SENAI Brazilian National Service for Industrial Training

Adaptive Learning in TVET

A INDÚSTRIA CRIA.
A INDÚSTRIA É MAIS.

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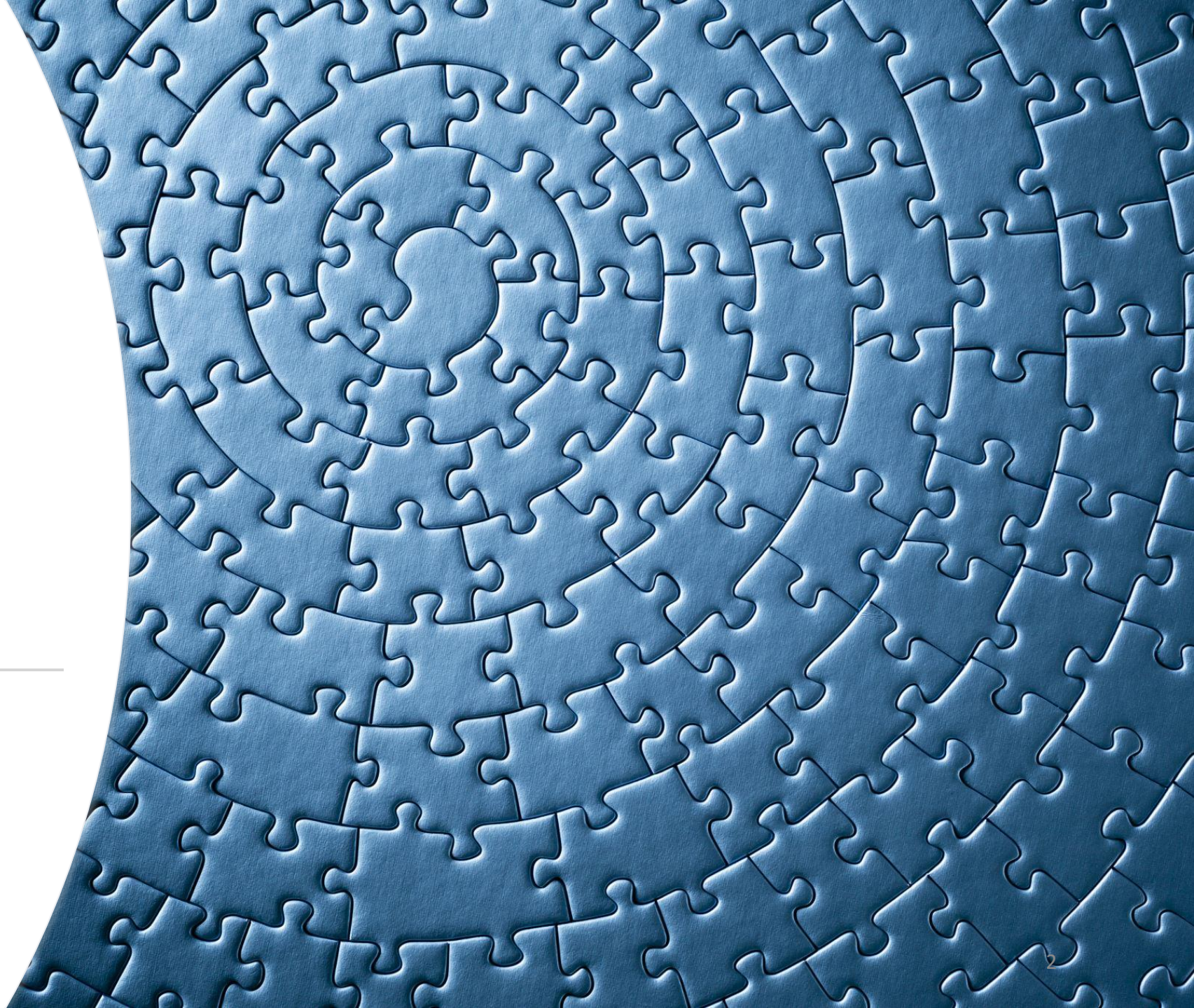
powered by CARNEGIE MELLON

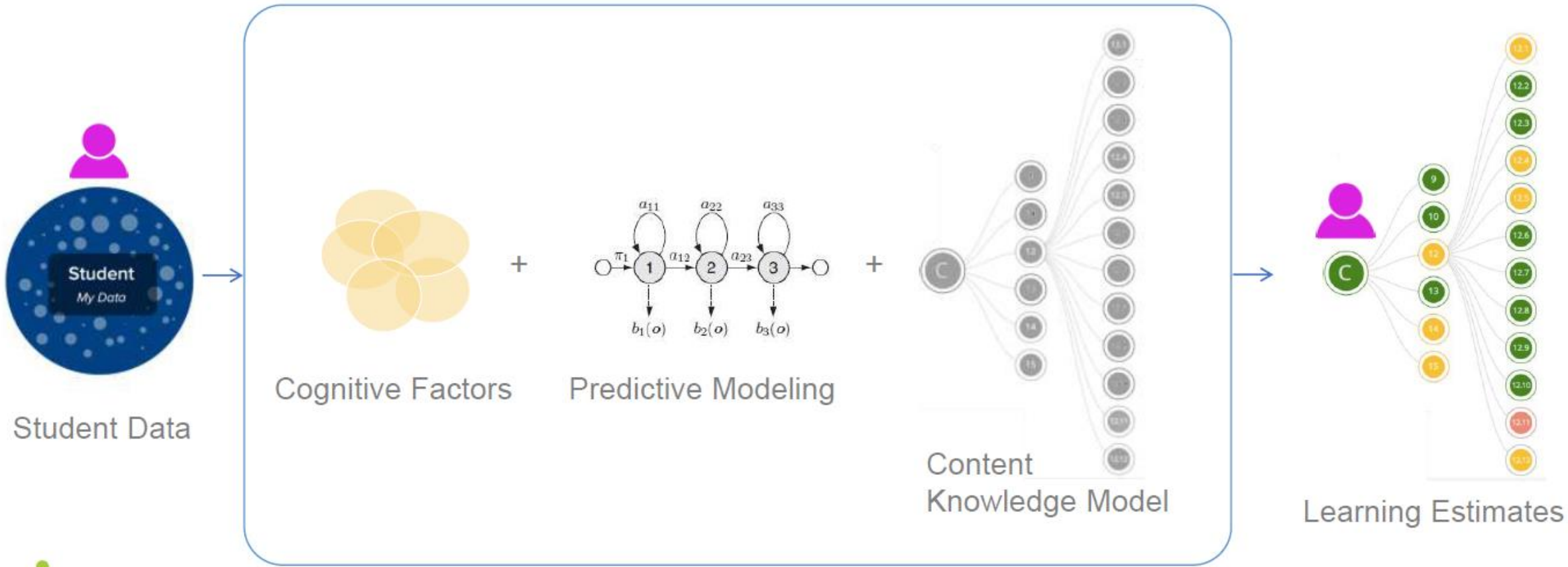
Concepts



Adaptive Learning is a modern and sophisticated learning system that seeks to meet students' individual needs on a large scale (Weber, 2012; Capuano et al., 2020; SENAI, 2020).

From Data Points to Insights

Millions of data points are modeled against course outcomes or goals to predict level of learning for each.



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Which students are struggling?

PIVOT

- Learning Objectives
- Students

One learning objective at time

LEARNING OBJECTIVES

- All Learning Objectives
- Select Learning Objective(s)

LEARNING ESTIMATE

- All estimates
- High
- Moderate
- Low

AVAILABLE PRACTICE (% OPPORTUNITY)

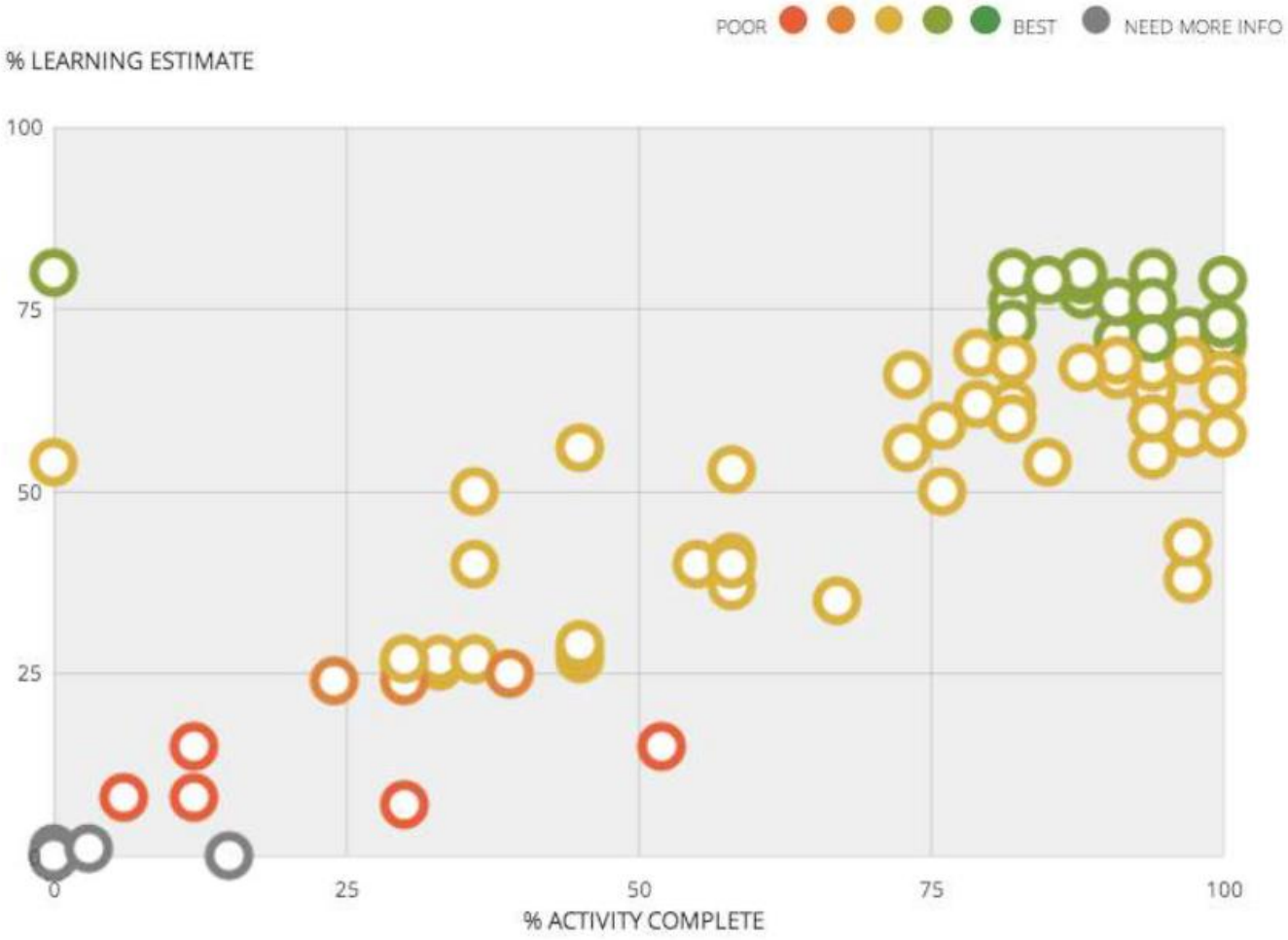
- All ranges
- > 75%
- > 50 - 75%
- > 25 - 50%
- 0 - 25%

POPULATION

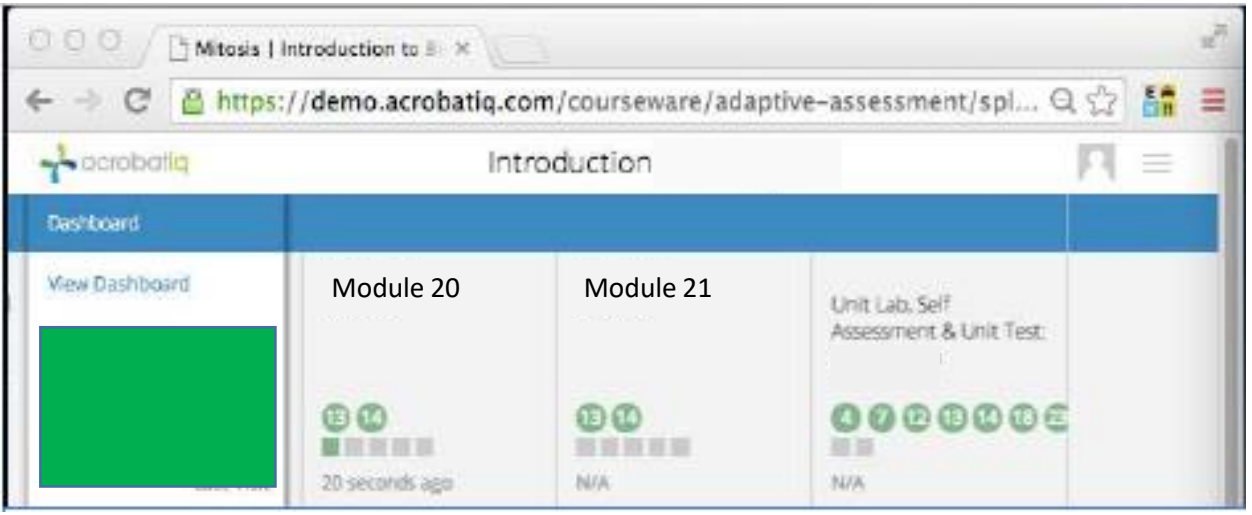
- All Students
- Select Students

TIME PARAMETERS

Last 7 Days



Data combines learning and participation to provide **better insight and guide instructors** to the most helpful interventions.



Student A has high learning estimates in the Module, and is directed to the key question

Student B has low learning estimates and is supported on the same key issue by presenting questions and hints linked to skills he needs help with.

Better insights help scale student support services

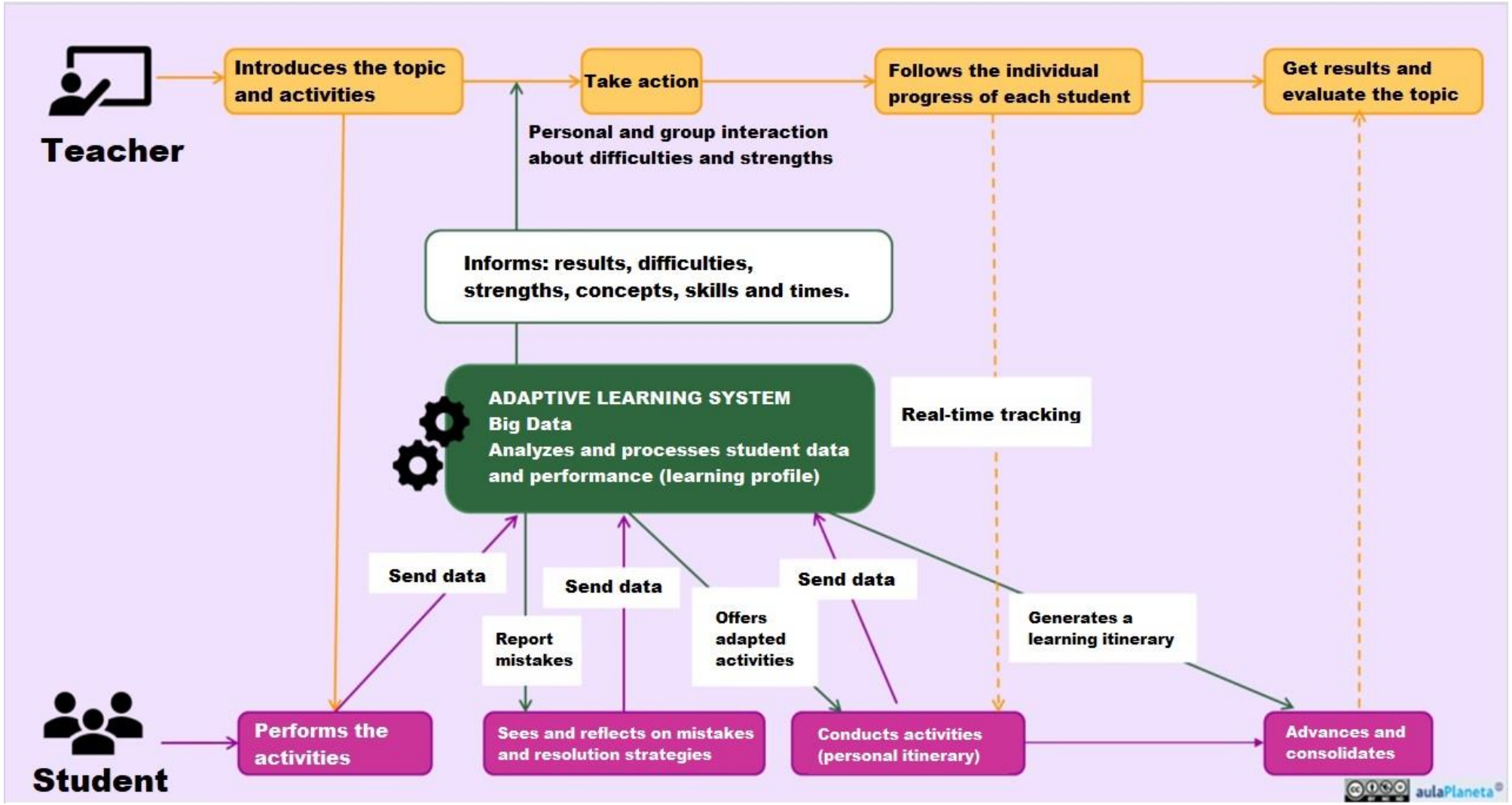
- Identifying at-risk students
- Intervening sooner
- Personalized (more efficient) sessions
- Recommending actions for students and instructors
- Just-in-time remediation and extra practice
- Direct help to the point of greatest need

Case Study

Get the thesis & poster here

Adaptive Learning platform in vocational education: a hybrid learning format

Integrated with problem-based learning situations and practical activities in the workshops.

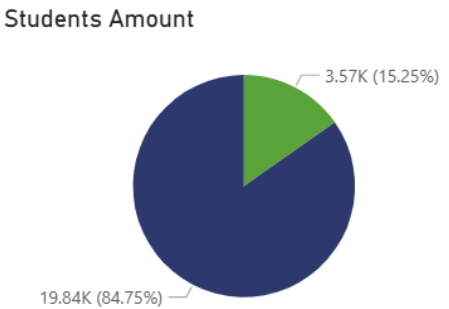


The data collection

2020 to **2023**

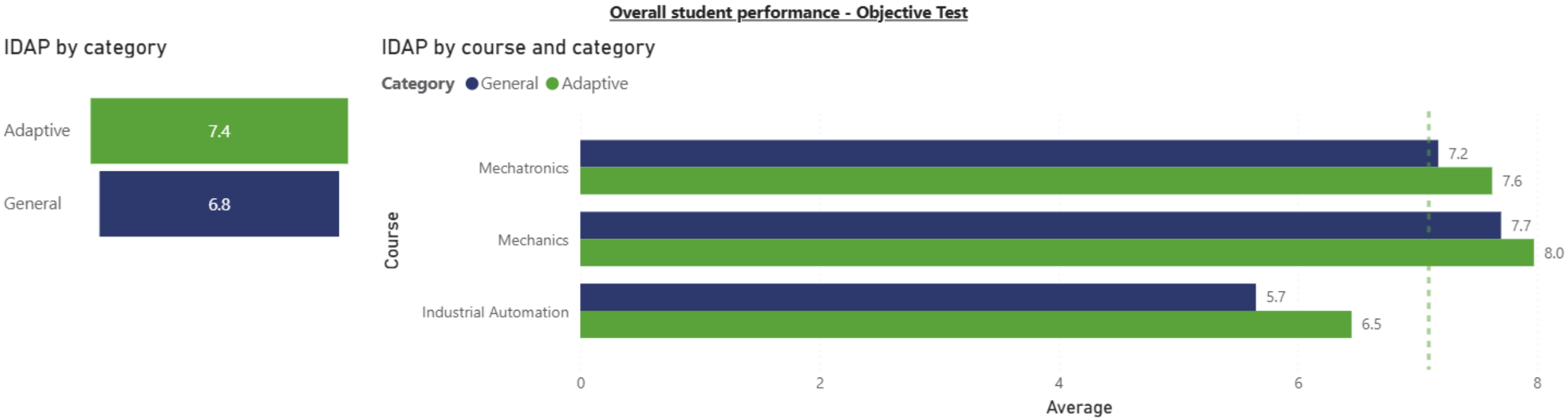
3,569 students used Adaptive Learning **19,840** used traditional teaching methods.

Mechanics, **Automation**, and **Mechatronics** technical courses



Final performance results in Adaptive vs Traditional - objective test

Professional Assessment Performance Index (IDAP)

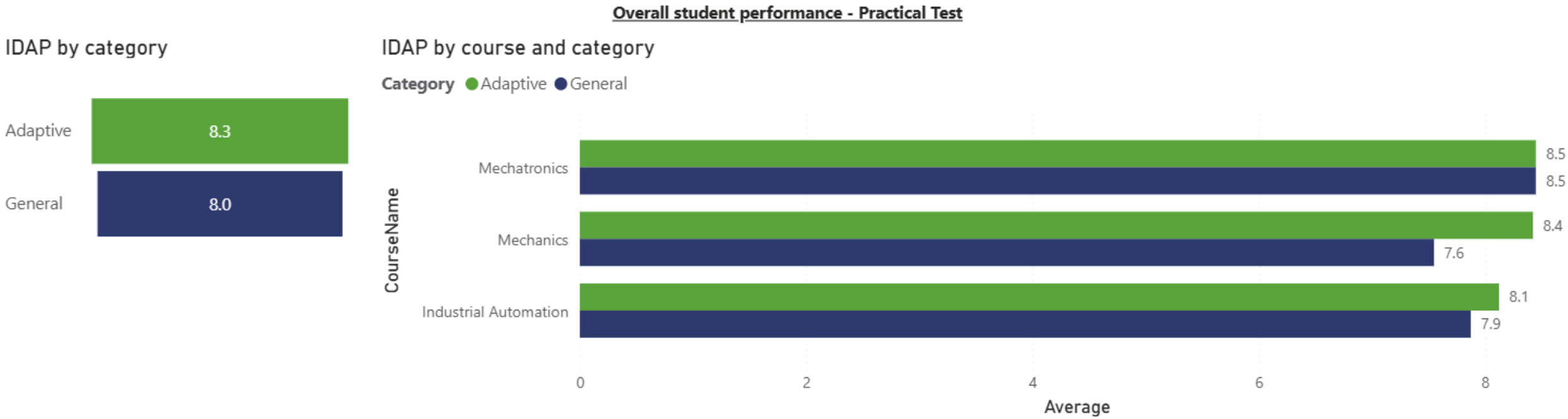


Final performance results in Adaptive vs Traditional - Total Average

Final performance results in Adaptive vs Traditional Total Average per course.

Final performance results in Adaptive vs Traditional - practical test

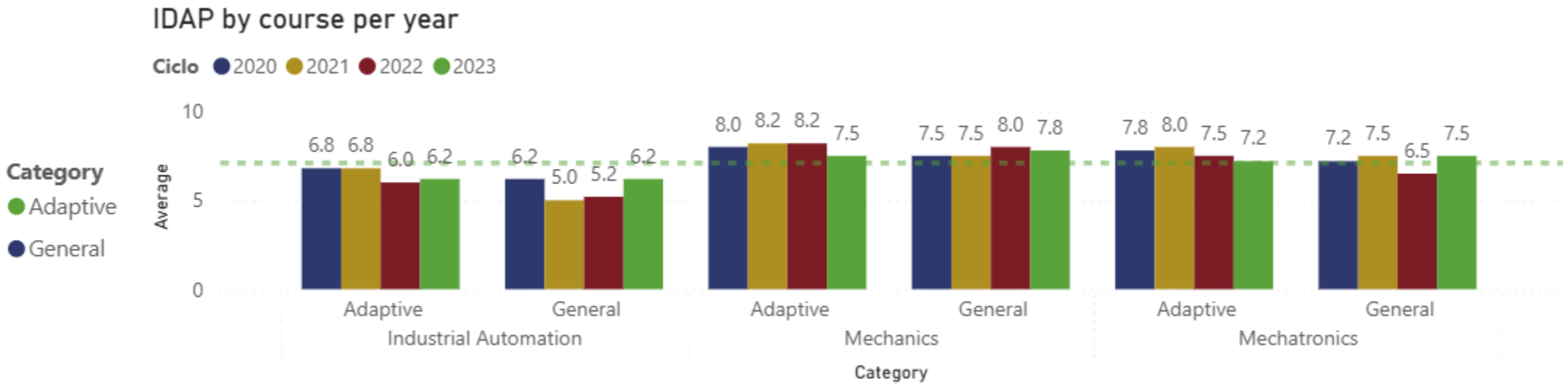
Professional Assessment Performance Index (IDAP)



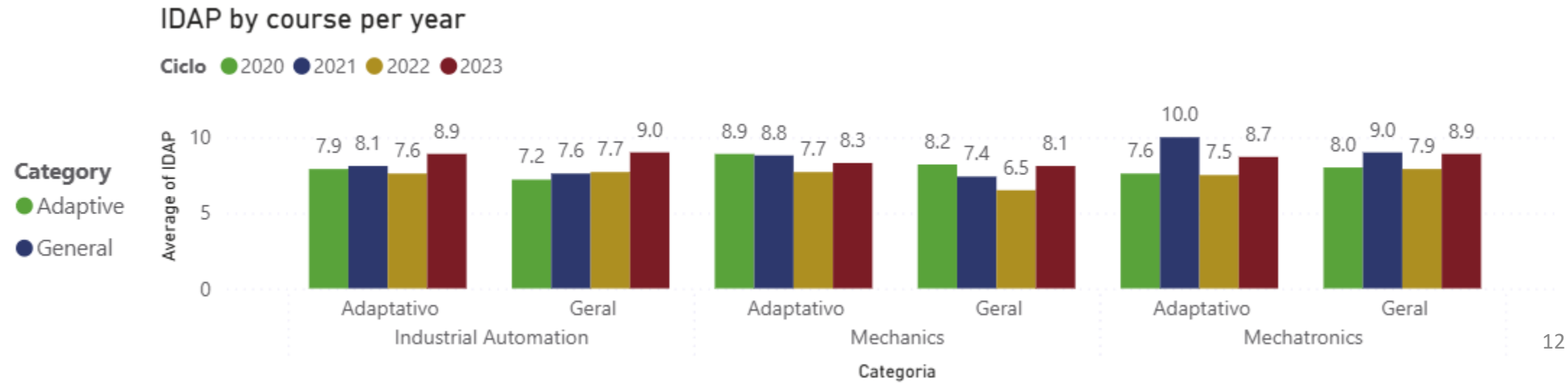
Final performance results in Adaptive vs Traditional - Total Average

Final performance results in Adaptive vs Traditional Total Average per course.

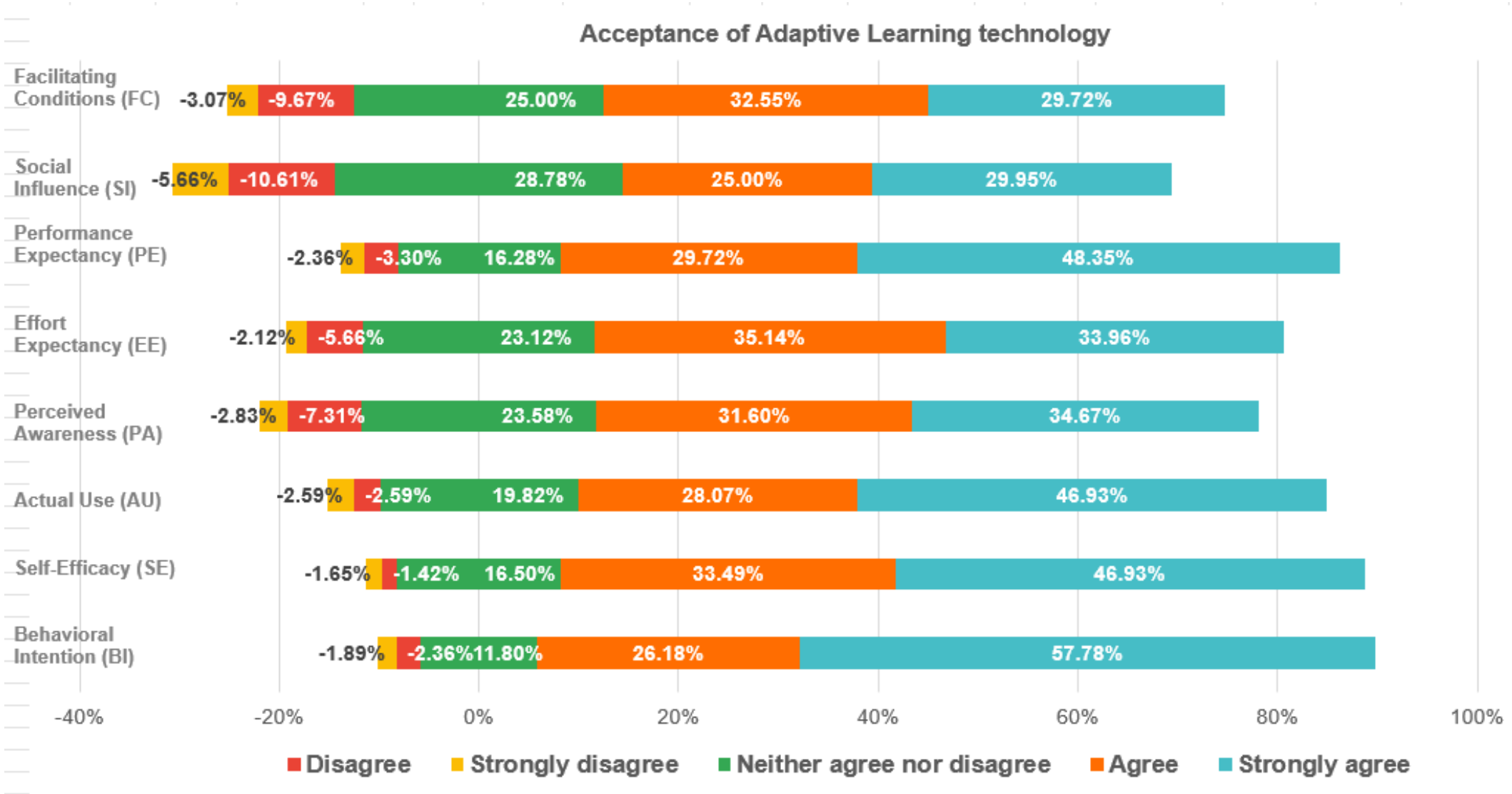
Results in Adaptive vs Traditional - objective test (per year)



Results in Adaptive vs Traditional - practical test (per year)



Results of Adaptive Learning acceptance by students in TVET Courses



A quantitative survey was applied to **212 students** based on the **Unified Theory of Acceptance and Use of Technology** (UTAUT)

Key takeaways (and reflections)

. The results indicated the success of implementing Adaptive Learning technology in TVET.

. There is good acceptance and motivation among students to use Adaptive Learning technology in TVET.

. Hybrid learning methodology works in TVET.

. Course development becomes more expensive because teachers must develop different types of resources (audio, video, text, storytelling, etc.) for the same learning objective (to offer adaptive learning paths to students based on their performance). Furthermore, it is necessary to develop a large number of assessment items (quizzes) for each learning objective, which also requires significant effort from teachers.

. To provide predictive analysis and offer adaptive learning paths, students must answer quizzes for each learning objective. This makes learning process boring (feedback from some students).

. Adaptive learning technology offers greater advantages for students who require greater learning support. It does not offer significant benefits for students who learn more easily (in terms of cognitive aspects).

. In our experience, we have adapted the entire course to the adaptive format. Now, we see that the best approach is to use this resource only in the introductory course modules (reducing development effort and investment) to ensure that students master the fundamentals required for specific modules.

. Teachers had difficulties in dealing with data analysis.

. New teacher profile, which uses AI and data to guide the teaching-learning process.

. Recommended solution for large classes of students where the teacher needs support to keep track of these students (creating a personalized individual path at scale).

Thank you!

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