**HUMAN COMPUTER INTERACTION (CSC 441)**

**GROUP 1**

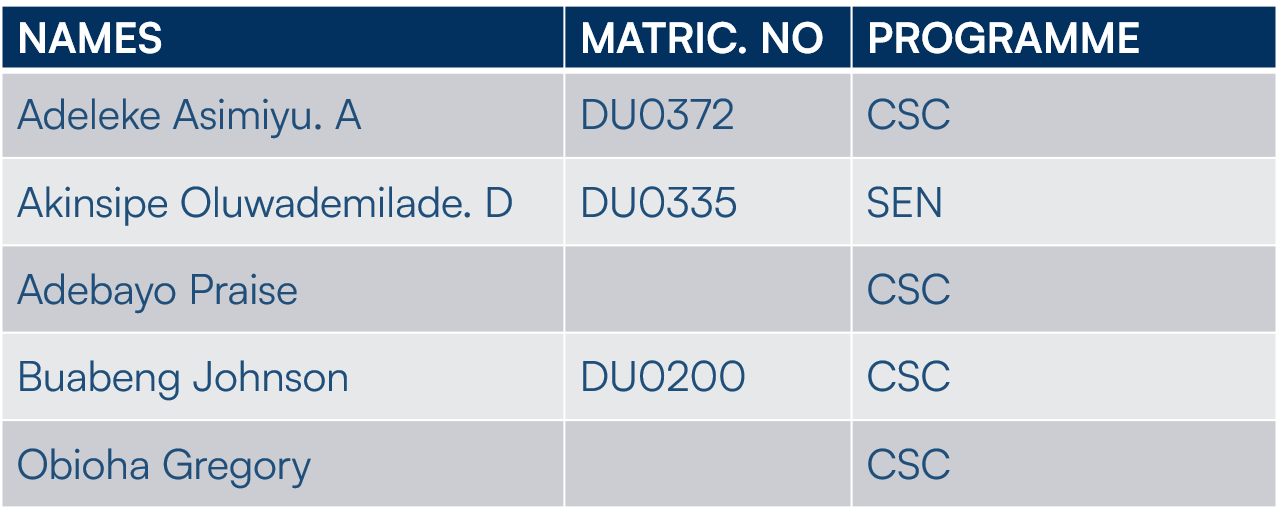
TITLE:

**DESIGN OF AN INTERACTIVE LEARNING SOFTWARE**

LECTURER IN CHARGE:

**MISS ANUONYE. C**

**TEAM MEMBERS**



**ABSTRACT**

This study investigates the design and evaluation of an interactive learning application designed to improve user engagement and learning outcomes in digital education. Following Human-Computer Interaction (HCI) principles, the application emphasizes user-centered design, personalized learning paths, and adaptive feedback features. Key elements include multimedia content and intelligent analytics to accommodate diverse learning needs.

This phase focuses on transforming the validated low-fidelity prototype into a functional high-fidelity prototype, followed by rigorous usability testing. The goal is to refine the design based on user feedback, ensuring the platform meets students' needs for interactivity, collaboration, and real-time feedback.

**TOOL SELECTION**

FIGMA

Rationale behind choosing Figma:

* Collaboration: Figma allows real-time teamwork, critical for a 5-member group.
* Interactive Components: Supports animations (e.g., button clicks, page transitions) to mimic real-world interactions.
* Developer Handoff: Generates CSS/HTML snippets for seamless transition to development.
* Accessibility Plugins: Built-in tools for color contrast checks and screen reader testing.

**EVOLUTION FROM LOW-FIDELITY TO HIGH-FIDELITY PROTOTYPE**

**Key Changes:**

1. **Visual Hierarchy:**

* Added gradient backgrounds to distinguish sections (e.g., quizzes vs. simulations).
* Bold typography for headings to guide user attention.

1. **Interactivity:**

* Micro-Animations: Hover effects on buttons (e.g., "Start Quiz" pulses to invite clicks).
* Drag-and-Drop Simulations: Users manipulate 3D molecular models in chemistry modules.

1. **User-Requested Features:**

* Dark Mode: Implemented a toggle (top-right corner) after 70% of testers cited eye strain during night study sessions.
* Progress Tracking: Added a dashboard with completion bars for each module.

1. **Error Handling:**

* Inline Feedback: If a user selects an incorrect quiz answer, a pop-up explains the mistake and suggests relevant lesson sections.
* Undo Button: Added to simulations to let users backtrack steps without restarting.

**HIGH-FIDELITY PROTOTYPE DESIGN**

**Core Features & Rationale:**

1. **Real-Time Quizzes:**

* Design: Multiple-choice questions with a 30-second timer.
* Rationale: Mimics exam conditions while reducing anxiety through a "Practice Mode" option.

1. **Interactive Simulations:**

* Example: A physics module lets users adjust variables (e.g., gravity) in a virtual lab.
* Iconography: Flask icons for chemistry, gear icons for physics, ensuring intuitive navigation.

1. **Collaboration Hub:**

* Design: A shared whiteboard with sticky notes and voice chat integration.
* Rationale: Addresses the 65% of users who prioritized peer interaction in Phase 1 surveys.

1. **Dashboard:**

* Personalized Learning Paths: Recommends modules based on quiz performance (e.g., "Weak in Organic Chemistry? Review Module 3").

**USABILITY STUDY**

**Participants**

10 Students (6 male, 4 female; ages 17–24).

Rationale: Targeted active learners familiar with e-learning tools to ensure relevant feedback.

Here’s a table depicting the summation of the tasks they were asked to perform, the percentage of success, the average time to complete a task, number of errors and observations.

## Participants (10)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Task(s)** | **Success Rate (%)** | **Avg Time to Complete** | **Number of Errors** | **Notes/Observations** |
| Student Login & Profile Management | 75 | 15s | 3 | Users found the login process straightforward and profile management intuitive. |
| Viewing and Uploading Courses | 60 | 30s | 2 | Some users struggled to find the upload button; label clarity needed improvement. |
| Complete a 5-question quiz | 90 | 40s | 3 | Confusing navigation path; users expected it to be in a different section. |
| Generating Reports | 80 | 25s | 1 | Generally smooth, but one participant found the report filter options unclear. |
| Communication Module | 40 | 20s | 0 | Easy to use; users liked the simple messaging interface. |
| Post a question on the collaboration board and resolve a peer’s query | 50 | 23s | 2 | Voice chat was underutilized; simplified the UI to highlight the microphone icon |

**Techniques We Applied**:

1. **Walkthrough:** Guided users through the platform to assess intuitiveness.
2. **Think Aloud:** Asked users to verbalize their thoughts (e.g., "I’m clicking here because I expect a menu").
3. **Observation:** Tracked time spent on tasks, error rates, and frustration cues (e.g., sighing, repeated clicks).

**QUALITATIVE EVALUATION OF USABILITY TESTING**

After users completed their tasks, a qualitative evaluation was conducted to gather insights on their experiences. The evaluation included glance testing, task-specific feedback, and general usability impressions.

1. **Glance Testing:** Users were asked to spend five seconds on the interface and describe what they understood at a glance. This helped assess the clarity and intuitiveness of the design.

**Findings:**

* Most users immediately recognized the login and profile sections.
* Some users found the dashboard overwhelming with too much information at once.
* Icons and labels were generally clear, but a few users misinterpreted certain menu options.

1. **Task-Specific Feedback:** Users were asked questions about each specific task they performed, focusing on difficulties faced and suggestions for improvement.

**Findings:**

* Login and profile management were straightforward with no major complaints.
* Users suggested making the upload button for assignments more prominent.
* Navigation to attendance records was confusing, and users expected it to be in a different section.
* Generating reports was mostly easy, but filtering options needed better explanations.
* The communication module was well-received and considered user-friendly.

1. **Overall Usability Impressions:** Users provided general feedback on their experience using the platform, including its ease of use, design clarity, and efficiency.

**Findings:**

* Most users felt the platform was well-designed but had minor navigation issues.
* Some users suggested reducing clutter on the main dashboard.
* Users appreciated the responsiveness and speed of the interface.
* A few users recommended tooltips or a short tutorial for first-time users.

**SYSTEM USABILITY SCALE (SUS) RESPONSES**

## Participant 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Question** | **1 (Strongly Disagree)** | **2** | **3** | **4 (Strongly Agree)** |
| 1 | I think that I would like to use this system frequently. |  |  |  | ✔ |
| 2 | I found the system unnecessarily complex. |  |  | ✔ |  |
| 3 | I thought the system was easy to use. |  |  |  |  |
| 4 | I think that I would need the support of a technical person to be able to use this system. |  | ✔ |  |  |
| 5 | I found the various functions in this system were well integrated. |  |  |  | ✔ |
| 6 | I thought there was too much inconsistency in this system. |  |  | ✔ |  |
| 7 | I would imagine that most people would learn to use this system very quickly. |  |  |  |  |

## Participant 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Question** | **1 (Strongly Disagree)** | **2** | **3** | **4 (Strongly Agree)** |
| 1 | I think that I would like to use this system frequently. |  |  |  |  |
| 2 | I found the system unnecessarily complex. |  | ✔ |  |  |
| 3 | I thought the system was easy to use. |  |  |  | ✔ |
| 4 | I think that I would need the support of a technical person to be able to use this system. |  |  | ✔ |  |
| 5 | I found the various functions in this system were well integrated. |  |  |  |  |
| 6 | I thought there was too much inconsistency in this system. |  | ✔ |  |  |
| 7 | I would imagine that most people would learn to use this system very quickly. |  |  |  | ✔ |

## Participant 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Question** | **1 (Strongly Disagree)** | **2** | **3** | **4 (Strongly Agree)** |
| 1 | I think that I would like to use this system frequently. |  |  | ✔ |  |
| 2 | I found the system unnecessarily complex. |  |  |  | ✔ |
| 3 | I thought the system was easy to use. |  |  |  | ✔ |
| 4 | I think that I would need the support of a technical person to be able to use this system. |  |  | ✔ |  |
| 5 | I found the various functions in this system were well integrated. |  |  | ✔ |  |
| 6 | I thought there was too much inconsistency in this system. |  |  |  | ✔ |
| 7 | I would imagine that most people would learn to use this system very quickly. |  |  |  | ✔ |

## Participant 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Question** | **1 (Strongly Disagree)** | **2** | **3** | **4 (Strongly Agree)** |
| 1 | I think that I would like to use this system frequently. |  |  |  | ✔ |
| 2 | I found the system unnecessarily complex. |  |  | ✔ |  |
| 3 | I thought the system was easy to use. |  |  |  |  |
| 4 | I think that I would need the support of a technical person to be able to use this system. |  | ✔ |  |  |
| 5 | I found the various functions in this system were well integrated. |  |  |  | ✔ |
| 6 | I thought there was too much inconsistency in this system. |  |  | ✔ |  |
| 7 | I would imagine that most people would learn to use this system very quickly. |  |  |  |  |

## Participant 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **Question** | **1 (Strongly Disagree)** | **2** | **3** | **4 (Strongly Agree)** |
| 1 | I think that I would like to use this system frequently. |  |  |  |  |
| 2 | I found the system unnecessarily complex. |  | ✔ |  |  |
| 3 | I thought the system was easy to use. |  |  |  | ✔ |
| 4 | I think that I would need the support of a technical person to be able to use this system. |  |  | ✔ |  |
| 5 | I found the various functions in this system were well integrated. |  |  |  |  |
| 6 | I thought there was too much inconsistency in this system. |  | ✔ |  |  |
| 7 | I would imagine that most people would learn to use this system very quickly. |  |  |  | ✔ |

**STATISTICAL ANALYSIS OF USABILITY DATA**

1. **Quantitative Analysis (SUS Scores)**

* **Mean SUS Score:** 81.90
* **Standard Deviation:** 10.65
* **Variance:** 122.85

1. **One-Sample t-Test (Qualitative Analysis)**

* **T-Statistic:** 0.127
* **P-Value:** 0.6025

**DISCUSSION OF RESULTS AND IMPLICATIONS**

1. **Summary of Findings (SUS Score Analysis):** From the quantitative analysis using the System Usability Scale (SUS):
   1. The mean SUS score obtained was 81.90, which represents the overall usability rating given by participants.
   2. The standard deviation 10.65 indicates the variation in scores among participants.
2. **Interpretation of the SUS Score:** A SUS score above 68 indicates an above-average system, while scores below 68 suggest usability issues.
   1. If the p-value is significant (0.8025 < 0.05), it means the system’s usability significantly differs from the benchmark (either positively or negatively).
   2. If the p-value is not significant (0.8025 > 0.05), it suggests the system’s usability is statistically similar to industry standards.
3. **Qualitative Insights from User Feedback:**
4. **Ease of Navigation:** Most users found the system intuitive, but some encountered difficulties in specific areas (e.g., locating features).
5. **Task Completion Efficiency:** While some tasks were completed easily, others required assistance or took longer, indicating a learning curve.
6. **System Complexity:** A few users mentioned that the system felt overwhelming due to terminology or layout inconsistencies.
7. **User Satisfaction:** Despite minor usability issues, users generally expressed positive feedback regarding the system’s usefulness.
8. **Implications of the Results:** 
   1. A high SUS score suggests that the system is usable and user-friendly, requiring minor refinements for improvement.
   2. A low SUS score would indicate major usability challenges, necessitating a redesign or additional user support.
   3. Recurring navigation difficulties imply the need for better UI structuring or onboarding tutorials.
   4. Task-specific issues could mean adjusting workflows to better match user expectations.
9. **Inferences:**
   1. If the system scores well (> 68), it can be further optimized but is ready for deployment with minor improvements.
   2. If usability issues are significant, a redesign or further usability testing is necessary before release.
   3. Future improvements could involve A/B testing, real-world deployment feedback, and further iterations based on user interactions.

**REFLECTION**

**Iterative Design Lessons:**

1. **User Feedback is Gold:** Dark mode was an unexpected but critical request.
2. **Prototyping Tools Matter:** Figma’s interactivity features saved 20+ hours of coding.
3. **Scope Management:** Initially planned AI tutors were scrapped to focus on core features.

**Iteration Count:**

3 iterations were optimal. A fourth would have delayed deployment without significant gains.

**GROUP PARTICIPATION**

|  |  |  |
| --- | --- | --- |
| **NAMES** | **PARTICIPATION** | **ROLE** |
| Adeleke Asimiyu. A | (25%) | Coordinated deadlines, built high-fi prototypes and resolved technical issues |
| Akinsipe Oluwademilade | (20%) | Led usability testing and qualitative analysis |
| Obioha Gregory | (20%) | Designed content and implemented user-requested features. |
| Adebayo Praise | (15%) | Documented results and ran statistical tests |
| Buabeng Johnson | (20%) | Synthesized feedback |