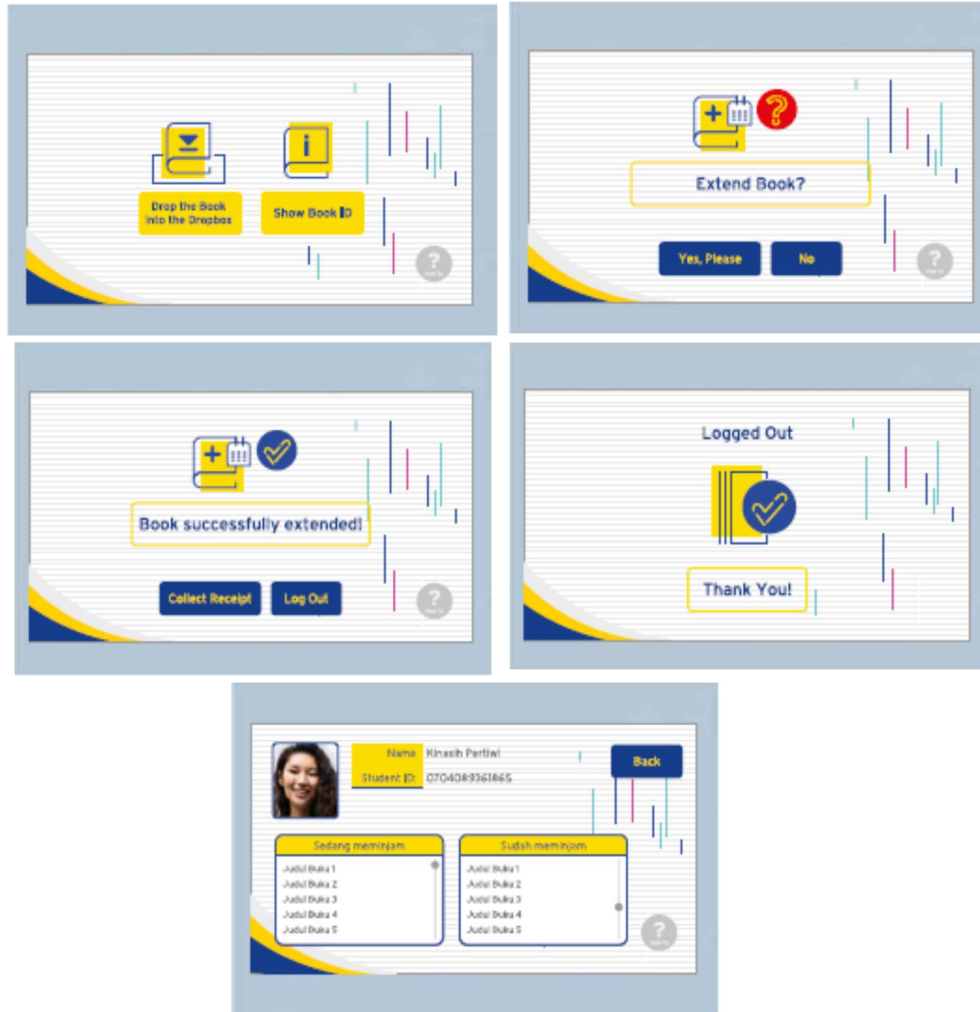


Figure 10. UI of a user profile on Drop Box

### 3.3 UI Design for Self Check

On the start page, the same as the drop box, the library identity will appear. Then an order will appear to place the ID card on the Self-Check device. After reading the user data, a loan menu and user profile will appear. If the loan menu is selected, there will be an order to place the book on self-check after putting the book on the device. The book data that will be borrowed will appear on the device screen, and the borrow menu will appear. After the book is in loan status, a receipt printing option will appear as proof of the loan, and a moment later, the user will log out of the system after selecting receipt printing.

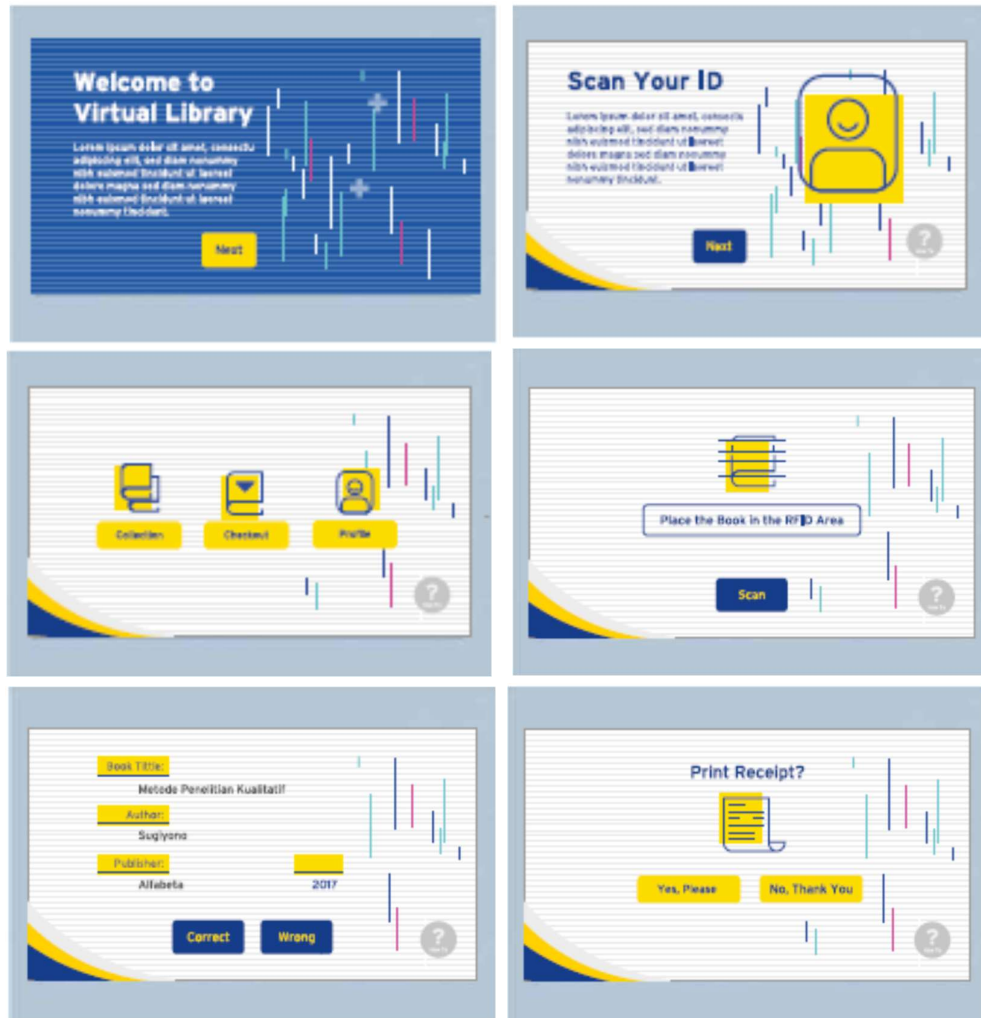


Figure 11. Desain UI Self Check

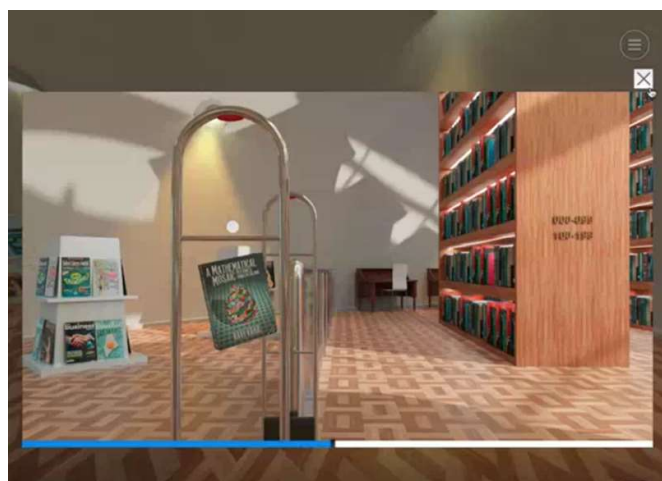


Figure 12. Animation pass through the security gate

### **3.4 Expert review results**

The test results show that the system can run starting from the initial menu, entering the circulation room, searching the OPAC, searching and retrieving books on shelves, borrowing at self-service, leaving the circulation room, and returning books to the drop box. Deficiencies in the system include not enough information on how to use the system at the beginning, which may confuse users. When picking up a book on a shelf, the animation visualizes the same book and stops without guidance or the next steps. The animation should be closed immediately, or there are directions to take the following steps in the borrowing process. The visualization of printing loan and return receipts are not visible. It is necessary to improve the design by choosing more readable and attractive font types and sizes.

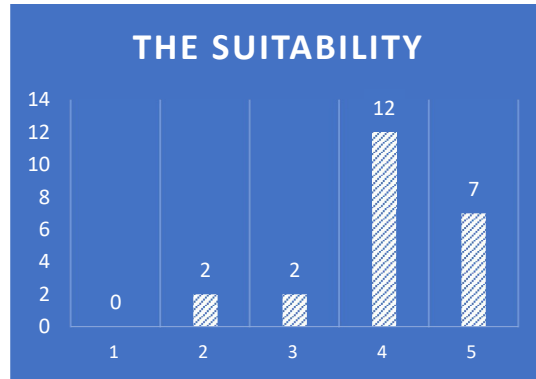
In borrowing and returning book design, user login is required, not only by scanning an ID card. In a bookshelf design, you should display the book cover, the synopsis, the number of books, and the classification number or book label. The reading part of the book is not very meaningful because it cannot be read. In the Self Borrowing and drop box sections, instructions are needed to make it easier for users to use the system, especially at the beginning of the system. ID cards should be designed like student cards to make them more real.

Room design can be improved by adding various ornaments like in an actual library, such as quotes, classification numbers, and directions. It is necessary to add the character of a librarian in the room, such as in the circulation section and several other places, so that it does not look lonely and more natural.

### **3.5 User review results**

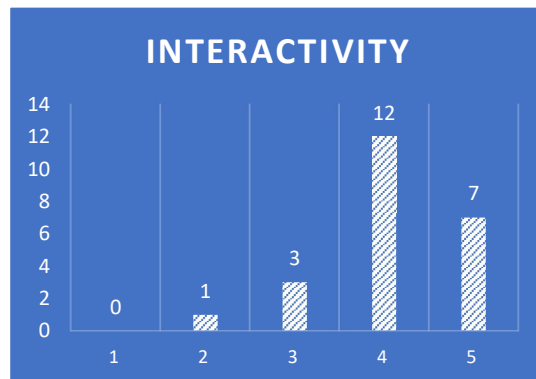
Twenty-three library students carried out user testing as respondents from several regions in Indonesia, such as Bogor, Kupang, Purwokerto, Denpasar, Samarinda, Palangkaraya Bandung, Bogor, Banda Aceh, Surakarta, Jakarta, Surabaya, Kediri, Medan and Yogyakarta. The students in different batches have taken lectures in semesters 3, 5, 7, 9 and 13.

The results reported seven respondents stated that the VR Library Automated Circulation System material was very suitable with the objectives of the Library Work Practice. There 12 respondents stated it was suitable, two said it was less suitable, and two said it was not.



*Figure 13. Respondents' assessment of the suitability of VR Library Automated Circulation System material to the Library Work Practice objectives*

Regarding application interactivity, seven respondents said it was very interactive, 12 respondents said it was interactive, three respondents said it was less interactive, and one respondent said it was not interactive.



*Figure 14. Respondents' assessment of VR Library Automated Circulation System interactivity*

User testing stated that 13 respondents felt this application could be used anywhere and anytime, 6 users agreed that this application could be used anywhere and anytime. Meanwhile, 3 students felt that the application could not be used anywhere and anytime and one person strongly disagreed.

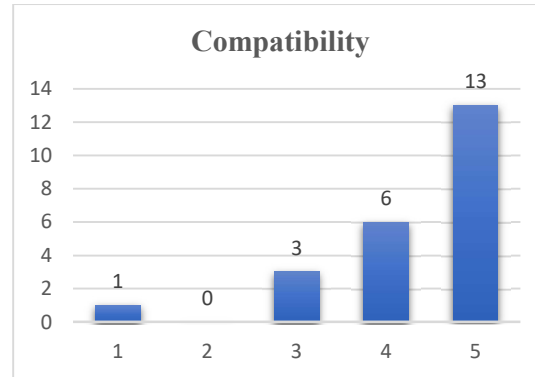


Figure 15. Compatibility

#### 4 CONCLUSION

From the results of expert and user reviews, it can be concluded that the Virtual Reality Automatic Library Circulation System can be used as a practicum medium. This Virtual Reality can provide a user experience about the self-service on the circulation library process that implements RFID. Need some improvements in terms of design, user manual, and interactivity factor so that users can get a more real experience in the circulation of libraries that implement RFID, especially in self-service.

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