# Holistic digital-assisted learning flow

*CONTEMPORARY PSYCHOLOGY DOMAINS*

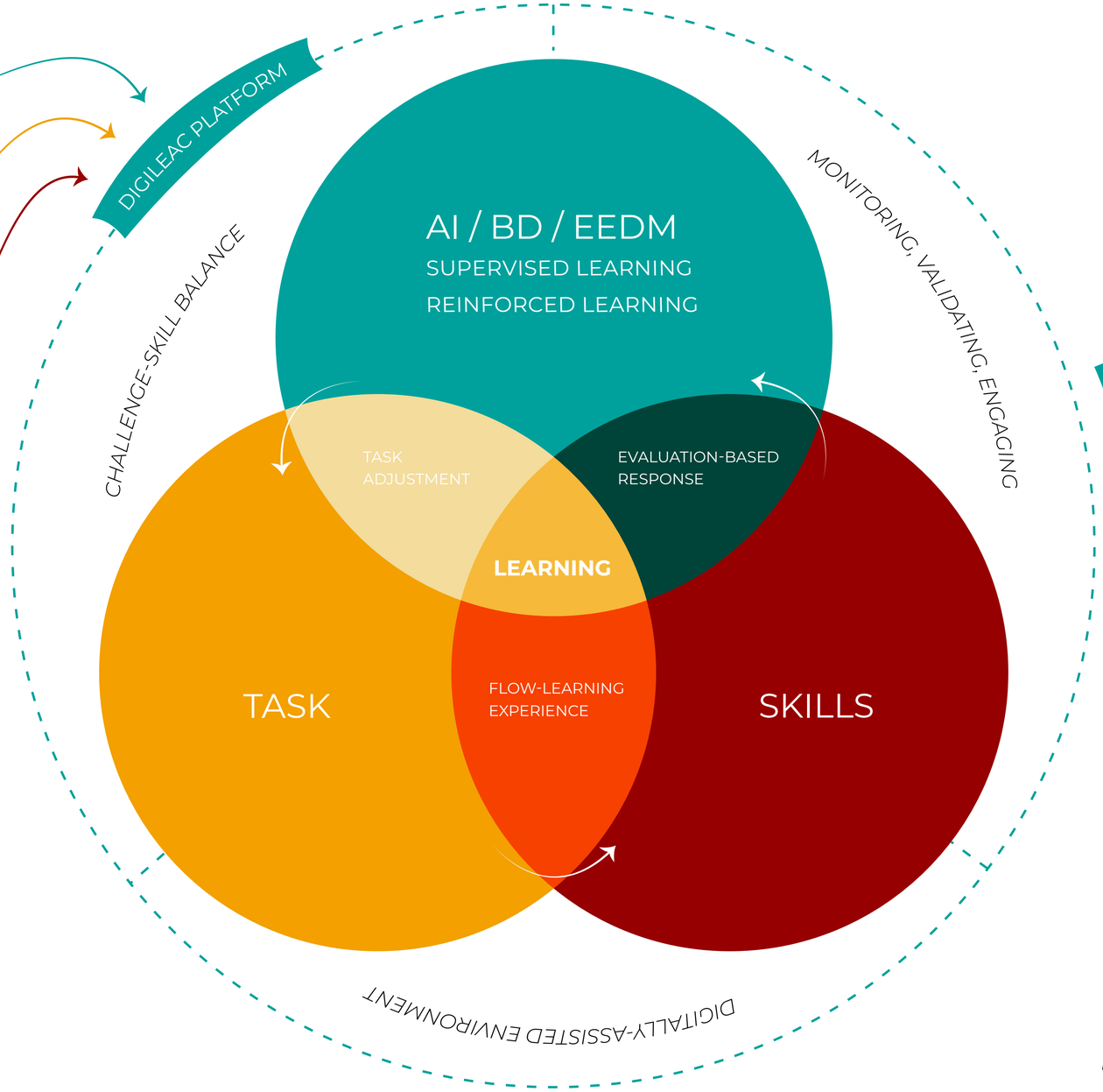
Tailored teaching methods and learning materials to provide an engaging and effective learning experience. Promotion of deep learning and long-term keeping of acquired knowledge.

*SERIOUS GAMES AND GAMIFICACION*

Game design elements enhance learning and create an immersive and interactive environment. Pupils participate with serious games and gamification actively in the learning process and develop skills and knowledge in a meaningful and entertaining ways.

*CURRICULA*

Setting the core values, objectives, and desired impacts for pupils. The comprehensive framework outlines the content, materials and methods to be used to achieve these goals as well as knowledge and skills pupils will acquire and how they are assessed.



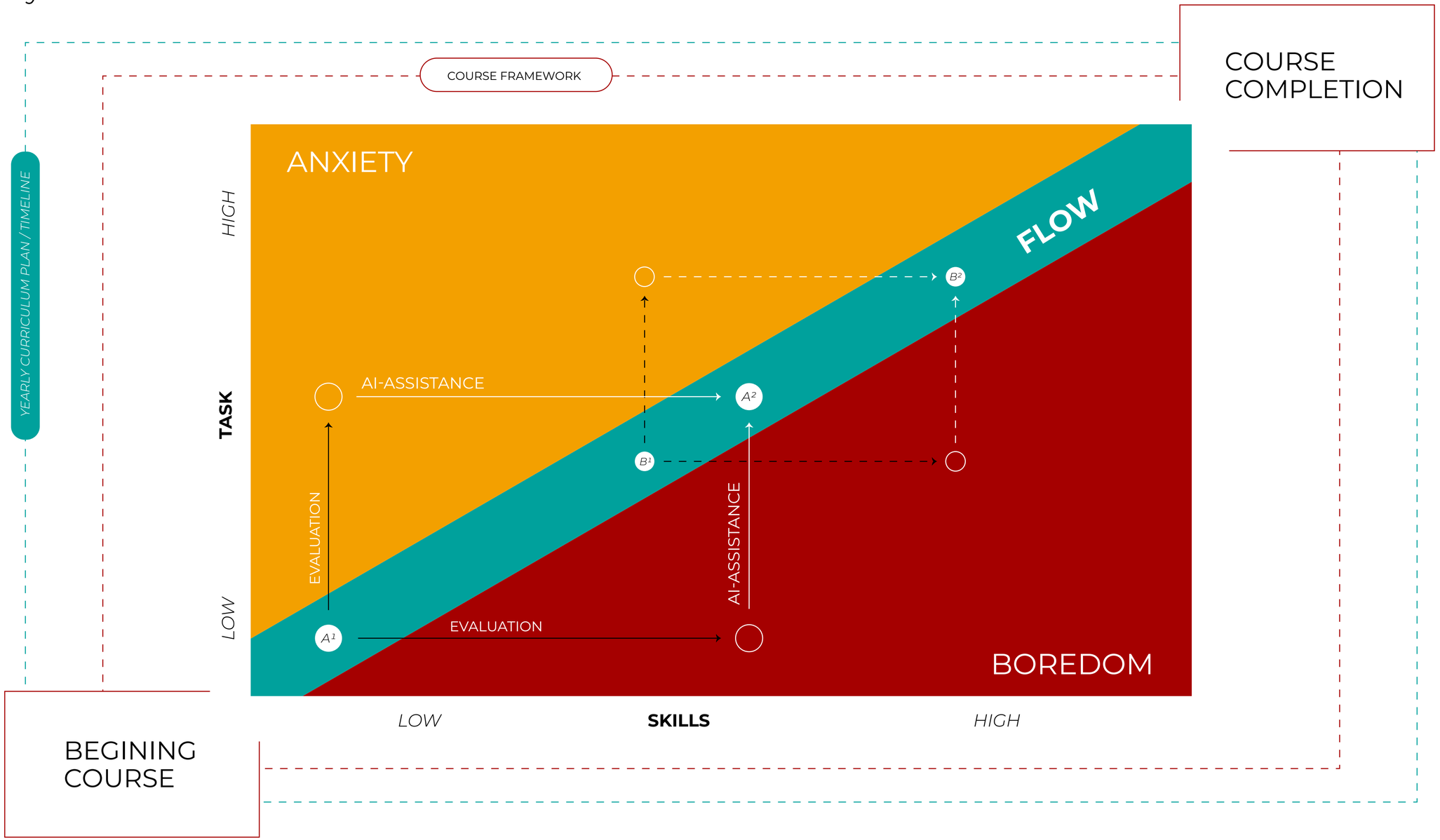

OUTCOME

**Holistic achievement of curriculum goals** facilitated by digitally-assisted learning framework. It offers tasks tailored to each pupil's improving skills to foster their motivation and satisfaction in learning.

*AI: Artificial intelligence*
*BD: Big Data*
*EEDM : Ethical educational data mining*

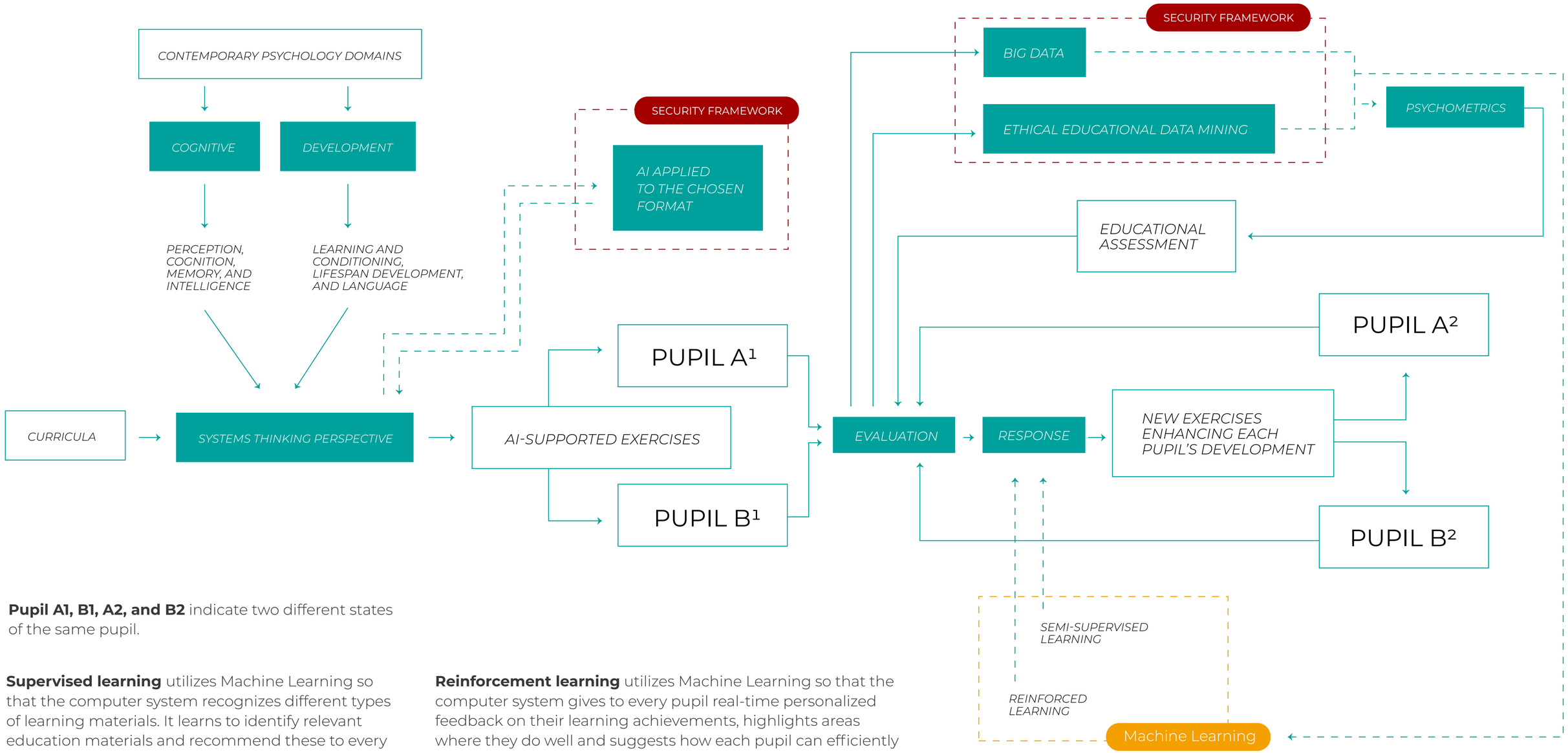
*Digitally-assisted learning environment combines the natural neuro-cognitive system of pupils with the artificial computational system of machines.*

# Digitally-assisted flow scheme




**A1, B1, A2, and B2** indicate two different states of the same pupil.

# Digitally-assisted holistic learning scheme

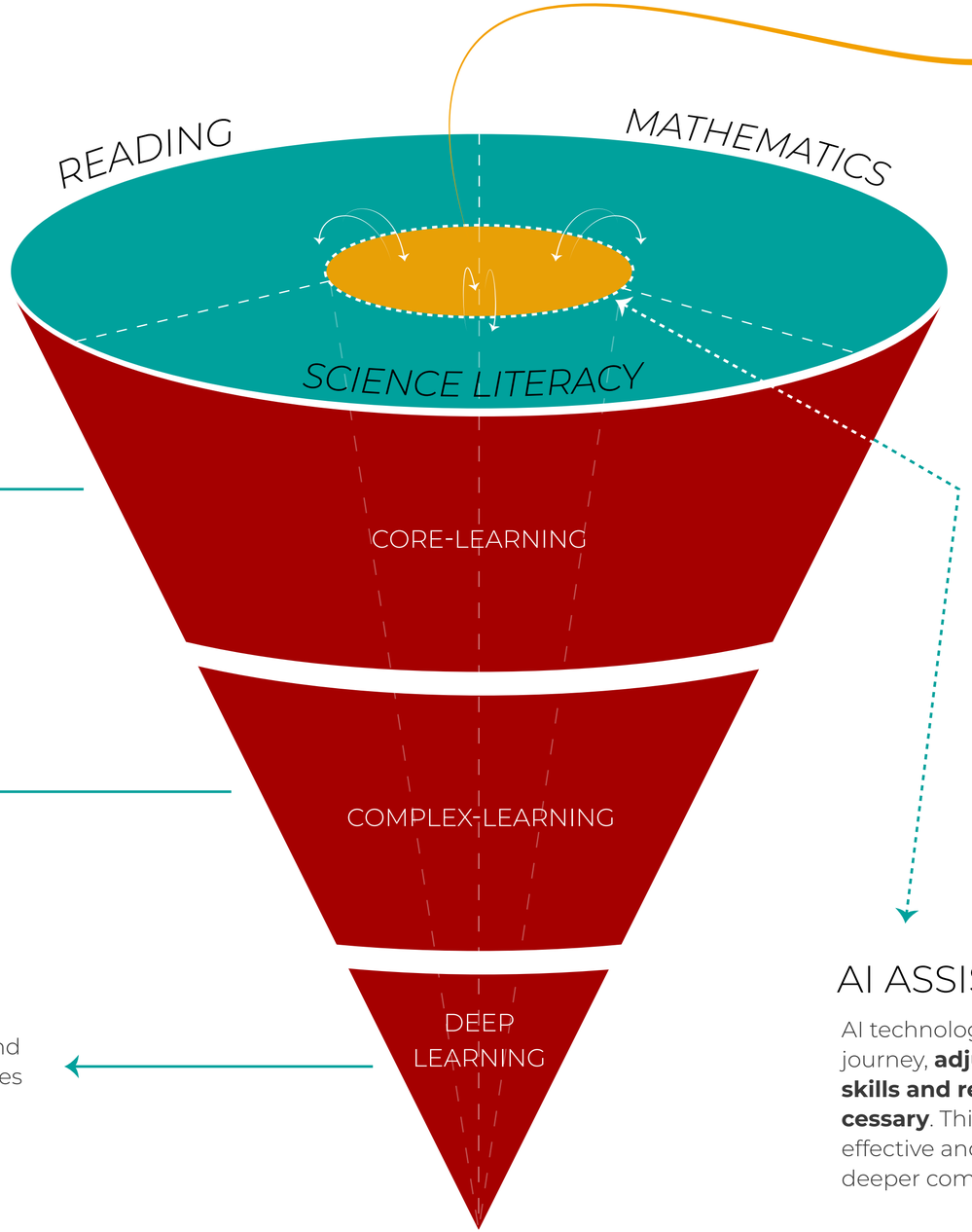



**Pupil A1, B1, A2, and B2** indicate two different states of the same pupil.

**Supervised learning** utilizes Machine Learning so that the computer system recognizes different types of learning materials. It learns to identify relevant education materials and recommend these to every pupil according to their individual learning needs.

**Reinforcement learning** utilizes Machine Learning so that the computer system gives to every pupil real-time personalized feedback on their learning achievements, highlights areas where they do well and suggests how each pupil can efficiently progress in education.

# Equalizing digital assisted curricula scheme




## CORE-LEARNING

Every pupil will have a secured knowledge baseline that covers the core objectives and values in the most basic form. This stage provides a solid foundation for further learning and ensures that all students have a common understanding of the topic.

## COMPLEX-LEARNING

Allows students to delve deeper into the same knowledge but in more complex ways. Here, students can explore the topic in more detail, apply their skills to practical problems, and develop a deeper understanding of the subject matter.

## DEEP-LEARNING

For the most advanced students, the cone's tip represents proficiency levels where they can apply their knowledge and skills in sophisticated ways. This stage provides opportunities for students to develop mastery in their field, pursue independent research projects, and prepare for advanced studies or careers in the field. The goal is to challenge and inspire students to reach their full potential.

## BIG DATA AND ETHICAL EDUCATIONAL DATA MINING

**Pupil data**, such as geographical location, age, and development progress, will be stored in a big data system and used for ethical educational data mining. **This information will be provided to the AI and ML systems to determine if a new approach is needed**. For instance, when the system identifies the geographical location of a student in Egypt, the language exercises will be adapted accordingly to align with their cultural standards, while maintaining the core educational objectives using AI.

The more exposure to AI, the more accurate and personalized exercises can be provided, as it can **identify micro differences such as psychological developmental levels and adjust the content to the most efficient way** of teaching at that stage.

*REINFORCED LEARNING*

*SEMI-SUPERVISED LEARNING*

## AI ASSISTANCE

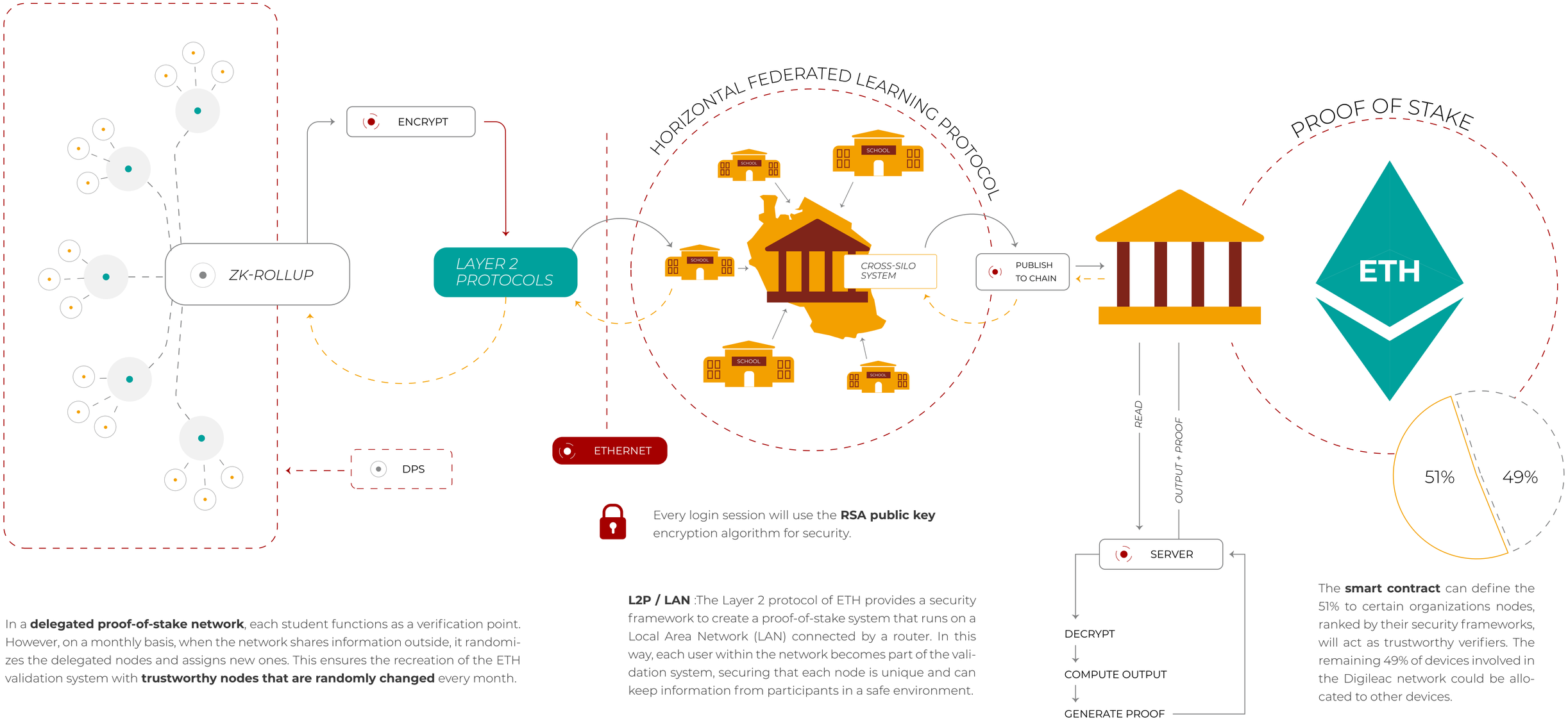
AI technology is integrated to assist the student's learning journey, **adjusting the level of difficulty based on their skills and recognizing when additional support is necessary**. This self-tailored approach allows for a more effective and engaging learning experience, leading to deeper comprehension and retention of the topic.

# Security and data transmission chart

A **ZK-rollup chain is a protocol that operates off-chain**, utilizing on-chain Ethereum smart contracts and built on top of the Ethereum blockchain. This protocol can compress data up to 8 times, providing scalability benefits.

With the **Cross-silo system** (Fachola Christian 2023), each institution will share the same data schema, sharing the same attributes for pupils and courses, which will secure an optimal standard for analysis baseline.

Using the **ETH blockchain**, the main institution can set a smart contract that defines different parameters to ensure that information behaves in a specific way across different layers and specifies which institutions will have access to it.



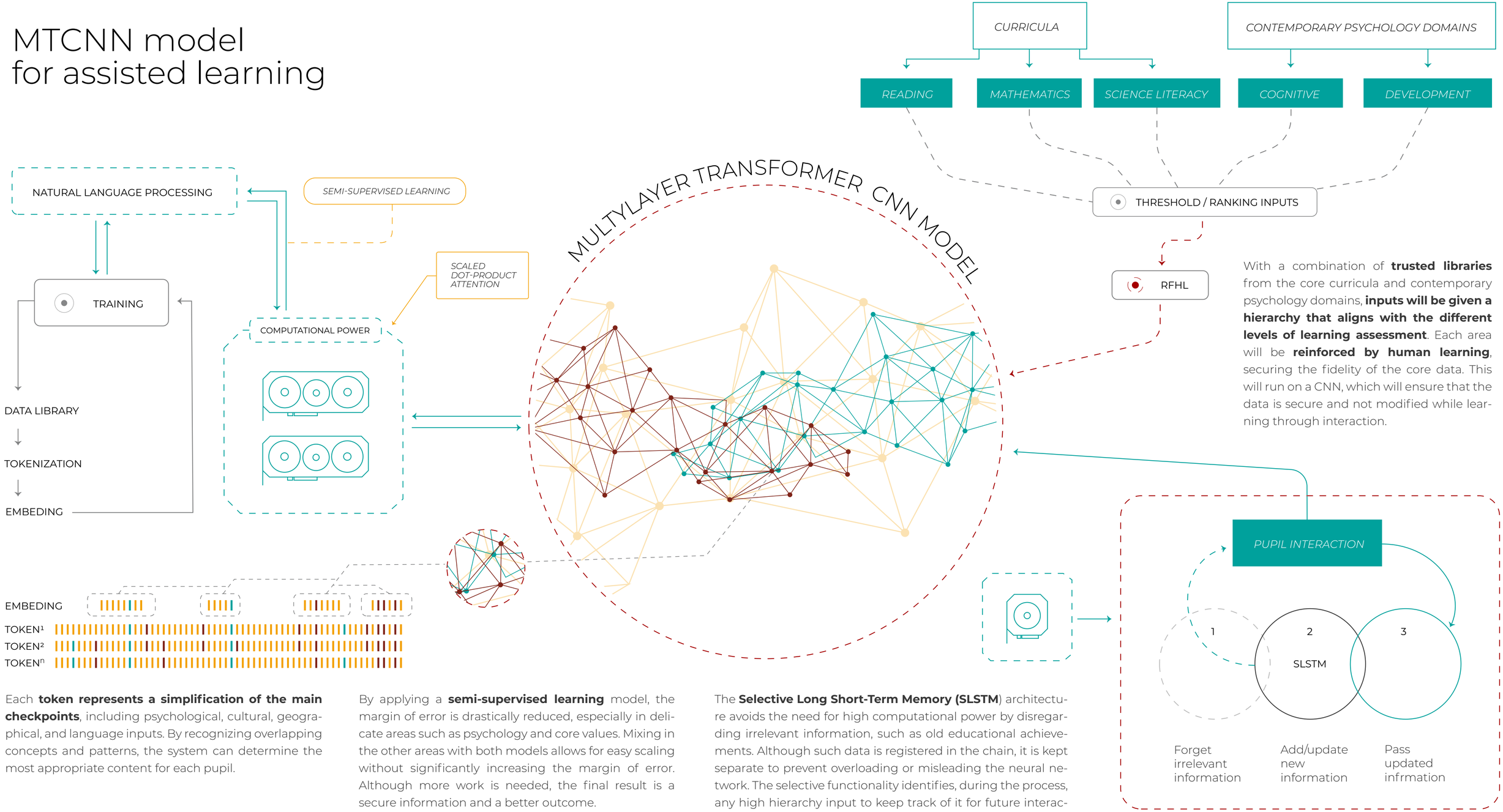

Every login session will use the **RSA public key** encryption algorithm for security.

In a **delegated proof-of-stake network**, each student functions as a verification point. However, on a monthly basis, when the network shares information outside, it randomizes the delegated nodes and assigns new ones. This ensures the recreation of the ETH validation system with **trustworthy nodes that are randomly changed** every month.

**L2P / LAN** :The Layer 2 protocol of ETH provides a security framework to create a proof-of-stake system that runs on a Local Area Network (LAN) connected by a router. In this way, each user within the network becomes part of the validation system, securing that each node is unique and can keep information from participants in a safe environment.

The **smart contract** can define the 51% to certain organizations nodes, ranked by their security frameworks, will act as trustworthy verifiers. The remaining 49% of devices involved in the Digileac network could be allocated to other devices.

# MTCNN model for assisted learning




With a combination of **trusted libraries** from the core curricula and contemporary psychology domains, **inputs will be given a hierarchy that aligns with the different levels of learning assessment**. Each area will be **reinforced by human learning**, securing the fidelity of the core data. This will run on a CNN, which will ensure that the data is secure and not modified while learning through interaction.

Each **token represents a simplification of the main checkpoints**, including psychological, cultural, geographical, and language inputs. By recognizing overlapping concepts and patterns, the system can determine the most appropriate content for each pupil.

By applying a **semi-supervised learning** model, the margin of error is drastically reduced, especially in delicate areas such as psychology and core values. Mixing in the other areas with both models allows for easy scaling without significantly increasing the margin of error. Although more work is needed, the final result is a secure information and a better outcome.

The **Selective Long Short-Term Memory (SLSTM)** architecture avoids the need for high computational power by disregarding irrelevant information, such as old educational achievements. Although such data is registered in the chain, it is kept separate to prevent overloading or misleading the neural network. The selective functionality identifies, during the process, any high hierarchy input to keep track of it for future interactions.