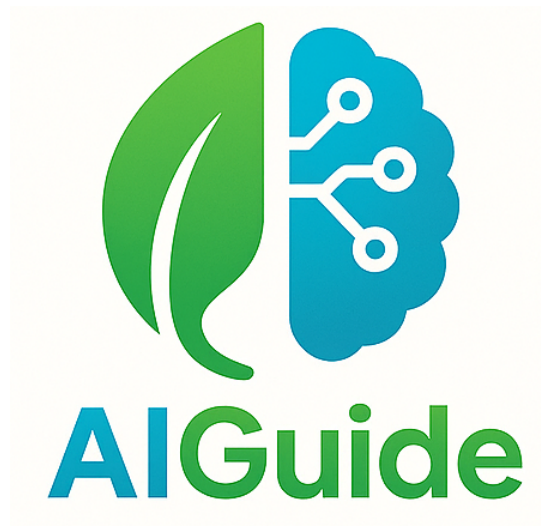




ONLINE COURSE CONTENT

MODULE 5: AI-SUPPORTED ASSESSMENT AND LEARNING ANALYTICS

2025-1-LT01-KA220-HED-000354784

Artificial Intelligence for Green Understanding, Insights & Decision Empowerment



SQUAREDEV



Co-funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the National Agency of Erasmus+ Programme in Lithuania – Education Exchanges Support Foundation (ŠMPF). Neither the European Union nor the ŠMPF can be held responsible for them.

Table of Contents

A. General Information	2
B. Content for STEM Higher Education Faculty.....	3
Key Points.....	3
Introduction.....	3
Concepts to Define at the Start.....	4
Learning Analytics and the Data Pipeline.....	4
Key Concepts	4
AI-Based Feedback Systems	4
Data-Driven Assessment and Structural Uncertainty	5
Formative Feedback and the Interpretation Routine	5
The Human Barrier.....	5
Evidence-Based Decision-Making Cycle (Discipline-Specific).....	5
Tools That Can Be Used in This Subtopic.....	6
Critical and Responsible Use	6
Videos and Interactive Resources (Additional Sources for the Lecturer).....	6
Guidance Flowchart for Professional Development	6
C. Real-Life Example	7
Best Practices Report Case: Gradescope and Cognii VLA – AI Assessment and Feedback.....	8
Preparing Your Own Real-Life Example.....	8
D. Interactive Learning Activity	8
1. Activity Description.....	9
2. Pedagogical Design	9
3. Design of the Student Assignment	9
4. Use of Artificial Intelligence and Sustainable Decision-Making.....	10
5. Evaluation and Evidence	10
6. Application Notes	11
Joint Completion Checklist.....	11
References.....	12



A. General Information

Module No.	Module 5 – AI-Supported Green Decision-Making (AIGUIDE)
Subtopic 5.3	AI-Supported Assessment and Learning Analytics
Artificial Intelligence Literacy Component	Learning analytics; AI-based feedback systems; data-driven assessment basics; formative feedback.
Decision-Making Skills	Interpreting feedback; making improvement decisions based on learner evidence.
Teacher Learning Outcome	Uses AI-supported assessment and learning analytics to monitor and support learning.
Student Learning Outcome	Interprets AI-generated feedback or assessment outputs for improvement.
Possible Tools	LMS analytics; rubric tools; AI feedback tools.
AI Literacy Level	Medium
Estimated Time	90 minutes in total: a 30-minute faculty development session (Section B) and a 60-minute student activity (Section D), plus optional independent preparation

B. Content for STEM Higher Education Faculty

Key Points

- A dashboard number is the output of a model, not a direct observation of learning.
- Uncertainty is structural: analytics indicators are proxies built from noisy measures such as scores and engagement.
- Formative use is the priority: early detection of struggling students and pinpointing difficult course parts.
- Human interpretation of the data is required; current systems analyse the student far more than the teaching.
- Every interpretation must end in an improvement decision – data that produces no decision is decoration.

Introduction

This subtopic gives teachers the primary knowledge for monitoring and supporting learning with AI-supported assessment and analytics. Learning analytics and educational data mining convert the data continuously produced by learning environments (Moodle-type LMSs, portals, MOOCs) into insight: continuous monitoring detects a struggling student at the earliest moment and pinpoints the parts of a course causing the greatest difficulty, while students can visualise progress and reach appropriate resources (Colchester et al., 2017).

The decisive competence is analytical literacy – knowing what a metric measures, how certain it is, what alternative explanations exist, and what decision it warrants. This section builds that literacy, because the field's own diagnosis is that limited educator knowledge, not missing technology, is the main barrier (Colchester et al., 2017).



Activity: Observe—Notice | Reading a dashboard (3 min)

Task: Look at an LMS analytics dashboard (or screenshot). For one indicator, ask: what was actually measured? Expected focus: clicks and time-on-task are proxies for engagement, not learning; a dashboard number is a model output, not a direct observation (Colchester et al., 2017).

Resource: SoLAR “What is Learning Analytics” · <https://www.solaresearch.org/about/what-is-learning-analytics/>

Concepts to Define at the Start

Learning analytics (LA) and educational data mining (EDM) are two overlapping fields that turn educational data into insight (Colchester et al., 2017). Formative feedback is information provided while learning is still in progress, so students can adjust their learning and teachers their teaching – the counterpart of summative assessment. Data-driven assessment bases decisions on systematically collected activity data (LMS logs, test results, engagement) rather than isolated impressions.

Learning Analytics and the Data Pipeline

The pipeline is a chain: interaction data → learner profile/model (knowledge, affect, traits, skills) → pedagogical action; the model either informs designer-specified pedagogy or gives the system self-learning capability from teacher and student behaviour (Colchester et al., 2017). Beneath the dashboards work fuzzy logic, decision trees, Bayesian networks, neural networks, genetic algorithms and hidden Markov models – techniques valued for imitating human reasoning under uncertainty (Colchester et al., 2017). The teacher does not need the mathematics, but must grasp that a dashboard number is a model output, never a direct observation.

Activity: Research and Learn | AI vs human feedback (30 min, independent preparation)

Task: Submit a short piece of work to an AI feedback tool and also mark it against the same rubric yourself. Compare specificity, accuracy and usefulness; write a short note on which advice you would act on and why (Porayska-Pomsta, 2016).

Resource: *Handbook of Learning Analytics, 2nd ed. (open access)* · <https://www.solaresearch.org/publications/hla-22/>

Key Concepts

Concept	Key Focus	Key Components	Evidence of Learning
Learning analytics / EDM	Turning learning data into insight	Data → learner model → action; techniques under uncertainty (Colchester et al., 2017)	The teacher reads an indicator as a model output, not a fact
Formative feedback	Improving learning while it happens	Early detection; four-question interpretation (Colchester et al., 2017)	The teacher ends each interpretation with an improvement decision

AI-Based Feedback Systems

Mature systems show what the tools can do. ALEKS uses adaptive questioning, assessment and targeted feedback in mathematics and science from primary to university level; Knewton employs ontologies and Bayesian reasoning for fine-grained conceptual progress and lets teachers create and reuse content; ASSISTments combines e-assessment with authoring so teachers tailor content, feedback and assessment for specific groups, and feeds its data into large randomised trials (Porayska-Pomsta, 2016). The critical



asymmetry: these systems analyse the student far more than the teaching, offering little support for teachers' systematic reflection on their own practice (Porayska-Pomsta, 2016).

Data-Driven Assessment and Structural Uncertainty

Assessment-driven adaptation operates with information that is uncertain and imprecise: decisions of the type “if the student’s knowledge of Excel is very low and of PowerPoint is high, then moderate Excel materials should be assigned” are made from noisy indicators such as scores and engagement (Colchester et al., 2017). Moreover, most existing systems do not learn from students but encode the assumptions of a few experts (Colchester et al., 2017). The consequence for the teacher: every indicator and every automated score is the output of a model under uncertainty; single points and small differences are noise, and each metric has plausible alternative explanations.

Key control question:

What was measured, how certain is it, what alternative explanations exist, and what improvement decision follows? Data that produces no decision is decoration.

Formative Feedback and the Interpretation Routine

Analytics is most defensible when it improves learning while it happens. Every AI-generated feedback message or indicator is read through four questions: What was actually measured? How certain is it (trends over time and across measures, not single points – Colchester et al., 2017)? What alternative explanations exist (low LMS activity may mean disengagement – or a printed textbook)? What improvement decision follows – revisiting a topic, changing a strategy, redesigning a task, or talking to the student? Where AI contributes to a grade, the teacher must be able to explain the basis of the score and personally review contested cases.

The Human Barrier

The main obstacle to successful LA/EDM use is limited educator awareness and knowledge – of both the practical functioning and the theoretical concepts – leaving many unable to analyse results correctly or decide on actions (Colchester et al., 2017). The proposed remedy is cultural: cultivating a data-driven approach in the educational setting (Colchester et al., 2017). This subtopic is that remedy in practice.

Evidence-Based Decision-Making Cycle (Discipline-Specific)

The evidence-based decision-making cycle is applied here in a discipline-specific manner using the 5E workflow (Bybee et al., 2006), in the form adopted across AIGUIDE Module 3, Subtopic 3.7. AI supports the evidence, comparison and communication stages; verification, the final choice and professional responsibility remain with the human.

Stage	Key Question	Appropriate AI Support	Human Responsibility
Engage	Which decision about your own work must the feedback inform?	Reframes the question; points out what the feedback does not tell you	States the decision and the indicator it depends on
Explore	a. What is each indicator actually built from? b. What are the criteria for a sound reading?	a. Organises the indicators and the feedback. b. Lists the assumptions behind each metric	a. Verifies what was measured and how. b. Judges which readings are admissible
Explain	Which explanations of the result are consistent with the evidence?	Generates alternative explanations and counterarguments	Weighs the alternatives and states the level of certainty



Elaborate	Which improvement action is defensible?	Drafts the action and its rationale	Chooses one action for the next submission and reports why
Evaluate	What was verified, rejected or left uncertain?	Flags inconsistencies and missing evidence	Sets the re-check point and the fairness check, and names what stays uncertain

Tools That Can Be Used in This Subtopic

- LMS analytics – continuous monitoring of activity, progress and assessment; early detection of struggling students (Colchester et al., 2017).
- Rubric tools – making criteria explicit for students and for AI, and reducing unwanted interpretation latitude.
- AI feedback tools – immediate, individualised response at a scale a human cannot match in large groups.

Critical and Responsible Use

- Formative use is prioritised; where AI contributes to grades, the basis is explainable and contested cases are reviewed by the teacher (Porayska-Pomsta, 2016).
- Automation bias is countered by forming one's own judgement before viewing the AI's.
- Fairness is sample-checked: models may undervalue unusual answer styles or non-native speakers (Vinuesa et al., 2020).
- Students are told what data is collected, what dashboards show and how it is used.
- Tooling is proportionate to the monitoring need; a weekly LMS loop often beats an extra data-hungry platform (Vinuesa et al., 2020).

Videos and Interactive Resources (Additional Sources for the Lecturer)

Additional resources for the lecturer. Items marked [S] are recommended during the 30-minute faculty development session and take about 5 minutes in total; items marked [I] are for independent preparation and are not counted in the session time. Links were checked and are stable; if a link changes, search the resource title.

- [S] SoLAR – “What is Learning Analytics”: concise authoritative introduction by the Society for Learning Analytics Research. <https://www.solaresearch.org/about/what-is-learning-analytics/>
- [I] 60 Minutes / CBS – “Meet Khanmigo: the student tutor AI” (~13 min): a real-classroom report on an AI tutor being piloted in schools; shows AI feedback in use while the teacher stays the decision-maker. <https://www.youtube.com/watch?v=Ia3CPhVkUtg>
- [I] Handbook of Learning Analytics, 2nd ed. (open access): see Ch. 1 “What is Learning Analytics” and Ch. 13 on teacher- and student-facing analytics. <https://www.solaresearch.org/publications/hla-22/>
- [I] Google Teachable Machine (interactive): train a small model in the browser in minutes; demonstrates how training data and imbalance shape outputs – useful for interpreting analytics and bias. <https://teachablemachine.withgoogle.com/>
- [I] “A Gentle Introduction to Learning Analytics” (DE-TEL open book): introductory chapter with links to further resources. <https://ea-tel.eu/detel-book/chapter/topics/learning-analytics/>

Guidance Flowchart for Professional Development

Stage	Activity
Understanding analytics	Read a dashboard and name what each metric actually measures (Colchester et al., 2017).



Systems knowledge	Review ALEKS, Knewton and ASSISTments and the student-vs-teaching asymmetry (Porayska-Pomsta, 2016).
Interpretation routine	Practise the four-question routine on a real indicator.
Fairness check	Sample-check AI feedback across answer styles and student groups (Vinuesa et al., 2020).
Formative loop	Design a weekly monitor → decide → re-check loop for one topic.
Creating your own example	Draft a formative loop and rubric for your module.



C. Real-Life Example

Best Practices Report Case: Gradescope and Cognii VLA – AI Assessment and Feedback

The AIGUIDE Best Practices Report documents Gradescope (Turnitin) as an AI-assisted assessment and rubric platform (AIGUIDE Best Practices Report, 2026, Assessment & Feedback Tools). The recorded functions include AI-assisted answer grouping that clusters similar student responses, auto-grading of multiple-choice, bubble-sheet, coding and numeric short-answer items, dynamic rubric creation with bulk retroactive rubric changes, and handwritten-exam scanning – all integrated with Canvas, Blackboard, Brightspace, Moodle and Sakai via LTI. It is the report's reference case for rubric-based, analytics-supported assessment at scale.

The report documents Cognii VLA (Cognii, Inc.) as a virtual learning assistant that assesses open written responses and provides real-time formative feedback and adaptive coaching until mastery, integrated with MOOCs, Canvas, Moodle and e-books via API, and rated high in ecosystem relevance with direct educational impact (AIGUIDE Best Practices Report, 2026). Together these cases show what AI-supported assessment offers a STEM lecturer: rubric-anchored feedback and analytics that flag struggling students – while, as the report and the literature stress, the teacher interprets the outputs and reviews contested scores, since such systems analyse the student more than the teaching (Porayska-Pomsta, 2016; Colchester et al., 2017).

The report adds an important framing for this subtopic: adaptive and tutoring tools do not directly produce green decisions but strengthen the mathematical, scientific, analytical and problem-solving foundations students need for green decision-making (AIGUIDE Best Practices Report, 2026).

If the main tool is not available:

If neither tool is licensed: peers apply the same rubric and the LMS quiz analytics supply the monitoring; the interpretation routine – measure, judge certainty, weigh explanations, decide – is identical.

Preparing Your Own Real-Life Example

- Choose a documented assessment case from the Best Practices Report (e.g., Gradescope, Cognii VLA or ALEKS) that fits your assignment.
- Choose 2–3 indicators tied to the outcome and state what each actually measures.
- Define the decision thresholds and the improvement action for each.
- Plan a fairness sample-check and a human review route for contested scores.
- Specify how you will re-check the effect of the action in the next cycle.



D. Interactive Learning Activity

Student Learning Activity Card

For STEM university students

Project	Artificial Intelligence for Green Understanding, Insights & Decision Empowerment (AIGUIDE)
Module / Subtopic	Module 5 / Subtopic 5.3 – AI-Supported Assessment and Learning Analytics
Activity Code	M5-A3.5-S3
Event Title	Interpreting AI Feedback on Your Own Green-STEM Work
Developing Partner	VMU / AIGUIDE Consortium
STEM Context / Discipline	Interdisciplinary STEM; environmental data, energy, bioengineering, biology.

1. Activity Description

Recommended Duration	60 minutes + optional preparation
Delivery Format	☒ In-class ☐ Synchronous online ☐ Asynchronous online
Student Grouping	☐ Individual ☒ Pairs ☒ Small groups (3–4 students)
Summary	Students interpret the AI feedback and analytics produced on their own submitted green-STEM work, apply the four-question routine, and end each interpretation in one improvement action for their next submission.

2. Pedagogical Design

Learning Objectives	By the end, students will: (1) read an indicator about their own work as a model output; (2) judge how certain it is; (3) weigh alternative explanations for their own result; (4) decide one improvement action for their next submission; (5) check whether the feedback treated their answer style fairly.
Goal: AI Literacy	☒ Understanding AI concepts ☒ Using AI tools critically ☒ Evaluating AI outputs ☐ Building AI systems
Focus on Green Decision-Making	☒ Climate change ☒ Energy ☒ Materials/resources ☒ Biodiversity
Prerequisite Knowledge	Basic data literacy and familiarity with an LMS or rubric/AI-feedback tool.
Key Concepts	Learning analytics; formative feedback; structural uncertainty; automation bias; fairness. The five steps of this activity follow the 5E workflow: Engage → Explore → Explain → Elaborate → Evaluate (Bybee et al., 2006).

3. Design of the Student Assignment

Student Scenario / Assignment	Goal: to turn AI feedback on your own work into one justified improvement action. Context: you submit a short life-cycle comparison of two packaging materials to an AI feedback tool marked against the course rubric, and you
--------------------------------------	---



	receive its comments together with your own attempt count and time-on-task figures. Interpret both, decide what you will do differently next time, and state how you will know whether it worked.
Student Guidelines	Step 1 (Engage) – State which decision about your own work the feedback must inform. Step 2 (Explore) – State what each indicator actually measures and from what data. Step 3 (Explain) – Judge how certain it is and list at least two alternative explanations. Step 4 (Elaborate) – Decide one improvement action for the next submission and report why. Step 5 (Evaluate) – Set the re-check point and check whether the feedback was fair to your answer style and language.
Input Materials	☒ Dataset ☒ Dashboard/screenshot ☒ AI feedback sample ☐ Image/video
Expected Student Output	☐ Short report ☒ Decision matrix ☒ Presentation ☐ Working prototype
Submission Format	A one-page interpretation with an improvement decision per indicator, or a short presentation of the same.

4. Use of Artificial Intelligence and Sustainable Decision-Making

Recommended AI Tools	• LMS analytics – monitoring. • Rubric tools – explicit criteria. • AI feedback tools – immediate individualised response.
AI Prompt / Interaction Guide	Sample prompt (for an AI feedback tool): “Using the attached rubric, give formative feedback on this response, citing the rubric criterion for each comment; do not assign a grade.”
Critical Evaluation	Students judge whether the feedback on their work is accurate, rubric-aligned and fair across answer styles and languages; miscalibrated feedback is flagged for human review.
Human Decision Component	Students make the improvement decision about their own work; the AI informs, it does not decide.
Responsible AI / Ethics Note	Students are told what data is collected; contested scores have a human review route; tooling is proportionate to the need (Vinuesa et al., 2020).
AI Usage Log	A brief, four-part log: (1) How did AI contribute? (2) Which outputs were independently verified? (3) Which outputs were corrected or rejected? (4) What is the final decision and on what evidence does it rest?

5. Evaluation and Evidence

Evaluation Method	☒ Checklist ☒ Graded rubric ☒ Peer feedback ☒ Teacher assessment
Assessment Criteria	1. Disciplinary accuracy; 2. Evidence-based reasoning; 3. Critical and transparent use of AI; 4. Sustainability trade-offs; 5. Clear and human-driven final decision; 6. Fairness of the reading across answer styles and language, with a human review route.
Evidence to Be Collected	☒ Interpretation document ☒ Decision matrix ☒ Screenshot of AI feedback ☒ Peer-feedback form
Success Criteria	Sufficient performance on at least five of the six criteria; the final decision is made under human responsibility and supported by evidence-based justification.



Feedback Questions	1. Which indicator was most misleading, and why? 2. What decision did you make and how will you re-check it? 3. Where did the AI feedback need human correction?
---------------------------	--

6. Application Notes

Teacher Preparation	Review Subtopic 5.3; prepare an anonymised or simulated dashboard and an AI-feedback sample.
Time Schedule	Dashboard demo: 10 min Interpretation work: 30 min Presentations: 15 min Reflection: 5 min.
Accessibility / Inclusion	Provide indicators in written form; allow the most proficient language; avoid exposing real student identities.
Potential Risks	Over-trusting the dashboard; treating proxies as learning; unfair automated scoring.
Precautions / Contingency Plan	Use simulated data if real analytics are unavailable; require a human review route for any grade.

- Step-by-step implementation. The screenshots named below are captured by the teacher from the tool actually used and inserted before delivery.

Step	What the teacher does	What to capture as evidence
1. Prepare	Set up the AI feedback tool with the course rubric and run one anonymised sample submission through it before class.	Rubric file and sample output
2. Demonstrate	Project one feedback output and one analytics view; capture a screenshot of each and label what the indicator is built from.	Annotated screenshots
3. Run	Students submit their own short work, receive feedback and complete the four-question routine for each indicator.	Interpretation sheet
4. Review	Pairs challenge any reading of a proxy as learning.	Decision matrix
5. Close	Each student records one improvement action, its re-check date and the AI Usage Log.	Improvement action and AI Usage Log

Joint Completion Checklist

No.	Checkpoint	Completed
1	Each indicator is read as a model output, not a fact.	☐
2	What was actually measured is stated (proxy vs. learning).	☐
3	Certainty is judged over time and across measures.	☐
4	Alternative explanations are weighed.	☐
5	Each interpretation ends in an improvement decision.	☐



6	A fairness sample-check is planned.	☐
7	A human review route exists for contested scores.	☐
8	Data collection is transparent to students.	☐



References

- Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Carlson Powell, J., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins, effectiveness, and applications. BSCS.
- CBS News. (n.d.). Meet Khanmigo: The student tutor AI [Video]. 60 Minutes. [Publication date to be verified before release.] <https://www.youtube.com/watch?v=Ia3CPhVkUtg>
- Colchester, K., Hagra, H., Alhazzawi, D., & Aldabbagh, G. (2017). A survey of artificial intelligence techniques employed for adaptive educational systems within e-learning platforms. *Journal of Artificial Intelligence and Soft Computing Research*, 7(1), 47–64. <https://doi.org/10.1515/jaiscr-2017-0004>
- European Association of Technology Enhanced Learning. (n.d.). A gentle introduction to learning analytics. In DE-TEL open book. [Publication date to be verified before release.] <https://ea-tel.eu/detel-book/chapter/topics/learning-analytics/>
- Google. (n.d.). Teachable Machine [Web application]. [Publication date to be verified before release.] <https://teachablemachine.withgoogle.com/>
- Lang, C., Siemens, G., Wise, A. F., Gašević, D., & Merceron, A. (Eds.). (2022). The handbook of learning analytics (2nd ed.). Society for Learning Analytics Research. <https://doi.org/10.18608/hla22>
- Porayska-Pomsta, K. (2016). AI as a methodology for supporting educational praxis and teacher metacognition. *International Journal of Artificial Intelligence in Education*, 26(2), 679–700. <https://doi.org/10.1007/s40593-016-0101-4>
- Society for Learning Analytics Research. (n.d.). What is learning analytics? [Publication date to be verified before release.] <https://www.solaresearch.org/about/what-is-learning-analytics/>
- Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S. D., Tegmark, M., & Fuso Nerini, F. (2020). The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature Communications*, 11, 233. <https://doi.org/10.1038/s41467-019-14108-y>
- AIGUIDE Consortium (2026). Best Practices Report (WP2-A3). Erasmus+ project 2025-1-LT01-KA220-HED-000354784.

