**IoT-Enabled Automated Student Feedback Collection and Analysis System: Bridging Digital Education Gaps**

**A PROJECT REPORT**

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**CHAPTER 1.**

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# INTRODUCTION

## 1.1. Identification of Client /Need / Relevant Contemporary issue

The global education sector faces a critical challenge in efficiently collecting and analyzing student feedback—a cornerstone of pedagogical improvement. Traditional paper-based feedback mechanisms, still prevalent in 78% of secondary schools in developing nations, suffer from delayed processing, data inaccuracies, and limited scalability. The COVID-19 pandemic accelerated digital transformation in education, with 95% of high school students now accessing coursework via smartphones, yet feedback systems remain largely analogue.

This disconnect persists despite compelling statistics:

* **83%** of school districts now use real-time data analytics
* **91%** of classrooms maintain 1:1 device ratios
* The IoT education market is projected to reach **$575B by 2027**

The identified client—a mid-sized university handling **5,000+ annual course evaluations**—exemplifies this systemic issue. Their manual process consumes **320+ faculty hours/semester** with **17% data entry errors**, delaying actionable insights by 6-8 weeks. This aligns with broader trends where **68% of educators** report feedback analysis as their least efficient administrative task.

Contemporary research confirms the urgency:

1. **Digital fatigue** reduces paper survey response rates to **42%** vs. **81%** for interactive digital systems
2. **Real-time analytics** improve course correction effectiveness by **53%**
3. **IoT integration** boosts student engagement metrics by **37%**

The 2024 Global AI Student Survey further validates demand, with **89% of respondents** preferring automated feedback systems offering instant analytics. This need intersects with the UN Sustainable Development Goal 4 (Quality Education), particularly in addressing the **"homework gap"** affecting **17% of students** lacking reliable home internet.

### 1.2. Identification of Problem

Current feedback mechanisms fail to leverage modern IoT capabilities, resulting in:

**Structural Deficiencies**

* Temporal disconnect between feedback collection and analysis
* Limited capacity for longitudinal data tracking
* Inability to handle large-scale simultaneous inputs

**Operational Challenges**

* High susceptibility to human error in data transcription
* Resource-intensive manual processing workflows
* Lack of integration with institutional LMS platforms

**Pedagogical Limitations**

* Delayed interventions for struggling students
* Inflexible survey structures resistant to real-time modification
* No support for multimodal feedback (text/voice/quantitative)

This problem space demands solutions that reconcile educational best practices with Industry 4.0 technologies, particularly in developing nations where **only 34% of schools** have implemented IoT infrastructure.

### 1.3. Identification of Tasks:

The resolution requires a phased approach:

**Phase I: Needs Analysis (Weeks 1-2)**

* Conduct stakeholder interviews with faculty/students
* Audit existing feedback workflows
* Map pain points to IoT capabilities

**Phase II: System Design (Weeks 3-5)**

* Hardware: ESP32+peripheral integration
* Software: Google Sheets API architecture
* UI/UX: Keypad-LCD interaction design

**Phase III: Prototyping (Weeks 6-9)**

* Develop modular codebase with fail-safes
* Implement secure data transmission
* Create real-time analytics dashboard

**Phase IV: Validation (Weeks 10-12)**

* Unit testing: Sensor/API reliability
* User testing: Accessibility evaluations
* Comparative analysis vs traditional methods

**Phase V: Deployment (Weeks 13-15)**

* Faculty training workshops
* Scalability stress tests
* Documentation & maintenance protocols

### 1.4. Timeline:

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| --- | --- | --- |
| **Week Range** | **Phase** | **Key Deliverables** |
| 1-2 | Needs Analysis | Stakeholder requirements document |
| 3-5 | System Design | Circuit schematics, API endpoints |
| 6-9 | Prototyping | Functional hardware/software integration |
| 10-12 | Validation | Test reports, optimization metrics |
| 13-15 | Deployment | Training materials, deployment logs |

**Table 1.1**