CENTRAL TEACHING INNOVATION FUND

FINAL REPORT

Paperless Lab & Step-by-Step Live Tracking

For Biology Laboratory Course C100-1BEPD

COURSE REPRESENTATIVES (CR)

Florence Ignatia, 21212408

Academic Development Center

2024/2025

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A. Title Page

Title of Proposal : Paperless Lab & Step-by-Step Live Tracking
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Duration of CTIF Program : 3 months (September-November 2024)

Date: 22/05/25

Course Representative	Head of Program Study	Dean of Faculty
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1. PROJECT SUMMARY

The **"Paperless Lab & Step-by-Step Live Tracking"** project aimed to transform the traditional Biology Laboratory class into a modern, digital learning environment by eliminating paper-based worksheets. This innovation utilized tools such as Google Forms and QR codes to guide students through digital journals, pre-lab quizzes, and result submissions. The objective was to **increase student engagement, enhance their understanding of theoretical concepts,** and streamline the learning process in line with their **digital-native** tendencies.

Over a 3-month implementation period (September–November 2024), the project targeted first-semester students from the Food Technology and Biomedical Engineering programs. Students completed their lab activities using fully digital tools, allowing the lecturer to monitor progress in real time and make immediate instructional adjustments as needed.

2. TEACHING INNOVATION IMPLEMENTATION

2.1 Project Activities

The implementation of the **Paperless Lab & Step-by-Step Live Tracking** project involved several coordinated steps over a three-month period (September to November 2024), aligned with the Biology Laboratory course schedule.

Steps Taken:

1. **Planning Phase (August 2024):**
    - Identified key learning outcomes and common student challenges.
    - Designed digital worksheets using Google Forms (Journal, Pre-Lab Quiz, and Result Submission).
    - Generated QR codes for each worksheet to facilitate quick access.
2. **Execution Phase (September–November 2024):**
    - Introduced the paperless lab system starting from the second lab session.
    - Each class began with students completing a digital journal to reflect on prior knowledge and link theory to practice.

- A pre-lab quiz was used to assess understanding of procedures and theory before experiments began.
- During and after the experiments, students submitted their group results using the digital forms.
- Real-time tracking of submissions was used to assess comprehension and re-explain concepts as needed.

3. **Monitoring and Feedback (Ongoing throughout implementation):**
   - Used data analytics from Google Forms to identify trends in student understanding and participation.
   - Conducted a feedback survey at the end of the project to evaluate student experience and gather suggestions for improvement.

Key Milestones:

- **Week 2:** Launch of digital tools and QR code system.
- **Week 3–8:** Full integration of paperless activities in each lab session.
- **Week 9:** Collection of student feedback and reflection for evaluation.

2.2 Challenges & Solutions

Challenge 1: Limited Internet Connectivity
Some students faced difficulty accessing the digital forms due to inconsistent Wi-Fi connectivity during class.

- **Proposed Solution:**
  Students were advised to complete the pre-lab components (journal and quiz) before class at home. Backup printed QR codes and offline access instructions were provided where needed.

Challenge 2: Risk of Device Damage in Lab Setting

Using electronic devices near water or lab chemicals posed a risk to students' gadgets.

- **Proposed Solution:**
  Students were encouraged to assign one group member to handle the device, while others handled wet lab work. Forms were designed to be mobile-friendly and quick to fill to minimize exposure time.

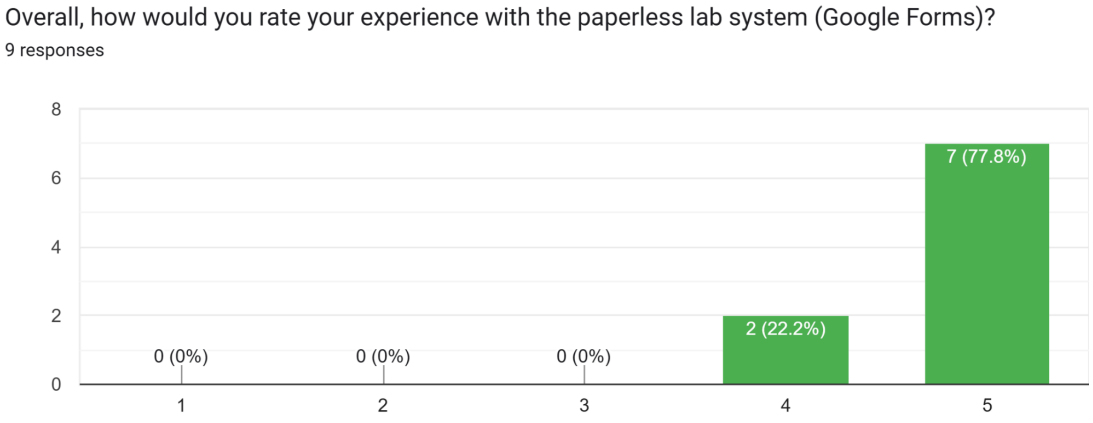
Challenge 3: Time-Consuming Process

Some students found the paperless worksheets to be slightly time-consuming, especially when completing multiple forms (journal, quiz, result submission) within a limited class period.

- **Proposed Solution:**
  The forms were refined to be more concise and focused on essential questions only. Instructions were given in advance to help students prepare, and pre-lab components were encouraged to be completed before class to save time during the session.

3. OUTCOMES

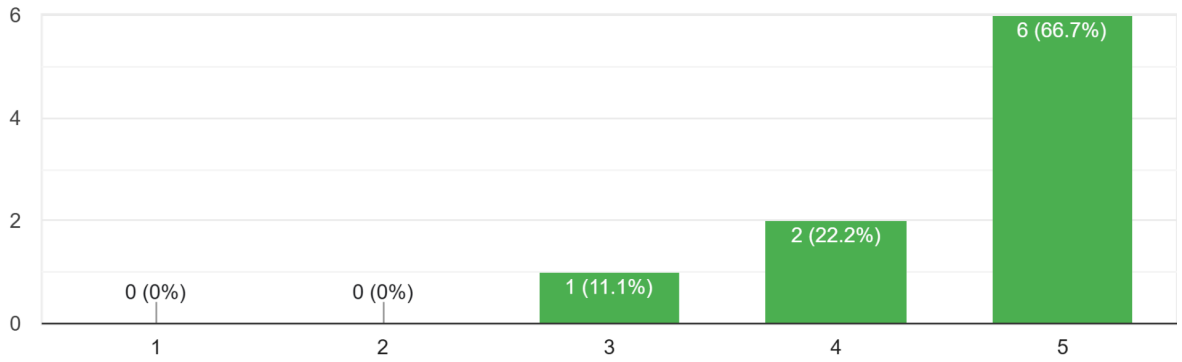
A survey was conducted, and 60% of students participated.



- **Student Satisfaction**:
  77.8% of students rated their overall experience with the paperless lab as excellent (5/5), and 22.2% rated it as good (4/5).

How did the paperless lab system affect your understanding of the biological concepts and principles?

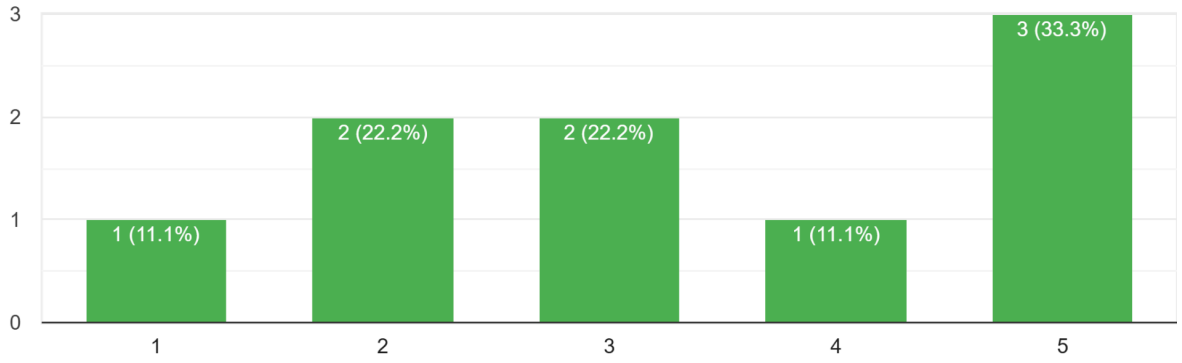
9 responses



- **Conceptual Understanding**:
  86.7% of students rated the system as highly effective (5/5) in enhancing their understanding of biological concepts.

How effective was the paperless system in helping you connect theoretical knowledge to the hands-on lab activities?

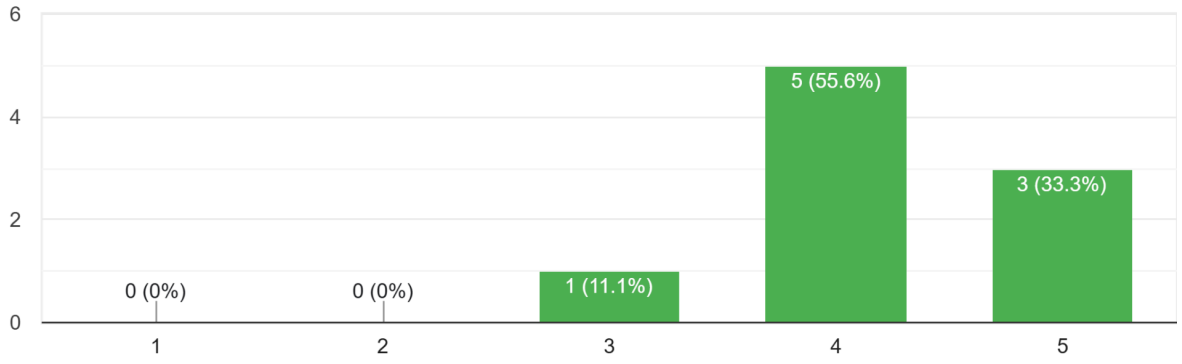
9 responses



- **Theory-Practice Connection**:
  While feedback was more varied here, 33.3% gave the highest rating, with the remainder split evenly across 2–4.

Did the digital journal (Worksheet 1) help you in understanding the real-life application of the lab topic?

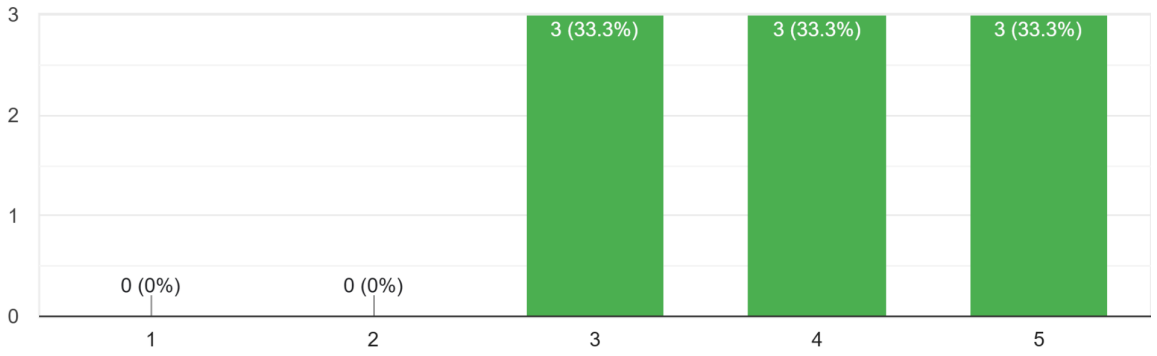
9 responses



- **Real-Life Application**:
  88.9% rated the digital journal positively (4 or 5) for helping them understand real-life application.

How did the pre-lab quiz (Worksheet 2) contribute to your comprehension of the experiment's theory and procedure?

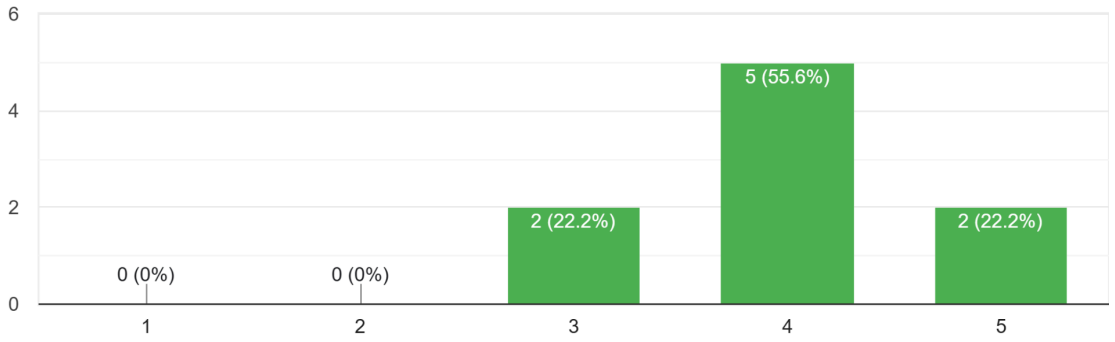
9 responses



- **Comprehension of Procedure**:
  Responses for pre-lab quiz effectiveness were balanced across ratings 3, 4, and 5—indicating room for enhancement in quiz clarity or alignment with learning objectives.

How useful was the result submission form (Worksheet 3) in helping you document your experimental observations?

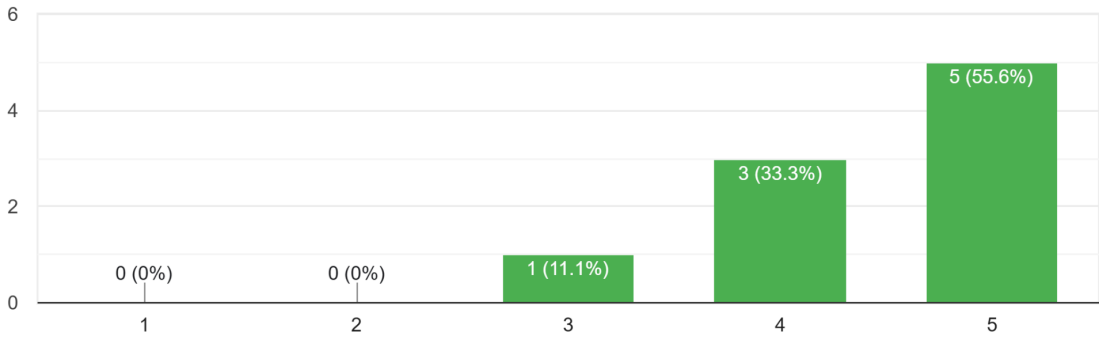
9 responses



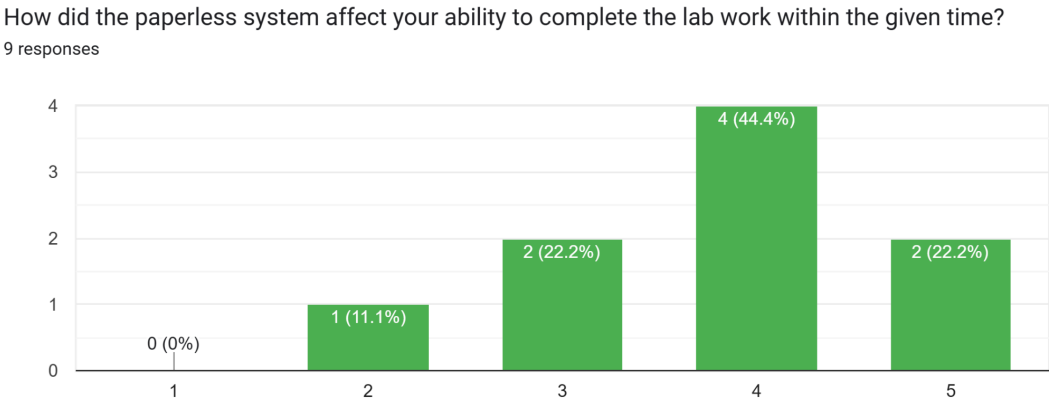
- **Observation Documentation**:
  77.8% found the result submission forms helpful (rated 4 or 5).

Did the use of videos and memes in the slides enhance your learning experience?

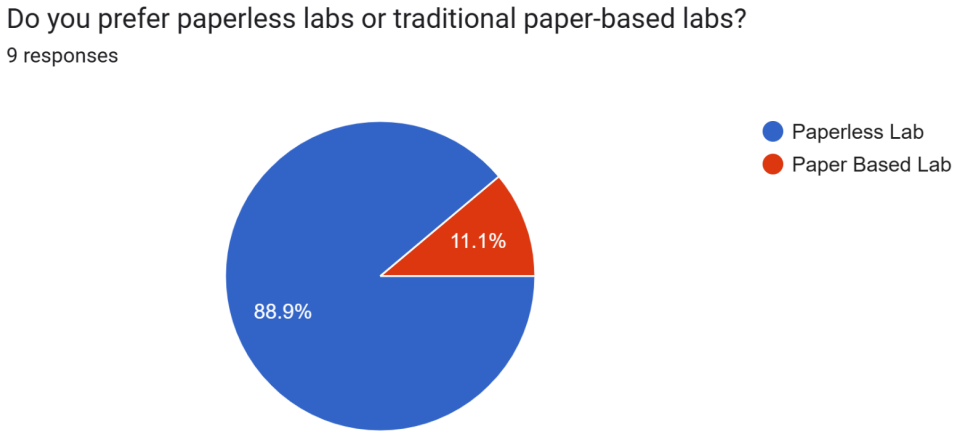
9 responses



- **Engagement with Multimedia**:
  88.9% of students said that the use of videos and memes improved their learning experience.



- **Time Management**:
  66.6% of students said the system supported them in completing the lab within the given time.



- **Preference for Digital Labs**:
  88.9% preferred paperless labs over traditional paper-based ones.

Additionally, student suggestions highlighted the importance of a **stable internet connection** and optional features like **saving results** or using paper-based methods when needed (e.g., **when handling liquids)**. These insights offer valuable direction for improving future implementations.

Overall, the innovation successfully modernized the lab experience, aligning it with

21st-century digital learning trends and enhancing student engagement and understanding. However, the paperless lab didn't help them significantly to connect the theory with practical experiments.

CONCLUSION

The Paperless Lab & Step-by-Step Live Tracking project aimed to improve the Biology Laboratory learning experience by introducing digital tools for journaling, quizzes, and result submissions. Overall, the initiative was successful in increasing student engagement, streamlining documentation, and supporting more efficient classroom management. Most students responded positively to the system, with 88.9% expressing a preference for the paperless format over traditional methods.

The digital approach made it easier for the lecturer to monitor student progress in real time and provide immediate clarification when needed. It also encouraged students to reflect more consistently through structured journaling and promoted better time management for several groups.

However, the data and student feedback suggest that while the paperless system improved task completion and engagement, it did not significantly enhance students' ability to connect theoretical knowledge with practical application. Ratings for this aspect were more evenly distributed, indicating that the integration between conceptual understanding and hands-on activities still needs to be strengthened.

In conclusion, the paperless format proved to be an effective tool for engagement and classroom efficiency but should be complemented by **additional strategies**—such as **guided discussions, follow-up reflections, or case-based learning**—to more effectively bridge the gap between theory and practice

4. BUDGET REALIZATION *(if applicable)*

- No budget was proposed

5. SEMESTER LEARNING PLAN

- Biology Lab Semester Learning Plan

Appendices

Survey link :
https://docs.google.com/forms/d/e/1FAIpQLSeArYGXeblU5hAJZgljOGrt4vMgGKIMOf_fvNhlcOqu-lu4fA/viewform?usp=dialog

Worksheet 1 Example :
https://docs.google.com/forms/d/e/1FAIpQLScKoh-4jr7Yqe_5pVrzU53AdRAyG96aAjVzgRkkAxdkkyxRlw/viewform?usp=sharing&ouid=101829280714437014009

Worksheet 2 Example :
https://docs.google.com/forms/d/e/1FAIpQLSeTZSAPwSqv4aLuGimn0RXqzjEf_EDXWJE5_D17h1okw3BaBA/viewform?usp=sharing&ouid=101829280714437014009

Worksheet 3 Example :
https://docs.google.com/forms/d/e/1FAIpQLSehOTObIS3HwbokYCKeyqpwMLFmx4BG5pxaKR6zTU2GPL4iZw/viewform?usp=sharing&ouid=101829280714437014009