Learning Analytics & Data-Driven Personalisation

Using learner data to improve engagement, support, and outcomes

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What is Learning Analytics?

- Learning analytics is the **measurement, collection, analysis, and reporting of data about learners and their contexts**.
- Its purpose is to **understand and optimize learning** and the environments in which learning occurs.
- It helps educators, institutions, and learners make better decisions using evidence.

Core idea:

Better data -> better insight -> better learning support.

What is Data-Driven Personalisation?

- **Data-driven personalisation** means using data about user behavior, preferences, and needs to deliver more relevant experiences.

In education, this means:

- adapting content to learner needs
- recommending next activities
- identifying students who need support
- improving communication and interventions
- creating more engaging learning pathways

In simple terms:

The system learns from learner behavior and responds more intelligently.

Why This Matters

- **Why are learning analytics and personalisation important?**
- Learners have different abilities, goals, and pace.
- One-size-fits-all teaching often misses individual needs.
- Digital learning platforms generate rich data that can be used meaningfully.
- Personalized learning can improve:
  - engagement
  - retention
  - performance
  - satisfaction
  - timely support

Main benefit:

More relevant learning experiences lead to better outcomes.

Key Data Sources in Learning Analytics

- **Common sources of learner data**
  - attendance records
  - assignment submissions
  - quiz and exam scores
  - demographic and enrollment data
  - LMS logins and time spent
  - video watch behavior
  - feedback surveys

These data points help answer:

- Who is engaged? Who is struggling? What content works?
- When should intervention happen?

How Learning Analytics Works

Basic process

1. **Collect data** from learning systems and student interactions
2. **Organize and clean data**
3. **Analyze patterns and trends**
4. **Interpret findings**
5. **Take action** through intervention or redesign
6. **Evaluate results** and improve continuously

- **Outcome:**
  Data is converted into actionable educational insight.

Personalisation in Education

- **Examples of personalised learning experiences**
  - recommended readings or videos
  - adaptive quizzes based on performance
  - reminders for incomplete tasks
  - suggested revision topics
  - individualized feedback dashboards
  - different pathways for beginners and advanced learners
  - peer collaboration suggestions
  - alerts to instructors when engagement drops
- **Goal:**

  Deliver the right support to the right learner at the right time.

Uses of Learning Analytics

- **Learning analytics can be used for:**
  - ***Learner reflection***
    Helping students understand their progress and behavior
  - ***Early warning systems***
    Predicting which students may require extra support
  - ***Targeted interventions***
    Helping teachers plan support for individuals and groups
  - ***Course improvement***
    Identifying weak content, confusing assessments, or low-engagement activities
  - ***Institutional decision-making***
    Supporting planning, recruitment, retention, and quality improvement

Learning Analytics vs Educational Data Mining

Aspect	Learning Analytics	Educational Data Mining
Focus	Improving learning and decision-making	Discovering patterns from educational data
Orientation	Practical and human-centered	Technique- and algorithm-centered
Users	Learners, teachers, administrators	Researchers, analysts, system designers
Output	Dashboards, interventions, recommendations	Models, predictions, classifications

Important note:

The distinction between these fields is becoming less rigid, and both increasingly overlap.

Major Trends in Learning Analytics

- **Recent trends in the field include:**
  - predictive modeling in education
  - student engagement analysis in online courses
  - support for teachers through analytics tools
  - social and collaborative learning analysis
  - online learning behavior tracking

Cont..

- integration of machine learning
- theory-informed and interpretable models
- broader convergence toward educational data science
- A large review of nearly 3,900 publications identified nine major learning analytics topics and highlighted growing interest in predictive modeling.

Benefits of Data-Driven Personalisation

For learners	For educators	For institutions
· more relevant learning content · faster feedback · better motivation · support matched to actual need · improved self-awareness	· clearer insight into student progress · evidence-based teaching decisions · efficient intervention planning · improved course design	· stronger retention strategies · improved learning quality · better resource allocation · informed policy decisions

Example: Personalised support in an online course

An institution notices that some students	Using learning analytics, the system can:
❖ log in less often ❖ skip videos ❖ submit assignments late ❖ perform poorly on quizzes	· flag at-risk learners early · send reminders or support messages · recommend revision materials · alert instructors for follow-up · adapt content difficulty where possible

Data-Driven Personalisation Techniques

- **Segmentation**
  Grouping learners by needs, behavior, or performance
- **Behavioral targeting**
  Responding to learner actions in real time
- **Recommendation systems**
  Suggesting resources, activities, or content
- **A/B testing**
  Testing which messages or learning designs work better
- **Predictive analytics**
  Anticipating future performance or disengagement
- **Adaptive pathways**
  Changing the learning path based on progress

Role of Dashboards

Analytics dashboards help visualize learning data

They can show:

- progress over time
- activity levels
- assessment performance
- missed deadlines
- peer comparison
- risk indicators

Cont…….

- **Benefits of dashboards**
- support learner self-regulation
- help teachers monitor classes
- make complex data easier to act on
- **Best use:**
  Dashboards should support action, not just display numbers.

Challenges and Risks

Key concerns

- data privacy and security
- informed consent
- bias in algorithms
- over-surveillance of learners
- misinterpretation of data
- lack of transparency
- poor data quality
- over-reliance on prediction without educational context

Critical reminder:
Data should support human judgment, not replace it.

Ethical Considerations

Responsible use of learning analytics requires:

- transparency about what data is collected
- clear purpose for data use
- student awareness and consent where appropriate
- secure storage and governance
- fairness in algorithms and interventions
- explainable models
- support-focused, not punitive, applications

Ethical question:

Are we using data to empower learners, or simply to monitor them?

How to implement effectively

- start with clear educational goals
- collect only useful and relevant data
- ensure data quality
- combine analytics with teacher insight
- use interpretable models where possible
- test interventions before scaling
- review outcomes regularly
- protect privacy and fairness

Success factor:

Technology works best when aligned with pedagogy.

Thank You