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# From the weight room to the classroom: student-generated data as a catalyst for engagement

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## Abstract

This study investigates the impact of student-generated data on engagement and motivation in a sports analytics course at an NCAA Division III college. Using wearable fitness bands, force plate technology, and performance visualization software, students collected and analyzed data related to their own or their peers' athletic performances. Guided by Experiential Learning Theory and Self-Determination Theory, the course was designed to foster deeper learning through hands-on, personally relevant experiences. Survey responses and course evaluations revealed that students perceived higher motivation, stronger conceptual understanding, and greater enjoyment when analyzing data they helped generate. Thematic analysis highlighted evidence of autonomy, competence, and relatedness - key dimensions of intrinsic motivation. Instructor observations further supported that familiarity with the data streamlined instruction and increased student engagement. Importantly, the study demonstrates that NCAA Division III institutions can implement high-impact, data-driven learning experiences despite resource limitations. These findings offer a scalable model for integrating active learning into sport analytics and related disciplines.

**Keywords**: sports analytics, data literacy, experiential learning theory, self-determination theory, wearables

## Introduction

Despite the growing demand for data literacy and analytical competencies in sport management, many undergraduate programs continue to rely on pre-curated datasets that are disconnected from students' lived experiences. This instructional approach can result in deficiency in desired learning outcomes: students often fail to engage meaningfully with the data, misinterpret key metrics, or overlook the broader context that informs real-world decision-making (Burress, 2022; Grimshaw, 2015). The absence of personally relevant or authentic data diminishes cognitive engagement and leads to a reduced ability to apply analytical thinking beyond the classroom.

This problem is particularly acute in sport analytics, where the analysis of human performance should feel tangible and immediate to students. In settings where students merely consume sanitized datasets, their understanding of performance metrics can become too abstract, decreasing their motivation to engage analytically. Consequently, learners may disengage, seeing analytics only as a theoretical framework rather than a practical, empowering skillset. This has implications not only for academic achievement but for workforce readiness in a data-driven sport industry.

Advancements in wearable technologies and force plate systems have made it increasingly feasible, even for resource-constrained institutions, to enable students to generate their own performance data. When students work with data tied directly to their own athletic activity, they gain insight that is emotionally resonant and pedagogically powerful. Prior studies have linked this kind of personal relevance to increased motivation, deeper learning, and greater retention (Clegg et al., 2020; Ryan & Deci, 2000). Yet these benefits remain unevenly distributed. NCAA Division I institutions often have the financial and infrastructural means to provide such experiences, while NCAA Division III schools, facing a 12:1 spending gap in athletic budgets (U.S. Dept. of Education, n.d.), frequently lack the resources to adopt emerging technologies.

The objective of this study is to examine how the integration of student-generated performance data can enhance student engagement and motivation in a sports analytics course at a Division III college. Framed by Experiential Learning Theory (ELT) and Self-Determination Theory (SDT), the study explores whether and how working with personal data, gathered through wearable fitness bands and force plates, can address the engagement gap typically seen with abstract, curated datasets. This research not only informs instructional design in analytics education but also offers a scalable model for incorporating high-impact learning into under-resourced academic programs.

This leads to our research questions:

> **RQ1:** ***Does generating and working with personal data increase student engagement?***
>
> **RQ2:** ***Do students report higher motivation and interest when analyzing data they personally generated?***

While this study is grounded in well-established theoretical frameworks—Experiential Learning Theory (Kolb, 1984) and Self-Determination Theory (Deci & Ryan, 1985), its purpose is primarily exploratory. Rather than testing predefined hypotheses, we aim to better understand how student-generated data affects motivation and engagement in the context of a Division III sport analytics course. The research questions guide this exploration and are designed to surface insights that could inform the development of formal hypotheses in future studies. By identifying patterns in student responses and instructional outcomes, this study contributes to the theoretical groundwork needed for future hypothesis-driven research.

## Literature Review

This section reviews current empirical research related to student engagement in analytics education, the role of data literacy, and the availability of performance technologies in different institutional contexts. It highlights key gaps in literature, particularly concerning the application of student-generated data in resource-constrained environments like Division III colleges.

### Resource Disparities Between Division I and Division III Athletics

Institutions in NCAA Division I typically benefit from substantial funding, robust alumni networks, sponsorships, and dedicated staff, enabling them to invest in state-of-the-art sports science labs, wearable technologies, and integrated analytics platforms. These resources are often embedded into both athletic training and academic programs, offering students seamless opportunities to engage with real-time, personalized data (Reiter et al., 2023).

In contrast, NCAA Division III programs often operate within significant financial constraints. Athletic departments face mounting challenges due to rising costs, declining enrollments, and increased pressure to justify expenditures (NCAA, 2025). Administrators are frequently asked to stretch limited budgets, sometimes relying on aging equipment, deferred facility upgrades, or insufficient staffing (Winnicker, 2019). Fundraising and revenue generation become critical, yet time and expertise to pursue such efforts are often lacking (Plinske, 2000). As Engbers (2012) noted, "external opportunities are now more important than ever" for Division III programs to sustain operations and remain valued by institutional stakeholders.

These limitations directly impact the educational mission, particularly in courses like sport analytics that could benefit from performance technologies. Unlike their Division I peers, students at Division III institutions may not have regular access to force plates or biometric wearables unless faculty independently secure equipment and create integrated learning experiences. As such, innovation and adaptability at the instructional level are essential.

**Integrating Performance Technology into the Classroom**
The rise of wearable and performance technologies offers educators new tools to operationalize both ELT and SDT. Tools from vendors like VALD, Whoop, and FYTT provide personalized feedback, allowing students to engage with dynamic data sets that reflect their actual experiences. The process of managing the data collected and curating it so that it may be analyzed is difficult. Such tasks are typical of what today's data-oriented sport employees will need to perform (Pifer et al., 2023). Visual platforms assist learners in making sense of complex information and identifying meaningful trends. These interfaces not only enhance cognitive engagement but also support struggling students by offering accessible entry points for analysis.

All student-athletes benefit from connecting their athletic performances with their academic pursuits (T. L. Clegg et al., 2023). However, the benefits of these technologies remain unevenly distributed. This form of "digital divide" between NCAA divisions reflects deeper disparities in institutional resources. Division I programs may deploy entire departments to manage sport science infrastructure, while Division III institutions often rely on faculty to create, implement, and sustain technology-enhanced learning independently. The Department of Education (Equity in Athletics Data Analysis Cutting Tool, n.d.) reports that Division I programs outspend those in Division III by a 12-1 ratio, despite being outnumbered approximately 4-1.

In this context, research into the effectiveness of student-generated data pedagogy is particularly valuable. If meaningful engagement and learning can occur using modest resources, shared devices, entry-level wearables, or even simplified data tracking protocols, this approach could serve as a model for other resource-limited programs seeking to increase data literacy and student motivation.

**Student Engagement and Data Literacy in Higher Education**
Student engagement, encompassing cognitive, behavioral, and emotional dimensions, is a key driver of academic success in higher education (Fredricks et al., 2004). In technical and applied fields like sport analytics, the pedagogical challenge is twofold: equip students with the skills to analyze data while also cultivating the interest and motivation necessary to sustain inquiry and critical thinking. Traditionally, instruction has relied on curated datasets, which offer controlled conditions but can foster a sense of detachment in students. However, to achieve data literacy students have to struggle through working with

authentic data (Kjelvik & Schultheis, 2019). When learners cannot connect personally with the data, the accompanying analytical concepts may appear abstract or irrelevant, leading to reduced engagement and failure to achieve learning outcomes.

The increasing accessibility of sport science technologies, such as force plates, fitness bands, and mobile analytics platforms, offers an opportunity to shift from passive data consumption to active data generation. These tools enable students to collect and analyze their own physiological and performance data, which can enhance engagement through personal relevance. However, this transformation is not universally accessible across institutional types, especially within the NCAA's stratified athletic landscape (Katz et al., 2015).

**Gaps in Literature and Study Contribution**

Prior research relevant to this study spans four primary areas: student engagement and data literacy, experiential learning in applied education, motivational theory in instructional design, and the integration of wearable and performance technologies in academic settings.

First, a growing body of literature emphasizes the importance of engaging students with authentic data to promote data literacy and critical thinking. Scholars have noted that pre-curated or overly-simplified datasets can obscure real-world complexity and reduce students' ability to draw meaningful insights (Grimshaw, 2015; Burress, 2022; Kjelvik & Schultheis, 2019). When learners work with personally relevant data, they are more likely to develop both technical competence and reflective judgment.

Second, experiential learning models have been widely applied across disciplines, including sport education, to promote active engagement and real-world problem-solving (Kolb, 1984; Roberts, 2012). However, most empirical studies in this space either focus on general instructional strategies or do not directly address the challenges of working with real, student-generated datasets in analytics education.

Third, work grounded in Self-Determination Theory (Deci & Ryan, 1985; Ryan & Deci, 2000) has demonstrated that learners are more intrinsically motivated when they experience autonomy, competence, and relatedness. Some studies have applied SDT to athletic or performance contexts (Clegg et al., 2020), yet few have explored how these motivational dimensions manifest in data-intensive classroom settings, particularly in sport analytics courses.

Fourth, there is increasing interest in using performance technologies like wearables, force plates, and data visualization tools in both athletic and educational environments. For example, recent research has shown that digital technologies can increase engagement and foster long-term learning behaviors (Martín-Rodríguez & Madrigal-Cerezo, 2025; Pifer et al., 2023). However, most such work assumes access to institutional resources commonly available at well-funded Division I programs. The broader implications for under-resourced institutions remain underexplored.

Taken together, these streams suggest that while authentic, technology-enhanced, and student-driven data experiences hold promise for increasing engagement and motivation, little is known about how such approaches function in constrained environments, such as NCAA Division III institutions. This study addresses that gap by exploring how wearable and performance data tools can be integrated into a sports analytics course using existing infrastructure and modest resources. By focusing on student-generated data and aligning instruction with both Experiential Learning Theory and Self-Determination Theory, the study provides a scalable, theory-informed model for fostering engagement, motivation, and data literacy in resource-limited academic settings.

## Theoretical Framework

This study is grounded in two complementary theories: Kolb's Experiential Learning Theory (ELT), which explains how students learn through direct involvement in data collection and analysis, and Deci and Ryan's Self-Determination Theory (SDT), which offers insight into the motivational processes underlying student engagement. These theories inform both the course design and the interpretation of student responses.

### Experiential Learning Theory (ELT)

Kolb's Experiential Learning Theory (Kolb, 1984) provides a powerful framework for designing learning environments that emphasize active participation. The theory (see Figure 1) outlines a four-stage cycle, Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation, through which learners derive knowledge from direct experience. ELT has been widely applied across health sciences, business, and sport education (Roberts, 2012).

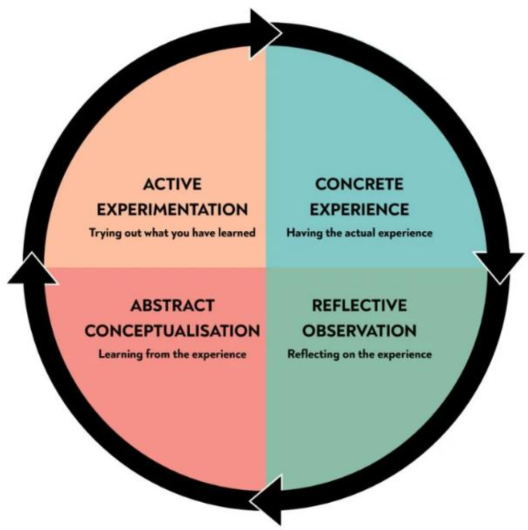


**Figure 1. Kolb's Experiential Learning Theory (1984)**

In the context of sport analytics, technologies such as force plates (to capture ground reaction force), Whoop bands (to track sleep, strain, and heart rate), and FYTT (a performance data visualization tool) enable students to engage in the full experiential cycle. They generate *concrete experiences* by collecting personal data, reflect on trends (*reflective observation*), connect these patterns to scientific concepts (*abstract conceptualization*), and test performance modifications based on their analyses (*active experimentation*). At resource-constrained institutions, applying ELT requires creative use of available tools. Even limited or shared access to performance technologies can enable transformative learning if integrated strategically into the curriculum. By leveraging what is available, faculty can provide powerful experiential learning that enhances both engagement and technical skill development.

### Self-Determination Theory (SDT)

While ELT explains how students learn through experience, Self-Determination Theory (Deci & Ryan, 1985) offers insight into why students become motivated to learn. SDT posits that learners are more engaged when three basic psychological needs are met: *autonomy* (the sense of control over one's actions), *competence* (feeling capable of success), and *relatedness* (feeling connected to others).

Integrating student-generated data into classroom instruction meets these needs in multiple ways. Students gain autonomy as they design and direct their own data collection. Competence is built as they analyze meaningful, real-world data and apply theoretical concepts to their lived experiences. Relatedness emerges through collaboration with peers, coaches, and faculty, especially when data becomes a shared object of inquiry. These dynamics enhance both motivation and persistence (Ryan & Deci, 2000).

Notably, a study of Division I athletes revealed that personal relevance of data, when students analyze their own performance metrics, boosts motivation and fosters data literacy (T. Clegg et al., 2020). While this study focused on a Division I institution, the underlying motivational mechanisms described by SDT are likely to apply in Division III settings as well, provided the conditions for self-directed, collaborative learning are met.

## Methodology

### Research Design

This study employs an exploratory qualitative case-study design to examine how integrating student-generated data affects engagement and motivation in a sports analytics course at a Division III institution. The research is theory-informed, drawing on Experiential Learning Theory (ELT) and Self-Determination Theory (SDT), but not hypothesis-driven. The primary goal is to identify patterns and insights that can inform future pedagogical practices and hypothesis-based research.

### Participants and Sampling

Participants were students enrolled in two separate sections of a 200-level Sport Performance Analytics course at a Division III college in New England during the 2024–2025 academic year. The courses enrolled a combined total of 40 students, the majority of whom were sport management majors. Notably, 57% of the students were also varsity student-athletes, representing a range of team sports. Participation in the hands-on data generation and the feedback surveys was voluntary, and all identifying information was removed prior to analysis.

### Data Collection Procedures

Students engaged with performance data using two technologies:

- Whoop fitness bands, which captured daily physiological data (heart rate variability, sleep performance, strain, etc.).
- VALD force plates, which measured ground reaction force and other performance metrics during movements like vertical jumps.

All students were introduced to the data collection technologies through in-class demonstrations and were given the opportunity to use the tools directly in both athletic and academic contexts. Participation in the data-generating activities was voluntary; students could opt in without any requirement to share their personal data for analysis. Data for this study were collected from three sources:

1. Instructor observations and field notes recorded throughout the semester.
2. A customized end-of-semester survey developed by the research team to solicit student reflections on engagement, motivation, and learning.
3. Responses to the standard university-wide course evaluation, which included open-ended questions on instructional impact and learning outcomes.

**Data Analysis**
Qualitative responses were analyzed using thematic analysis. An open coding approach was used to identify key phrases and ideas related to engagement, interest, autonomy, and perceived learning. These initial codes were then organized into higher-order themes aligned with the three dimensions of Self-Determination Theory: autonomy, competence, and relatedness. Instructor field notes were used to triangulate student feedback and identify convergence between observed behaviors and reported perceptions. Because the study was exploratory, no inferential statistics were used. The goal was to surface meaningful patterns and student experiences that could inform instructional design, not to draw generalizable causal claims.

**Ethical Considerations**
All students were informed about the voluntary nature of participation in the data generation and survey components. Data was anonymized during collection and analysis. The study protocol was reviewed in accordance with the institution's guidelines for pedagogical research conducted within the classroom setting.

## Equipment Overview

In this section we describe the equipment (both hardware and software) used in this research. We highlight lessons learned and best practices to assist other institutions considering similar purchases. While this research explores the use of this equipment in a classroom setting, we also provide reaction from coaches and athletes for those institutions considering this equipment outside of a classroom setting.

**Force Plates**
Force plates (see Figure 2) are giant microchips that are equipped with sensors to measure ground reaction force (GRF) exerted by a person performing over 20 different movements such as jumps, squats and pushups. The plates detect force, velocity, and time, and measure KPIs (key performance indicators) such as peak force, eccentric duration and concentric asymmetry (VALD Performance, n.d.). There are several vendors offering this technology including VALD (https://valdhealth.com/), Bertec (https://www.bertec.com), Hawkin Dynamics (https://www.hawkindynamics.com), and AMTI – Advanced Mechanical Technology, Inc. (https://www.amti.biz).

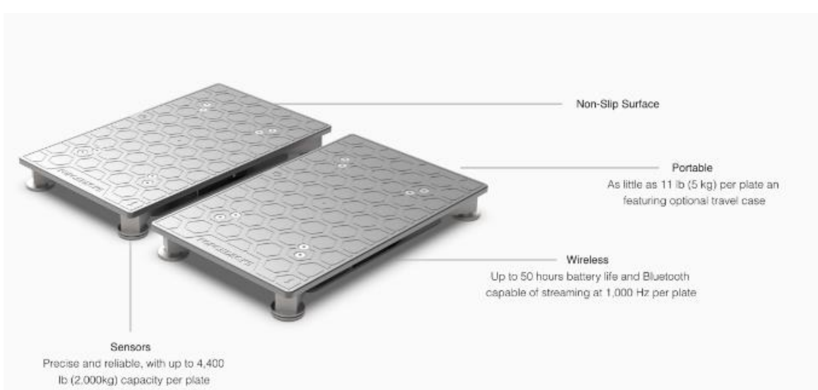


**Figure 2. Force Plates Features**

Tests on force plates provide insights into an individual's athletic capacities, force generation, fatigue status, rehabilitation, and return-to-play progress post injury, as well as left-to-right asymmetries between limbs.

There are various tests that look at not only the lower body but also the upper body, and isolated tests that look at joint specific strength capacities such as ankle, hamstring, hip, knee, shoulder, and chest.

**Purchase and Setup**

Prior to purchasing the equipment, we spoke with peer Division III institutions to confirm the efficacy of force plates, and learned that one of the two primary producers of force plates, VALD Performance, provided a significant discount to educational institutions using the product in the classroom. This put the purchase price in the range that would qualify for a technology grant being offered by the institution. We qualified for the grant by highlighting that the data from these devices would be used in a classroom setting. Setting up the force plates was easy and consisted of leveling the plates on the floor. The technical skills needed to connect them to each other, as well as to an iPad monitor (see Figure 3), were easy enough that IT staff were not needed.


**Figure 3. In the Weight Room**

The force plates were purchased in August 2024 and used twice a week by all varsity athletic teams except for Track and Field and Cheer (while all teams were given the opportunity to participate, the coaches from these two teams declined the use due to various challenges with their sport) resulting in over 400 student-athletes.

**Reaction of Athletes**

Athletes spoke highly of the equipment on several fronts. Since the force plates also took the player's weight, one player noted that it was a time saver for his large team rather than stepping on a separate scale. Another athlete noted that it was beneficial to see her asymmetry given her "bad soccer ankles." Another noted that seeing the graphs produced in Power BI from the force plate data that showed his progress was easier to understand and that seeing the graph lines trending upward was motivational.

**Reaction of Coaches**

Most of the coaches were receptive to the data provided; a few were very excited about the data and used it extensively. A handful simply lacked the time to assimilate new information. As coaches better understood the data, they became more receptive.

> *"our team loved utilizing the data and would design a practice based on what it was showing."* ***Men's Head Ice Hockey Coach***

The ability to track fatigue and asymmetry was especially appealing to coaches. Coaches could see how extensive travel to an away game, for instance, greatly diminished student-athlete output and could reduce practice workload. Asymmetry testing helped athletes understand imbalances and in one instance allowed a coach to identify a player who did not verbalize his discomfort, sit that player for several games, and bring him back to full speed for the playoffs.

> *"the force plates were instrumental to our program in a number of ways. The most important is with injury indication...the data was very easy to see on my end."* ***Men's Head Basketball Coach***

**Data Collection**
Athletes from each participating team used the force plates twice per week. At each session, bodyweight was measured and jump height tested. For the jump test, athletes performed a double-leg (DL), countermovement (CM) vertical jump. This technique starts with the athlete upright, then performs a quick downward motion (eccentric phase), and immediately jumps upward (concentric phase) simulating natural explosive movement. The athlete jumps using both legs, assessing bilateral (two-legged) power and symmetry.

Metrics (See Appendix A for sample data) provided during this jump were Eccentric Braking Impulse, Jump Height, Eccentric Duration, Concentric Duration, Force at Zero Velocity, Peak Power, P1 Concentric Impulse, P2 Concentric Impulse. Data was collected from each athlete, and they were placed into their team, and then broken down into their position group and graduation year. Data from VALD went to the VALD cloud server where data could be accessed by proprietary software and downloaded to a CSV file.

**Fitness Bands**
Wearable fitness bands (see Figure 4) continuously monitor philological data like heart rate (HR), sleep performance, respiratory rate, resting heart rate (RHR), heart rate variability (HRV) and recovery which is a measure of how prepared your body is for performance.


**Figure 4. Whoop Fitness Band**

There are many wearable fitness bands and rings, including – Apple IWatch, Fitbit, Ouara Ring, and Garmin.

We chose Whoop because of its 99% HR and HRV tracking accuracy and its industry-leading sleep tracking (Whoop, n.d.). We received a 10% group rate discount on the purchase of 15 bands and paid $215.10 per band inclusive of a one-year membership.

**Purchase and Setup**
A pilot of 15 Whoop fitness trackers was purchased for the Men's Ice Hockey Team in October 2024. While participation was voluntary, students were enthusiastic about participating and expressed no concerns about the sharing of the data. Students wore the bands 24/7 except for when they were in a water situation (showering or swimming). Occasionally students would forget to wear them or charge them, but data was collected approximately 95% of the time.

**Reaction of Athletes**
The Whoops were intuitive to use by the student athletes and the athletes enjoyed the experience. One student commented on how much he enjoyed the Whoop and how it helped him be more aware of his body and how his body was recovering from an injury. Students were observed discussing each other's scores leading to an informal rivalry amongst the team. However, one student ended up opting out of the study as he did not like wearing the band and there were some challenges with the phone app not closing which could result in draining the phone battery.

**Reaction of Coaches**
Overall, the reaction from the coaches was extremely positive and led the coaches to wonder what other data we could collect to go along with the Whoop data. This led to discussions about interfacing with the school cafeteria to track when and how often athletes were eating.

**Data Collection**
Data was collected daily on hours of sleep, HRV, and strain. Strain measures cardiovascular exertion, basically how hard one's body works over a period based on heart rate and how long it stays elevated. The Whoops are intuitive for the user, but our challenge was collating all of the individual data. Whoop did not have a team-based cloud we could access, and individuals had to send their information to the coaching staff and student workers. Anonymized individual data was then manually added into a spreadsheet. Beyond individuals sharing data with the coaches, the only other challenge was wearing the band and keeping it charged. There were only three remembered instances of athletes forgetting to charge their band over the entire season. Compliance with the Whoops was excellent, and athletes even began competing on who was the best sleeper.

## Results and Discussion

This section presents findings from student surveys, course evaluations, and instructor observations, organized around the two research questions. The results are analyzed using a thematic approach grounded in Self-Determination Theory, with triangulation provided by classroom and coaching observations.

**Data Sources and Sample Overview**
Data were collected from three primary sources:

1. **End-of-semester student survey (n = 40):** All students enrolled in two sections of a 200-level Sports Performance Analytics course were invited to complete a course-specific anonymous survey focused on their engagement, motivation, and experiences with the equipment and assignments. Thirty-eight students (95%) submitted responses.
2. **Standard university-wide course evaluation:** Students responded to open-ended prompts about what contributed most to their learning. These responses were collected anonymously at the end of the semester.
3. **Instructor observations:** Throughout the course, the instructor kept field notes documenting student reactions, participation levels, and informal conversations related to the learning experience.

Additionally, six varsity head coaches provided unsolicited feedback on the implementation of force plates and wearable technology during athletic practices and strength sessions. Their perspectives were included as contextual observations rather than as formal interview data.

**Thematic Analysis Approach**

Student responses from both the survey and course evaluation were analyzed using a thematic coding approach informed by Self-Determination Theory (SDT). An initial round of open coding identified emergent themes related to student experiences. These were then organized into three overarching categories aligned with SDT's motivational constructs: autonomy, competence, and relatedness. Instructor observations and coach comments were used to triangulate student responses and identify alignment between self-reported experiences and observed behaviors.

**RQ1: Does Generating and Working with Personal Data Increase Student Engagement?**

Across both student surveys and course evaluations, participants consistently emphasized that the hands-on, personal nature of the data collection activities contributed to higher engagement. Out of 38 student survey responses, 31 (82%) explicitly mentioned that being directly involved in generating or interpreting the data increased their interest in the coursework.

Comments such as:

- *"Going to the weight room and using real data on assignments made it feel more real."*
- *"Being able to see my own performance and compare it to others was way more interesting than using made-up numbers."*

were representative of the dominant themes. Students expressed greater emotional investment in the assignments when they were connected to their athletic identity or peer data. They also reported higher willingness to spend time troubleshooting data-related problems because the information felt personally meaningful.

Instructor field notes confirmed this increased engagement. Students showed heightened participation during in-class demos, asked more questions during data visualization tasks, and spent more time on open-ended analysis than in previous iterations of the course using standard datasets.

**RQ2: Do Students Report Higher Motivation and Interest When Analyzing Data They Personally Generated?**

Student survey responses were analyzed using SDT's three core constructs:

***Autonomy***

Students appreciated the freedom to choose which aspects of their data to analyze and how to visualize it. Nearly 70% of respondents (n = 27) mentioned increased motivation due to having control over their project focus or data selection.

- *"I was able to find things that I found interesting and see what happens when I analyze the data."*
- *"Independent research allows someone to figure out stuff for themselves—the most effective way to learn."*

***Competence***

Students noted that working with real, imperfect data gave them a better understanding of analytics tools and techniques. This authenticity prompted them to take ownership of learning and improved their confidence.

- *"Actually seeing people jumping and sprinting helped me understand the data better."*
- *"It was more enjoyable and more challenging because we had to figure out real issues."*

***Relatedness***

Students expressed increased connection to classmates and their athletic environment when working with team-generated data. Several described how shared data sparked informal discussions and collaboration.

- *"Being a student-athlete and looking at data from our college is more exciting and useful."*
- *"It was cool to see how my numbers compared with teammates."*

This social element reinforced both peer support and personal motivation.

***Desire for More Personalized Projects***

Several students advocated for more hands-on experiences in future iterations of the course:

- *"I would have enjoyed maybe a couple more projects."*
- *"I would only use the school data and maybe collect more personal data."*

These comments suggest that students not only engaged with the current format but actively wanted to deepen their involvement.

***Instructor Observations and Coach Feedback***

Instructor field notes documented improved classroom dynamics during data-focused activities, especially during lab sessions involving performance dashboards and data storytelling. Students were more likely to ask meaningful questions and offer insights tied to their own athletic experiences. Coach feedback further validated the instructional design. Six varsity head coaches noted the educational value of the equipment, with comments such as:

- *"Our team loved utilizing the data and would design practice based on what it was showing."* (Men's Head Ice Hockey Coach)
- *"The force plates were instrumental... especially for injury indication. The data was very easy to see."* (Men's Head Basketball Coach)

While these comments were informal, they support the claim that data from athletic contexts can be leveraged to increase both instructional relevance and student interest.

**Summary**

Together, student surveys, open-ended evaluations, and instructor observations provide strong, triangulated support that the integration of student-generated data enhanced engagement and intrinsic motivation. Coach feedback, while informal and external to the classroom, further validates the real-world relevance of the approach and suggests potential benefits beyond the academic setting.

## Conclusions

This study explored how integrating student-generated data into a sports analytics curriculum at a Division III institution can enhance student engagement, motivation, and learning outcomes. Grounded in Experiential Learning Theory (ELT) and Self-Determination Theory (SDT), the instructional approach allowed students to move beyond passive data analysis by actively participating in the data collection and interpretation process. Findings indicate that students were more engaged when working with data that was personally meaningful and relevant to their athletic experiences. The progression from individual data collection to building complex dashboards encouraged deeper cognitive involvement, while hands-on exposure to performance technology fostered emotional investment and real-world application. Student reflections and survey responses provided strong evidence of increased motivation, particularly when students experienced autonomy in choosing their data, developed competence through repeated practice, and found relatedness in collaborative or team-based data contexts.

In addition to supporting pedagogical goals, the use of accessible wearable technologies and force plates demonstrated that high-impact experiential learning can be achieved even within the budgetary constraints of a Division III setting. By creatively integrating available tools and aligning assignments with students lived experiences, instructors can overcome traditional resource limitations to deliver rich, motivating, and effective analytics education. This work contributes to a practical model for embedding active learning into sport analytics curricula and offers insights for educators seeking to improve engagement and data literacy in applied settings. Future research may explore how these findings generalize across disciplines or how long-term exposure to student-generated data affects learning persistence and career readiness.

Future work should extend these findings by employing hypothesis-driven designs that test specific claims about the impact of student-generated data on learning outcomes and motivational constructs across different institutional types. While the findings offer valuable insights, they are limited by the small sample size and absence of a comparison group. Future research should adopt hypothesis-driven designs and control conditions to test the replicability of these outcomes.

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# Appendix A –Sample Data

**Force Plate Sample Data**

| Bodyweigl | Eccentric Braking | Jump Height | Eccentric Dura | Concentric Dur: | Force at Zerc | Peak Power | P1 Concen | P2 Concen | Peak Power [W] |
|---|---|---|---|---|---|---|---|---|---|
| 273.6 | 69.4 | 11.8 | 610 | 340 | 2166 | 46.6 | 172.8 | 128.1 | 5783 |
| 166.9 | 46.4 | 17.6 | 592 | 260 | 1685 | 61.8 | 130 | 94.4 | 4680 |
| 284.4 | 49.5 | 11.9 | 500 | 280 | 2589 | 47.1 | 196 | 117.5 | 6073 |
| 202.6 | 60 | 13 | 462 | 254 | 2282 | 50.4 | 149 | 85.8 | 4635 |
| 290.9 | 64.1 | 9.7 | 491 | 232 | 2753 | 43.5 | 203 | 87.8 | 5741 |
| 175.3 | 75.2 | 17.4 | 466 | 272 | 2061 | 59.5 | 144.8 | 90.2 | 4732 |
| 187.8 | 53 | 9.9 | 537 | 223 | 1783 | 44.6 | 115.7 | 73 | 3800 |
| 202.9 | 77.2 | 20.7 | 377 | 199 | 2926 | 77.5 | 196.5 | 99.3 | 7130 |
| 164 | 78.3 | 14.2 | 476 | 173 | 2090 | 63.5 | 131 | 65.9 | 4726 |
| 214.3 | 42.4 | 14.4 | 607 | 273 | 2190 | 51.1 | 165.5 | 93.9 | 4971 |
| 159.3 | 69.9 | 16.8 | 413 | 214 | 1998 | 63.1 | 132.7 | 76.9 | 4558 |
| 159 | 46.9 | 15 | 574 | 300 | 1518 | 52.1 | 119 | 78.3 | 3759 |
| 170.6 | 50.3 | 14.3 | 449 | 234 | 2197 | 56.5 | 142.8 | 64 | 4370 |
| 264.9 | 58.8 | 10.7 | 566 | 313 | 2454 | 45.5 | 161.6 | 115 | 5462 |
| 158.4 | 17.1 | 14.2 | 705 | 285 | 1316 | 53.2 | 99.8 | 90.9 | 3827 |
| 214.5 | 67 | 13.2 | 644 | 337 | 1838 | 49.1 | 134.1 | 115.4 | 4778 |
| 166.3 | 72.2 | 16.3 | 453 | 255 | 1983 | 61.9 | 125.2 | 89.4 | 4669 |

**Fitness Band Sample Data**

| Date | Strain | HRV | Sleep |
|---|---|---|---|
| 2/2/2025 | 21.4 | 260 | 7.31 |
| 2/1/2025 | | 132 | 6.58 |
| 1/30/2025 | 17 | 147 | 7.42 |
| 1/28/2025 | 21.4 | 298 | 7.24 |
| 1/26/2025 | | 164 | 7.17 |
| 1/25/2025 | | 318 | 7.88 |
| 1/24/2025 | 9.8 | 255 | 12.03 |
| 1/22/2025 | 20.4 | 274 | 7.42 |
| 1/20/2025 | 26 | 129 | 5.98 |
| 1/19/2025 | | 128 | 5.55 |
| 1/18/2025 | 11.8 | 122 | 8.08 |
| 1/17/2025 | 7.4 | 301 | 12.85 |
| 1/15/2025 | 11.6 | 240 | 7.82 |
| 1/14/2025 | 20.1 | 186 | 6.6 |
| 1/13/2025 | 11.6 | 98 | 6.73 |
| 1/12/2025 | 19 | 124 | 7.7 |
| 1/11/2025 | | 92 | 8.3 |