Empowering Analytics for Instructors

An approach to analytics for instructors informed by Learning Sciences research
Goal
At Macmillan, our goal is to drive better learner outcomes. A fundamental part of our approach is to apply findings from the Learning Sciences to product design, improvement, implementation, and support.

Overview
Here we provide overarching principles for the design of effective analytics for instructors derived from a synthesis of the learning science literature. In addition, we provide examples of insights and dashboard reporting elements for instructors that leverage these principles.

Application
These overarching principles underpin the design of Macmillan’s analytics features and capabilities. However, these principles may also be applied by institutions, instructors, and instructional technologists to their own learning experiences.

Foundation
These principles are based upon a thorough literature review of educational and cognitive psychology research by learning researchers.

Process
These principles were developed through a rigorous and comprehensive ten-step research and refinement process that included:

- Primary and secondary literature review and synthesis by Macmillan Learning Research team
- Design of principles by Macmillan Learning Research team
- Internal review by 4 Macmillan Learning scientists
- External review by 7 students
- External review by 5 experts comprising Macmillan Learning’s Learning Research Advisory Board

All of these researchers, contributors and reviewers are listed to the right.
What educational analytics are actionable and for whom?

The term analytics is often used in different ways. For our purposes, we define analytics as the meaningful combining, computing, and visualizing of data into actionable insights.

Analytics that support effective teaching and learning are always actionable. They answer key stakeholder questions. They provide holistic, valid, and reliable insights into learner progress and performance — taking into consideration data from all aspects of the learning experience including cognitive, noncognitive, and behavioral inputs — and facilitate effective and efficient action. They provide insights that answer specific questions, while also facilitating the ability to seek additional information via supporting and raw data.

They provide learners with feedback, support metacognition and self-regulation, bolster motivation, and foster interaction and collaboration. As such, principles for analytics span many different areas of the learning sciences literature.
# Overarching Principles for Actionable Analytics

<table>
<thead>
<tr>
<th>Report Against Learning Objectives</th>
<th>Provide Strategic Feedback</th>
<th>Support Metacognition and Self-Regulation</th>
<th>Foster Motivation</th>
<th>Enhance Interaction and Collaboration</th>
<th>Enable Effective Interventions</th>
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<td>Learning objectives enable analytics that provide all stakeholders within the learning experience to monitor and improve mastery of concepts, application of skills, and development of attributes.</td>
<td>Strategic (timely, specific, targeted) feedback enables learners to better understand their current performance, how they should be performing, and how they can close the gap between the two.</td>
<td>Analytics can help learners more accurately and efficiently gauge their progress and adjust their practices accordingly, supporting improved metacognitive abilities and better self-regulated learning strategies.</td>
<td>Bolstering learner motivation and self-efficacy improves learner persistence, affect, and performance.</td>
<td>Fostering productive instructor-to-learner and learner-to-learner interaction and collaboration increases learner engagement and performance.</td>
<td>Providing valid insights (visualized in ways that reduce extraneous cognitive load) and supporting effective and efficient interventions enhances the experience of all stakeholders involved in the learning process.</td>
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Two broad categories of analytics

By combining analytics from each of these categories, stronger insights can be derived and more effective interventions can be enabled.

**Checkpoint Analytics**

*Indicate whether students interacted with materials or progressed as planned*

**Process Analytics**

*Indicate student information processing and knowledge application*
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<td>Support Metacognition &amp; Self-regulation</td>
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<td>E.g., Learner interactions on collaborative features (e.g., discussion board) — quantity of responses, quality (depth, breadth)</td>
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Essential Elements of Instructor Dashboard

Ability to view student performance at individual and cohort levels by framework, learning objectives, and behaviors. This data can be further analyzed by cognitive and noncognitive dimensions with the ability to then take one or more actions.

Instructors can select students based on attributes of interest and examine progress and performance accordingly.
Instructor Feedback

"Process, as it is illustrated here is about application of learning as opposed to simply undertaking a task." - Dr. Thomas

"Analytics that span these factors and gauge both use of material and success using the material allow for fine-grained insight into affect student learning, progress, and success." - Dr. Dolan

"This analytic structure provides more holistic insights that should allow both instructors and students to take more strategic action." - Dr. Dolan

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Checkpoint Analytics

Indicate whether students interacted with materials or progressed as planned.

Process Analytics

Indicate student information processing and knowledge application.
"A dashboard that will allow me to quickly prioritize current materials (e.g., quiz taken within the past couple of days) and focus on what students missed on the quiz would be super helpful." - Dr. Dolan
References


References


