TO ANALYZE LEARNING PLATFORM ENGAGEMENT PATTERNS USING MINITAB AND PROVIDE ACTIONABLE INSIGHTS THAT IMPROVE STUDENT PARTICIPATION AND REDUCE CONTENT ABANDONMENT.

1. Background

The university observed inconsistent student participation in its online courses, particularly after Week 3 of most modules. Although video analytics and quiz logs were available, instructional teams lacked statistical tools to uncover patterns. The university's learning analytics committee engaged us to conduct a rigorous statistical analysis using Minitab.

2. Data Summary

Platform:

Moodle-based LMS (data exported monthly)

Time Frame:

Spring semester (12 weeks), 2023

Dataset Fields:

Variable	Type	Description
Student_ID	Identifier	Anonymized unique student ID
Module_Name	Categorical	Course/module name
Video_Views_Per_Week	Continuous	Total video views by week
Quiz_Attempts_Per_Week	Continuous	Count of quiz attempts by week
Forum_Posts	Count	Total forum messages posted by student
Dropout_Flag	Binary	1 = Did not complete course, 0 = Completed
GPA	Continuous	Prior academic performance metric (scale 0.0–4.0)
Week	Categorical	Course week (1 to 12)

3. Methodology

Software Used:

Minitab 21

Analysis Workflow:

1. **Data Import & Preprocessing**
    - Aggregated weekly activity logs
    - Created engagement score (standardized composite of views, quizzes, posts)
2. **Descriptive Analysis**
    - *Stat > Basic Statistics > Display Descriptive Statistics*
    - Time-based patterns visualized via line plots
3. **Chi-Square Test**
    - *Stat > Tables > Cross Tabulation and Chi-Square*
    - Tested association between dropout status and forum participation
4. **Logistic Regression Model**
    - *Stat > Regression > Binary Logistic Regression*
    - Predicted dropout likelihood based on weekly engagement scores, GPA
5. **ANOVA for Engagement Over Time**
    - *Stat > ANOVA > One-Way ANOVA*
    - Compared mean engagement across weeks

4. Findings

Insight	**Statistical Evidence**
Engagement dropped sharply after Week 3	ANOVA $p < 0.001$; significant decline after Week 3
Forum participation was a strong predictor of course completion	Chi-Square $p = 0.004$

Students with GPA < 2.5 more likely to disengage	Odds Ratio = 2.3, Logistic Regression p = 0.009
Early quiz completion correlated with full course participation	Regression coefficient = 0.71, p < 0.01

Logistic regression model accuracy: 81.4% **AUC (ROC curve):** 0.84

5. Visual Outputs (Created in Minitab)

- Line chart: Weekly average engagement score
- Boxplot: Engagement score by dropout status
- ROC curve: Predictive performance of dropout model
- Bar chart: Quiz participation by module
- Pareto chart: Course features most cited in dropout feedback

6. Results & Implementation

- **Course designers added interactive activities earlier in modules** to counter Week 3 drop-off
- Forum participation was made mandatory in Weeks 2–4
- Personalized reminders were deployed for low-GPA students with declining activity metrics
- Content redesign and outreach led to a **22% increase in Week 4 engagement** and a **9% drop in mid-semester withdrawals** in the subsequent term

7. Recommendations

- Embed peer interaction opportunities by Week 2 in all asynchronous modules
- Track engagement using Minitab control charts mid-semester for timely interventions
- Assign academic advisors based on GPA-activity risk model
- Expand LMS data fields to include time-on-page metrics and sentiment from discussion posts

8. Future Scope

- Build a real-time learning analytics dashboard powered by Minitab's scripting layer
- Integrate mood-based engagement analysis using NLP on forum content
- Conduct multi-institution comparative benchmarking to identify scalable instructional models

9. Application Value

- Enabled academic teams to **translate raw LMS logs into meaningful, action-oriented insights**
- Strengthened data-informed decision-making in curriculum planning
- Demonstrated how **Minitab could be used beyond manufacturing and quality control**, especially in education and behavioral analytics