

NOLAI | REFERENCE FRAMEWORK 2022

This reference framework provides guidance for shaping NOLAI's question-forming process and co-creation programme. We update the reference framework every year based on new insights and developments. Questions? Feel free to send an email nolai@ru.nl. You can read more about us at www.nolai.nl.

Why use a reference framework?

School administrators, school leaders, teachers, teacher trainers, academics and people from the business community work together to improve primary and secondary (special) education through AI in NOLAI. This requires a common language.

Shared starting point

We develop intelligent educational innovations with the aim of improving the quality of primary and secondary education using AI. Using AI supports and strengthens teachers' roles, and promotes equal opportunities for every student.

Our main questions

Students learning and teachers teaching form the founding principles for NOLAI and its partners. Together, we answer the following questions:

1. How does the technology work? Or, rather, how does the smart technology work?
2. What does the technology have to offer? In other words, what forms of adaptivity are possible using smart technology?
3. Who is in charge? Or, to what extent is the teacher and/or smart technology in charge?

Question 1 | How does the technology work?

The way the AI works is the starting point for existing technologies and technologies to be developed. We generally distinguish between three components performed in conjunction:

Detecting Interpreting Actions

- *Detecting* data in smart technologies. For example, a student's response to a question.
- *Interpreting* of detected data in smart technologies, based on key elements. Think of vocabulary, for example.
- *Translating* an interpretation into useful information for students, teachers and/or actions. Think of feedback or a dashboard, for example.

Question 2 | What does technology offer?

Smart technology deployed for learners, teachers and/or actions differs in how it meets the targeted student learning needs (adaptivity).

Different kinds of adaptivity

Smart technologies can offer one specific form of adaptivity or a combination.

- *Step* | Feedback within a task performed by the student.
- *Task* | Selection of the most appropriate next task for the student.
- *Curriculum* | The learning path is selected along with the associated learning objectives for the student.

Different learning roles

These forms of adaptivity can also be focused on the various learning functions: knowledge (cognitive), self-regulation (metacognitive), emotion (affective) and motivation. Current technologies tend to focus on knowledge, particularly on aspects within structured domains, such as numeracy, spelling, reading and mathematics.

Question 3 | Who is in charge?

One characteristic of intelligent technologies is that the roles of AI and humans shift. The ideal 'Every student has their own tutor' has long been central to how we think about AI in education. This may have given the impression that the teacher can be replaced by technology.

Human intelligence

- creative thinking
- solving problems together
- connecting and interpreting different perspectives

Artificial intelligence

- quick data analysis
- classifying certain behaviour
- diagnosing knowledge
- proposing appropriate actions

Levels in hybrid intelligence

There are various possible combinations of human and artificial intelligence. At one extreme, the teacher controls and monitors the smart technology. At the other extreme, smart technology operates autonomously. Four other levels of control and monitoring can be identified in between these.

Level 1 | no support at all

The teacher acts independently, without the support or intervention of smart technology.

Level 2 | teacher support

The teacher receives additional information from the learning tool, but the smart technology does not act independently.

Level 3 | partially automated

Smart technology takes over small tasks from the teacher. The smart technology performs a specific form of adaptivity.

Level 4 | conditionally automated

The smart technology performs a wider set of tasks, and it monitors the teacher when additional human actions are needed. In doing so, the smart technology combines several forms of adaptivity.

Level 5 | highly automated

The smart technology acts largely independently, but it asks the teacher for input or additional information as necessary. Different forms of adaptivity can be provided without teacher intervention.

Level 6 | fully automated

Smart technology acts independently, without any intervention from the teacher.

Sources

A detailed explanation of these models can be found in these two publications:

- Molenaar, I. (2022). Towards hybrid human-AI learning technologies, European Journal of Education, online first
- Molenaar, I. (2021). Personalization of learning: Towards hybrid human-AI learning technologies. In OECD digital education outlook 2021: Pushing the frontiers with AI, blockchain, and robots (pp. 57-77). OECD Publishing