Spotlighting Learning Analytics: An Improvement Tool for Online Engineering Courses

Paige West
M.S. Civil Engineering, Construction Engineering & Management, Virginia Tech 2021
B.S. Civil Engineering, Virginia Tech 2019
Learning analytics provide insight into the black box of online learning

“Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs.”  – 1st International Conference on Learning Analytics and Knowledge (LAK)

<table>
<thead>
<tr>
<th>Purdue</th>
<th>UMBC</th>
<th>Researchers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signals</td>
<td>Bb</td>
<td>Course discussions to explore student learning communities</td>
</tr>
<tr>
<td>Early warning system that predicts at-risk students</td>
<td>Blackboard Track performance and predict student success</td>
<td>Identifying preferred instructional materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Introduction

Theoretical Framework

Research Questions

Methodology

Results & Discussion

Conclusion
Due to the lack of learning analytics theory, this study is grounded in the theory of social constructivism.

**Introduction**

Theoretical Framework

Methodology

Results & Discussion

Conclusion

**RQ 1**: In what ways can learning analytics describe student activity in an online engineering course?

**RQ 2**: To what extent do the students’ perception of the content correlate with their activity?
To explore the utility of learning analytics in an online platform, the researchers conducted a multiple-case study\textsuperscript{13} with a convergent mixed-methods approach\textsuperscript{14}.

**Online Construction Management**

| Spring 2020 | Summer 2020 | Fall 2020 |

**RQ 1**

**Learning Analytics**
Collection and Analysis

**RQ 2**

**Survey**
Collection and Analysis

Interpret Results to Compare
Course design and layout affects the learning analytic data collection.

**Instructional Format:**
Asynchronous with online synchronous TA & Professor office hours

**Five Modules**
Planning, Economics, Scheduling, Execution, Leadership

**Weekly Modular Format**
Video Lectures, Discussion Board, Homework, Project Assignment

---

**Planning III & IV**
- Housekeeping 3
- Planning III: Project Delivery
- Project Delivery - Discussion
- Checkpoint 4
- Marvel Bids!
  - Bid Document
    - Mar 1 | 0 pts
- Planning IV: Contract Types/Methods
- Contract Types - Discussion
- CEE 3014 - H3SuppReading.pdf
- Checkpoint 5
- A2: Getting Started
  - Feb 7 | 100 pts

**Lecture**
- Planning III: Project Delivery
- Contract Types - Discussion

**Activity/Discussion**
- Project Delivery - Discussion
- CEE 3014 - H3SuppReading.pdf
- Checkpoint 5

**Project Assignment**
- Bid Document
  - Mar 1 | 0 pts

**Homework**
- A2: Getting Started
  - Feb 7 | 100 pts
Data collection occurred during the course delivery process.

- **Pre-Course Survey**: Develop a baseline on the students' knowledge of construction.
- **Mid-Course Survey**: Report on the students' understanding and delivery of the module content and connection with the midterm exam.
- **Post-Course Survey**: Report on the students' understanding and delivery of the module content. Develop a post-class profile on what the students learned.

**Course Section Begins**

**Planning**

**Economics**

**Scheduling**

**Execution**

**Learning Analytics Collected**

**Course Section Ends**

- Midterm
- Final Exam
Using student activity by hour, an instructor can identify peak times to engage with their students.

Spring 2020

Summer 2020
Page visits are critical for student interaction

**Total Page Visits Distribution**

- **Homepage:** 1224
- **Module Page:** 2753
- **Assignments:** 1274
- **Discussions:** 1138
- **Lecture Pages:** 1226

**Total Lecture Page Visits by Page - Combined**

- **Planning Module:** 33%
- **Economics Module:** 24%
- **Scheduling Module:** 23%
- **Execution Module:** 20%

**Spring**

- Homepage: 2131
- Module Page: 2616
- Assignments: 1205
- Discussions: 1137
- Lecture Pages: 1129

**Summer**

- Homepage: 1224
- Module Page: 2753
- Assignments: 1274
- Discussions: 1138
- Lecture Pages: 1226
Students need a discussion post to reply to.

Spring 2020

$$R = 0.568, p<0.05$$

$$y = 1.1126x$$

$$R^2 = 0.9226$$

Summer 2020

$$R = 0.840, p<0.001$$

$$y = 1.0016x$$

$$R^2 = 0.9075$$

$${}^1\text{NM} = \text{met no minimums}, \text{RM} = \text{met reply minimum}, \text{EM} = \text{met entry minimum}, \text{BM} = \text{met both minimums}$$
Learning analytics describe student activity through:

- Popular activity times
- Course page visit frequency
- Student discussion interaction with their peers

How will you use learning analytics?
Questions?

Acknowledgements

CHEP

STILE

Virginia Tech
College of
Engineering

Research Committee
References