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EYE·TEACH

Deliverable D4.1

Ethics Regulations Report

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Table of Contents

Table of Contents 2
Executive Summary 4
Abbreviations 5
Introduction 6
Section I: Legal frameworks for privacy and data protection and ethical requirements for research involving human participants 8
1. European regulatory framework on data protection and privacy 8
1.1. Constitutional roots: from the European Convention to Union Treaties 8
1.2. The evolution of the data protection framework: from Directive 95/46/EC to the General Data Protection Regulation (GDPR) 9
1.3. Applicability of the GDPR to research activities involving human subjects 10
1.4. Soft law instruments and complementary regulations 12
1.5. Child data protection and national variations in the digital age of consent 14
1.6. Operational guidelines for EYE-TEACH partners on data protection compliance 15
2. Ethical guidelines for the protection of the rights of human research participants 17
2.1. Ethics in Social Sciences and Humanities 17
2.2. Informed consent 18
2.3. Protecting the rights of children participating in research 19
2.4. Ethical review of research projects 20
Section II: Guidelines and regulations for AI-based ET-analytics systems in education 24
3. European ethical guidelines on AI 24
3.1. Ethics Guidelines for Trustworthy Artificial Intelligence 24
3.2. Ethics By Design and Ethics of Use Approaches for Artificial Intelligence 26
3.3. Ethical guidelines on the use of AI and data in teaching and learning for educators 27
4. International standards on AI ethics 28
4.1. OECD AI Principles 28
4.2. UNICEF Policy Guidance on AI for Children 29
4.3. UNESCO Recommendation on the Ethics of Artificial Intelligence 30
5. The Artificial Intelligence Act 31

Conclusion **34**
References 36
Annex 1: EYE-TEACH Ethics self-assessment **39**
ALTAI REQUIREMENT #1 Human Agency and Oversight 40
ALTAI REQUIREMENT #2 Technical Robustness and Safety 44
ALTAI REQUIREMENT #3 Privacy and Data Governance 48
ALTAI REQUIREMENT #4 Transparency 53
ALTAI REQUIREMENT #5 Diversity, Non-discrimination and Fairness 56
ALTAI REQUIREMENT #6 Societal and Environmental Well-being 59
ALTAI REQUIREMENT #7 Accountability 61

Executive Summary

The deliverable D4.1 provides a comprehensive analysis of the key ethical guidelines and regulations that apply to the research activities of EYE-TEACH project, aimed at the development of an Artificial Intelligence (AI)-assisted eye-tracking (ET)-analytics tool for educational use. In particular, ethical and legal issues are related to (i) the processing of eye-traking data for training the AI pilot system and (ii) the involvement of human subjects, especially minors, in the project's experimental activities aimed at designing and evaluating the AI-assisted ET-analytics tool.

Abbreviations

AI	Artificial Intelligence
ET	Eye Tracking
ALTAI	Assessment List for Trustworthy Artificial Intelligence
FRIA	Fundamental Rights Impact Assessment
DPIA	Data Protection Impact Assessment
AI HLEG	High-Level Expert Group on Artificial Intelligence

Introduction

The EYE-TEACH project operates within a complex and rapidly evolving European regulatory context. The combination of eye-tracking (ET) technologies and artificial intelligence systems for educational support intersects with multiple regulatory areas, including personal data protection (GDPR), the recent regulation of AI (AI Act, EU Regulation 2024/1689), specific provisions on biometric data, and protocols for research involving vulnerable subjects, particularly minors.

These regulatory and ethical challenges are particularly relevant in the context of the EYE-TEACH project, given that processing of minors' biometric data through AI-based profiling systems presents a complex landscape from a data protection perspective. This requires the utmost rigour in applying the principles of ethics and privacy by design, algorithmic transparency, and informed consent. Furthermore, given the project's extensive use of AI technologies, the provisions of the AI Act (EU Regulation 2024/1689), which introduce a specific regulatory framework for the development and use of AI systems within the European Union, cannot be disregarded.

In response to this complexity, the EYE-TEACH project has established Work Package 4, which is entirely dedicated to developing a comprehensive ethical and legal framework for the responsible implementation of AI-assisted ET-analytics systems in the education sector. The mission of WP4 is to ensure the project's full regulatory compliance, develop specific protocols for the ethical treatment of biometric data from minors and create practical guidelines for educators, developers and policymakers.

This deliverable is the first result of WP4, providing the theoretical and regulatory foundations for all subsequent project activities. Through a systematic analysis of the European legal framework and ethical requirements for research involving human participants, the document sets out the principles and protocols that will ensure EYE-TEACH technologies are developed and implemented in full compliance with the highest European standards for protecting fundamental rights.

The deliverable is composed of two sections. **Section I** provides an overview of the normative frameworks in Europe and selected countries involved in the project (such as Italy, Spain, Finland, Belgium, the Netherlands, Germany, Poland, Malta) related to privacy and protection of biometric data, and specifically eye-tracking data.

Furthermore, national and international ethical guidelines are provided regarding strategies for protecting the rights of human participants, especially if minors, in experimental research activities. **Section II** discusses the overarching principles and ethical-legal requirements of the main European guidelines and regulations for the trustworthy development of AI systems. Furthermore, **Annex 1** provides the first version of the EYE-TEACH ethics self-assessment based on the Assessment List for Trustworthy Artificial Intelligence (ALTAI), a tool developed by the High-Level Expert Group on Artificial Intelligence (AI HLEG) of the European Commission. Following an ethics-and-privacy-by-design approach, this self-assessment aims to demonstrate how EYE-TEACH seeks to integrate ethical considerations from the outset and at every stage of project activities, identifying and mitigating the specific risks of using AI and ET technologies in educational contexts.

Section I: Legal frameworks for privacy and data protection and ethical requirements for research involving human participants

1. European regulatory framework on data protection and privacy

1.1. Constitutional roots: from the European Convention to Union Treaties

The protection of privacy and personal data in the European Union has its roots in fundamental principles consolidated in European human rights law. The starting point lies in Article 8 of the *European Convention for the Protection of Human Rights and Fundamental Freedoms* (ECHR), which establishes the "right to respect for private and family life". This fundamental principle has constituted the legal basis for the subsequent development of an increasingly articulated and specific regulatory corpus regarding the protection of personal data.

Furthermore, the *Charter of Fundamental Rights of the European Union* (Charter of Nice), proclaimed in 2000 and made legally binding by the *Treaty of Lisbon* in 2009, elevated the protection of personal data to an autonomous fundamental right. Articles 7 and 8 of the Charter represent the modern evolution of the privacy principles established in the ECHR:

- Article 7 – *Respect for private and family life*: takes up and consolidates the principle of Article 8 ECHR, guaranteeing every person's right to respect for their private and family life, home and communications.
- Article 8 – *Protection of personal data*: introduces a specific and autonomous right, establishing that "everyone has the right to the protection of personal data concerning him or her" and that "such data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law."

1.2. The evolution of the data protection framework: from Directive 95/46/EC to the General Data Protection Regulation (GDPR)

The need to harmonize national legislation on the protection of personal data, which emerged with the development of the internal market and the intensification of cross-border data flows, led to the adoption of *Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995* "on the protection of individuals with regard to the processing of personal data and on the free movement of such data". This directive represented the first systematic attempt to create a common regulatory framework for all Member States, establishing fundamental principles that would later be refined in the GDPR: principles of lawfulness of processing, specified purposes, proportionality, accuracy and limited storage.

The technological acceleration of the 2000s highlighted the inadequacy of the existing regulatory framework, leading to the adoption of *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 (GDPR)*, which came into effect on 25 May 2018. The GDPR is the cornerstone of data protection law across Europe and applies to any processing of personal data, including in research contexts. The GDPR introduces significant innovations: direct applicability in all Member States, strengthened principles (accountability, privacy by design and by default), enhanced rights (right to be forgotten, data portability), modernized governance (Data Protection Officer, impact assessments) and deterrent sanctions up to 4% of annual global turnover. Of particular relevance to the EYE-TEACH project are the following articles of the GDPR:

- Article 9 – *Special categories of personal data*: biometric data are classified as special categories, subject to enhanced protections and requiring specific conditions for processing;
- Article 8 – *Conditions applicable to child's consent*: establishes specific thresholds for the consent of minors in the context of the direct offer of information society services. "Information society service" means, according to Art. 4(25) GDPR and Art. 1(1)(b) of Directive 2015/1535, "any service normally provided for remuneration, at a distance, by electronic means and at the individual request of a recipient of services". In the EYE-TEACH context, it will be necessary to assess whether the developed system constitutes such a

type of service to determine the applicability of age thresholds (13–16 years depending on the Member State) or whether the general rules on consent of minors under national legislation apply;

- Article 22 – *Automated individual decision-making*: regulates profiling and decisions based solely on automated processing;
- Article 25 – *Data protection by design and by default*: requires the integration of data protection principles from the system design phase;
- Article 89 – *Safeguards and derogations relating to processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes*: establishes the specific framework for processing for scientific research purposes, providing for possible derogations from data subjects' rights provided that appropriate technical and organizational measures are implemented.

1.3. Applicability of the GDPR to research activities involving human subjects

The GDPR pays particular attention to processing for scientific research purposes, providing for derogations from certain rights of data subjects (such as the right of access, rectification, restriction and objection) while requiring, through Article 89, adequate safeguards through appropriate technical and organizational measures (such as, but not limited to, pseudonymization) when processing personal data for scientific research purposes, in particular to ensure the principle of data minimization according to Article 5 GDPR. Below are the most relevant provisions for the EYE-TEACH project.

Legal basis for research. Article 6 GDPR provides for various legal bases for the lawful processing of personal data. For public administrations (including universities and schools), the main legal basis is generally Article 6(1)(e) GDPR (performance of a task carried out in the public interest or in the exercise of official authority), while for private entities it may be Article 6(1)(f) GDPR (legitimate interests of the data controller), subject to balancing of interests assessment. However, in the specific case of the EYE-TEACH project, which involves the processing of specific biometric data additional to those normally collected for the performance of institutional school or university activities, the only applicable legal basis is consent according to Article 6(1)(a) GDPR. This principle applies to both public administrations and

private entities, since the research activity envisaged by the project is not essential for the performance of institutional tasks and requires the collection of types of data that would not otherwise be processed. However, the use of consent in the educational context presents significant criticalities arising from the imbalance of power existing between teachers/educational institutions and students, which may compromise the freedom of consent as required by Recital 43 of the GDPR and EDPB Guidelines 05/2020 on consent. Such issues can be mitigated through adequate transparency measures regarding the activities carried out, complete and understandable information on data subjects' rights, and above all the explicit and verifiable guarantee that refusal of consent does not entail any negative repercussions on the normal conduct of school activities or student evaluation.

Processing of special categories of personal data. Biometric eye-tracking data, classified as special categories according to Article 9(1) GDPR, are subject to a general prohibition on processing. To overcome this prohibition, it is necessary to resort to one of the derogations provided for in Article 9(2) GDPR, typically the explicit consent of the data subject (lett. a) or public interest for scientific research purposes (lett. j) with appropriate safeguards. In the specific context of the EYE-TEACH project, for the same reasons outlined in relation to the general legal basis, the applicable derogation will be that of explicit consent according to Article 9(2)(a) GDPR.

Principles of transparency and communication methods. The transparency obligations of the GDPR (Arts. 12-14) are of particular relevance in the educational context. Article 12, in particular, governs the methods for providing information to data subjects, requiring that this be provided in a concise, transparent, intelligible and easily accessible form, using clear and plain language, especially when the information is addressed specifically to children.

Accountability principle. Articles 5(2) and 24 GDPR establish the principle of accountability, requiring that the data controller be able to demonstrate compliance with the principles relating to processing and to implement appropriate technical and organizational measures to ensure and demonstrate that processing is carried out in accordance with the regulation. This requires complete and detailed documentation of all processing activities.

Data Protection Impact Assessments (DPIA). Pursuant to Article 35 GDPR, a DPIA is mandatory for processing operations that result in a high risk to the rights and

freedoms of natural persons. In the case of EYE-TEACH, which involves the processing of biometric data of minors through innovative technologies, the impact assessment must be conducted with the utmost care and attention, considering all possible risks but above all the impact these would have on the fundamental rights and freedoms of data subjects, should they materialize.

1.4. Soft law instruments and complementary regulations

The European data protection framework includes a set of non-binding rules developed by European supervisory authorities. These provide interpretative guidance and operational guidelines for applying the GDPR in specific contexts. In particular, the European Data Protection Board (EDPB) and its predecessor, the Working Party (WP29), have developed several guidelines that are particularly relevant to the EYE-TEACH project. These guidelines ensure the consistent application of the Regulation in all Member States, as required by Article 70 of the GDPR, and are generally followed by national supervisory authorities in their actions and decisions.

EDPB Guidelines 3/2019 on processing of personal data through video devices provide specific guidance on the processing of personal data through video acquisition devices and optical sensors. They explicitly clarify, through concrete examples, which biometric data fall within the category of special data according to Article 9 GDPR, and provide criteria for distinguishing between simple image recording and biometric data processing. In the context of the EYE-TEACH project, these guidelines are essential for correctly classifying eye-tracking data as biometric data, and for establishing the applicable principles for assessing proportionality, data minimisation, and the appropriate security measures for optical monitoring devices.

WP29 Guidelines on Data Protection Impact Assessment (DPIA) and determining whether processing is "likely to result in a high risk" for the purposes of Regulation 2016/679 (WP 248 rev.01) establish criteria for identifying processing that requires a data protection impact assessment and provide detailed methodologies for conducting it. For the EYE-TEACH project, these guidelines are essential, as it presents multiple high-risk factors, including the processing of biometric data (special categories), the involvement of minors, the use of innovative technologies and possible forms of automated profiling. The guidelines provide a methodology for systematically assessing these risks and identifying appropriate mitigation measures.

EDPB Guidelines 4/2019 on Article 25 Data Protection by Design and by Default detail the principles of data protection by design and by default, providing practical guidance on how to implement appropriate technical and organisational measures throughout the development lifecycle. For EYE-TEACH, these guidelines are crucial as they establish how to integrate data protection from the initial design phases of the system, including the selection of eye-tracking technologies, the design of AI algorithms, the definition of data architecture and the design of user interfaces. This ensures that privacy protection is incorporated by default into all system components.

EDPB Guidelines 05/2020 on consent under Regulation 2016/679 elaborate on the requirements for valid consent under the GDPR, paying particular attention to situations involving power imbalances and minors, as well as methods to ensure that consent is freely given, specific, informed and unambiguous. For EYE-TEACH, these guidelines are fundamental, as consent is the only applicable legal basis for processing the biometric data of students. The guidelines provide specific criteria to mitigate problems arising from power imbalances in an educational context, as well as offering guidance on how to structure appropriate consent processes for minors of different age groups.

WP29 Guidelines on Automated individual decision-making and Profiling for the purposes of Regulation 2016/679 (WP251rev.01) provide detailed guidance on processing involving automated decision-making processes and profiling activities. This includes criteria for identifying when such activities fall under Article 22 of the GDPR. For EYE-TEACH, these guidelines are relevant because the AI system analyses reading patterns to provide personalised feedback to teachers, which could potentially involve profiling students. The guidelines help determine when such profiling requires specific safeguards and how to implement adequate forms of human intervention.

EDPB Opinion 28/2024 on certain data protection aspects related to the processing of personal data in the context of AI models represents the most up-to-date and authoritative guidance on data protection aspects in the context of artificial intelligence. It addresses specific issues such as the application of GDPR principles to AI models, the processing of training data and the responsibilities of different actors in the AI development chain. For the EYE-TEACH project, this document is particularly relevant to the artificial intelligence component, as it provides

clarifications on how to correctly apply the GDPR when developing, training, and implementing AI systems that process the biometric data of students.

1.5. Child data protection and national variations in the digital age of consent

Article 8 of the GDPR establishes that the processing of children's personal data in relation to the direct offer of information society services is lawful where the child is at least **16 years old**. However, Member States may, by law, permit a lower age for these purposes, provided it is no less than **13 years old**. This flexibility has led to significant variations among the EYE-TEACH project partners' Member States, as documented by the EUConsent project[1], which provides a comprehensive overview of national regulatory choices in this area. In particular, the EYE-TEACH partner Member States have adopted the following thresholds.

Countries with threshold at **13 years**:

- **Belgium**: Article 7 of the Act of 30 July 2018 on the protection of natural persons with regard to the processing of personal data;
- **Finland**: Section 5 of the Data Protection Act (Tietosuojalaki 1050/2018);
- **Malta**: Subsidiary Legislation 586.11 – Processing of Child's Personal Data in Relation to the Offer of Information Society Services Regulations.

Countries with threshold at **14 years**:

- **Italy**: Article 2-quinquies of the Privacy Code (Legislative Decree 196/2003 as amended);
- **Spain**: Article 7.2 of the Organic Law 3/2018 on the Protection of Personal Data and Guarantee of Digital Rights (LOPDGDD).

Countries with threshold at **16 years**:

- **Netherlands**: Article 5 of the UAVG (Uitvoeringswet Algemene Verordening Gegevensbescherming);
- **Poland**: Act of 10 May 2018 on the Protection of Personal Data (Ustawa o ochronie danych osobowych).

[1] https://euconsent.eu/digital-age-of-consent-under-the-gdpr/

It is crucial to emphasize that these age thresholds apply exclusively to information society services, defined in Article 4(25) of the GDPR, which refers to Article 1(1)(b) of Directive (EU) 2015/1535. An information society service is any service normally provided for remuneration, at a distance, by electronic means and at the individual request of a recipient of services. This definition excludes numerous contexts of children's data processing relevant to EYE-TEACH, such as (i) scientific research in educational settings, (ii) health and psychological support services, and (iii) traditional school activities not delivered online. In such cases, general national laws on the legal capacity of minors continue to apply, creating potential complexities in the project implementation, as both GDPR thresholds for online services and specific national regulations for each processing context must be considered to ensure full regulatory compliance across all partner countries.

1.6. Operational guidelines for EYE-TEACH partners on data protection compliance

To ensure comprehensive GDPR compliance across all EYE-TEACH partner organizations, specific operational guidelines have been developed and distributed to all project participants. The *GDPR Compliance Guidelines and Requirements for Data Processing Activities* establish a systematic framework for managing personal data processing activities throughout the project lifecycle. The guidance document outlines seven essential steps that partners must progressively implement.

First, partners must identify all data processing activities within the project scope, distinguishing between primary processing (such as eye-tracking data collection during educational activities) and secondary processing (including dissemination and research activities). This mapping exercise ensures comprehensive coverage of all personal data flows.

Second, the document requires clear identification of each partner's role as either data controller or processor, with universities typically serving as joint controllers for the main research activities forecasted in the project, which involve biometric data collection and AI algorithm training.

Third, partners must map the complete data lifecycle from collection through anonymization or destruction, establishing clear responsibilities at each stage to ensure accountability and proper data governance.

Fourth and fifth, the guidelines mandate the establishment of formal agreements – both Joint Controller Agreements under Article 26 GDPR for partners acting as joint controllers, and Data Processing Agreements following European Commission standard contractual clauses for processor relationships.

Sixth, given the project's use of innovative eye-tracking technology and processing of minors' biometric data, partners must conduct comprehensive **Data Protection Impact Assessments (DPIAs)**. The guidelines recommend utilizing the Privacy Impact Assessment (PIA) tool developed by the French Data Protection Authority (CNIL), which provides a structured methodology for systematically evaluating privacy risks, assessing their likelihood and severity, and documenting mitigation measures. This software tool guides controllers through the entire DPIA process, ensuring compliance with Article 35 GDPR requirements. To facilitate this complex assessment, the WP4 coordinators will provide partners with a partially pre-completed DPIA template created using the PIA-CNIL tool, which can be imported and customized according to each institution's specific processing context.

Finally, partners must develop appropriate information notices and consent procedures tailored to the educational context, with particular attention to the power imbalance inherent in teacher-student relationships and the varying age thresholds for digital consent across member states.

These operational guidelines emphasize a pragmatic, step-by-step approach, allowing partners to address compliance requirements systematically while maintaining project momentum. The framework ensures that all EYE-TEACH partners, regardless of their specific role or jurisdiction, maintain consistent data protection standards that safeguard participants' rights while enabling the project's innovative research objectives.

2. Ethical guidelines for the protection of the rights of human research participants

Although documents such as the *Nuremberg Code* (1947), the *Declaration of Helsinki* (1964), the *Belmont Report* (1979), and the *International Ethical Guidelines for Biomedical Research Involving Human Subjects* (1982) originated in the biomedical field, they are relevant to research involving human subjects in the humanities and social sciences. They include fundamental ethical principles to regulate research with human subjects, such as avoiding unnecessary risks and harm, securing informed consent, confidentiality, and justice. However, research in the humanities and social sciences presents its own specificities. Consequently, the measures adopted to mitigate risks, disclose information, protect confidentiality and privacy, and ensure access to research might differ in important ways from those in biomedical contexts. Against this background over the years, national and European codes and guidelines have been developed to protect the rights and freedoms of research participants with a specific focus on the humanities and social sciences.

2.1. Ethics in Social Sciences and Humanities

Particularly relevant to EYE-TEACH's research activities is the document *Ethics in Social Science and Humanities Research*, published in 2021 by the European Commission to provide comprehensive ethical guidance for Social Sciences and Humanities (SSH) researchers, especially those involved in EU-funded projects. The primary objective of these guidelines is to support researchers in identifying and addressing ethical issues throughout the research process, ensuring compliance with EU principles and national laws, and safeguarding participants' rights and dignity. Its core ethical principles are:

- respect human dignity and integrity;
- guarantee honesty and transparency with research subjects;
- respect individual autonomy, obtaining free and informed consent (including assent in the case of minors);
- protect vulnerable individuals;
- guarantee privacy and confidentiality;
- promote justice and inclusion;
- minimize harm and maximize benefits;

- share benefits with disadvantaged populations, particularly if research is conducted in developing countries;
- respect and protect the environment and future generations.

The document emphasizes that it is essential to carefully consider the potential psychosocial consequences and risks (e.g., emotional, financial, or reputational harm) and to take measures to minimize the risks of participating in experimental activities. Particular attention must be paid to vulnerable individuals, whether due to their physical condition (e.g., children, people with cognitive disabilities or those unable to consent) or their background (e.g., refugees, irregular migrants, dissidents, traumatized individuals at risk of re-traumatization, individuals from conflict zones, victims of crime and/or violence, etc.).

Below we will focus on the main ethical principles and requirements applicable to EYE-TEACH research activities.

2.2. Informed consent

Obtaining informed consent is not only a legal obligation under the GDPR but also a fundamental ethical requirement in any research involving human participants and a commitment by researchers to transparency, fairness, and participant well-being.

Participants in research have a right to know how participation may impact them and how their data will be used, so they can voluntarily decide whether or not to participate, without coercion or manipulation. To be considered valid and ethically sound, informed consent must meet the following minimum criteria.

Voluntariness. Participation in research must be voluntary, and participants must be informed that they can withdraw their consent at any time, without having to provide a reason and without any penalty or negative consequences.

Informed Understanding. Participants must receive a clear explanation of the nature of the research, including at least: the objectives and methodologies that will be used in the research, as well as the participation modalities (e.g., interviews, surveys), so that they understand the time commitment and effort required. Furthermore, potential risks and inconveniences (physical, psychological, social, economic, legal, etc.) as well as the expected benefits, whether direct or indirect, must be explained. Finally, where applicable, the possibility of "incidental findings" (i.e., unexpected information with respect to the research's objectives) must be

clarified, describing the procedures envisaged for their management and possible communication to participants, should they so wish.

Documentation and format. Researchers must provide a written information sheet and consent form as a default standard. They must be written in the native language of the participants or their parents/legal guardians, especially if different from that of researchers and of the Country in which the study is being conducted, to ensure that participants can fully understand the research. The consent process should be adapted to the participants' literacy level, intellectual capacity, and sociocultural context. Especially in social science research, situations may arise where standard procedures for obtaining written informed consent are culturally inappropriate or may pose risks to participants. In such cases, oral consent or other alternative methods may be used, if justified and documented.

Transparency. Participants must be informed of all aspects of the research, including the research funding body, possible conflicts of interests, the beneficiaries of the results, and the contact person for questions or complaints. Furthermore, researchers must commit to confidentiality with participants and explain what will be done in the event of a breach or if they are legally required to disclose information they have learned, even unexpected ones (i.e., incidental findings).

2.3. Protecting the rights of children participating in research

Key ethical guidelines at the international level, such as the *UN Convention on the Rights of the Child* (1989), the EU *Ethics in Social Sciences and Humanities*, the EU *Ethics and Data Protection* (2021), and at the national level, such as the CNR *Child Protection Policy and Code of Conduct* (2016), emphasize the following ethical criteria for research involving children:

- balancing potential benefits with burdens on minors;
- limit children's involvement to scientifically relevant, high-quality studies;
- implement risk assessment and management procedures;
- provide dual consent: child's assent and parent/guardian's consent.

Consent procedures are critical when involving young children in research. While parents or legal guardians must provide their explicit consent, minors also should give their assent to participate in the study and their dissent should prevail over parental approval in research not meant to provide them any direct significant

benefit. The different developmental stages (infants, children, adolescents) can guide researchers to recognize the relevant capacities of minors with respect to voluntariness and informed understanding as defined above. Continuous monitoring of the capacities for assent/consent is necessary to identify any verbal or non-verbal cues that may indicate disagreement; and in long-term studies, if minors reach adulthood, a review of consent is required. Researchers should also communicate information on the study in a clear and age-appropriate way, using alternatives to written explanations (such as audio, video, graphics), if necessary.

Research involving minors in schools. When conducting studies on minors in schools, researchers should pay particular attention to specific risks that may arise. They should clearly explain to minors that opting out will have no impact on their academic performance or results, emphasizing the research's independence from the school and teacher evaluations. Especially in research on reading and comprehension skills, it is also important to avoid, starting from the study design, the risk of revealing individual students' performance, which could lead to psychological distress, stigma, or unhealthy competitive dynamics. Furthermore, the project's expected outcomes should specify whether the research has a direct or indirect benefit for participants, such as the possibility to use technologically advanced tools and receive personalized educational interventions to improve their reading and text comprehension skills in the future.

2.4. Ethical review of research projects

The main European research framework programmes (e.g., Horizon 2020, Horizon Europe) require ethical reviews for research projects involving higher-than-minimal risk. Ethics review is meant, primarily, to ensure compliance with the above-mentioned ethical guidelines and guiding principles of research ethics. Therefore, EYE-TEACH participates in an ethics review process led by the European Commission with experts appointed by it. This review will be conducted mid-project (M15) and at its conclusion (M36). EYE-TEACH has also established an ethics and legal advisory board composed by independent experts.

Furthermore, each task involving human participants will receive ethical approval from the ethics committee of the partner organization leading the experimental activity. In particular, the University of Antwerp, the University of Valencia, and the University of Turku are required to submit ethical clearance requests to their

university ethics committees for planned activities involving teachers and students, as detailed below (**Table 1**).

Table 1: Information on ethical clearances required for activities involving human participants.

EYE-TEACH task involving human participants	Ethical clearance	Ethics Committee of the partner organization
As part of **task 1.2** of WP1, the researchers of the University of Antwerp will conduct a vignette-based online survey study with educators from various levels of formal education (primary, secondary, and higher education) across several European countries. Participants will respond to hypothetical scenarios involving AI-assisted eye-tracking technologies for reading comprehension. The survey will assess their acceptance, preparedness, and readiness to adopt such technologies, as well as their perceived needs and self-assessed competencies. Demographic background information (e.g., gender, teaching experience, educational level, subject taught, country of employment) will be collected in anonymous form. All data will be stored anonymously and retained for up to 10 years after project conclusion. The study will take place from mid October (M10) to mid December 2025 (M12).	Ethical clearance (ID: SHW 2025_47_1) for the study was approved on May 15, 2025.	***Ethics Committee for the Social Sciences and Humanities*** of the University of Antwerp
As part of **task 1.3**, controlled laboratory experiments will be conducted by the University of Antwerp to optimize the design of an AI-assisted ET-analytics tool for teachers. Specifically, these experiments will compare various design features, including different eye-movements visualization techniques, static versus dynamic	The submission of the ethics clearance request will take place around November 2025, while the response is expected around February 2026.	***Ethics Committee for the Social Sciences and Humanities*** of the University of Antwerp

Table 1: Information on ethical clearances required for activities involving human participants.

EYE-TEACH task involving human participants	Ethical clearance	Ethics Committee of the partner organization
displays, and different teacher dashboard formats. This will allow researchers to assess how teachers interact with these data presentations. The study involves eye-tracking measures, screen recordings, audio from think-aloud and stimulated recall interviews, as well as self-report questionnaires with demographic information. This study is planned from M13-M24 of the project.		
WP2 will collect data in two studies (**task 2.3:** Eye-Movement Metrics Validation Study and **task 2.4:** Pilot System Potential Study) conducted simultaneously at the University of Valencia and the University of Turku. The Eye-Movement Metrics Validation Study (**task 2.3**) examines the validity of eye-movement measures, identified in the meta-analysis (task 2.1), for predicting reading comprehension under controlled conditions. This study will be carried out in a laboratory setting, where participants' eye movements are tracked while they complete a predesigned reading comprehension task. Eye movements may be recorded using two different methods simultaneously, such as a laboratory-based device and a webcam-based system, in order to verify the validity of the webcam-based measurement. The Pilot System Potential Study (**task 2.4**) investigates the feasibility of an AI-based pilot system in an actual learning environment. In this study,	The application for ethical approval for **task 2.3** will be submitted around November 2025, with notification expected around April 2026. The application for **task 2.4** will be submitted in April 2026, with expected approval by August 2026.	***Ethics Committee in Experimental Research*** of the University of Valencia ***Ethics Committee for Human Sciences*** at the University of Turku

Table 1: Information on ethical clearances required for activities involving human participants.

EYE-TEACH task involving human participants	Ethical clearance	Ethics Committee of the partner organization
participants complete a reading comprehension task while their eye movements are recorded with a webcam-based system. The AI-based pilot system provides teachers with feedback on students' task performance via a dashboard designed in the project. Participation in the studies is voluntary. Participants in both studies will include both children and adults, and informed consent will be obtained from all participants. For children, informed consent will also be obtained from their guardians, in accordance with the ethical guidelines and legislation of each country.		

Section II: Guidelines and regulations for AI-based ET-analytics systems in education

3. European ethical guidelines on AI

The European Commission has published several ethical guidelines for the responsible development, implementation, and use of AI systems. Although not legally binding, these frameworks aim to help researchers and beneficiaries of Horizon Europe projects systematically address ethical issues and demonstrate compliance with European values and legal frameworks. The following are the most relevant for researchers developing an AI-based ET-analylitics tool for educational purposes.

3.1. Ethics Guidelines for Trustworthy Artificial Intelligence

In April 2019, the High-Level Expert Group on AI (AI HLEG), appointed by the European Commission, published the *Ethics Guidelines for Trustworthy Artificial Intelligence*, which have since become a reference point for AI ethics in Europe. While not legally binding, these guidelines establish seven key requirements for designing AI systems to be considered "trustworthy" (i.e., lawful, ethical and robust). Below, these seven ethical requirements are applied to the design of the EYE-TEACH AI system.

Human Agency and Oversight. AI systems should empower people, allowing them to make informed decisions and maintain control, with the ability to intervene and supervise the AI. In education, AI systems should be designed to support teachers and students. In particular, teachers should not overly rely on AI systems losing their independent judgement, while students should not be forced to adapt to AI's decisions.

Technical Robustness and Safety. The AI system must be resilient and secure. It should work as intended, be resistant to errors or hacking, and have fallback plans if something goes wrong. For an AI-based eye-tracking system, robustness means it should accurately interpret eye-tracking data handling different types of end users.

Safety also implies strong cybersecurity measures so that eye-tracking data of children are not vulnerable to unauthorized access.

Privacy and Data Governance. This requirement underlines that the AI system must comply with privacy and data protection laws (such as GDPR) and ensure quality data management. Therefore, the AI system should be trained only on necessary, relevant and accurate eye-tracking data, acquired with appropriate consent, anonymized, securely stored and processed on local devices as much as possible.

Transparency means that it should be clear what data was used to train the AI model and how the AI system works. Traceability mechanisms can help meet this requirement, which include the aspects of "explainability" (i.e., AI systems should be designed to provide explanations of their outputs in a way that all users can understand) and "communication" (i.e., users must be informed that they are interacting with an AI system, as well as of its capabilities and limitations). In an educational context, transparency means that teachers, students, and parents are clearly informed that an AI system is analyzing eye-tracking data and why. The AI system should provide context and reasons for its inferences and recommendations (e.g., "the student's gaze was away from the screen for X minutes") in understandable terms, rather than a simple numerical score. Transparency can promote trust in using the AI system if teachers understand its limitations and rationale. Additionally, it can help identify errors in assessing students' reading comprehension, which may be due to various types of technical limitations and variations in its real-world use.

Diversity, Non-Discrimination and Fairness. AI systems should be fair and free of biases, accessible to all users, and involve relevant stakeholders throughout their entire life circle. Because promoting equity in education is crucial, the AI system must work for diverse student populations, regardless of their physical characteristics (e.g., eye color) or cognitive abilities (e.g., neurodivergence). To achieve this goal, during its development the AI system should be tested for any kind of biases, including those related to gender and ethnicity to avoid that the tool reinforces stereotypes. Furthermore, the needs of students with disabilities (e.g., visual impairments) should be carefully assessed to avoid being penalized by the AI system.

Societal and Environmental Well-being. AI systems should benefit all human beings, including future generations, while ensuring their sustainability and respect of the

environment. For an AI system in education, the societal dimension concerns improving the quality of education and learning outcomes, while respecting individual rights and societal values. Therefore, it is worth considering whether the AI system could create an environment of surveillance and psychological stress, caused by an excessive emphasis on performance metrics, and undermine trust between students and teachers. The AI system should instead help teachers identify students who are struggling and provide support in their teaching strategies.

Accountability means that developers and deployers of an AI system should be responsible for its behavior and outcomes: e.g., by monitoring its performance, auditing it for compliance with the above requirements, and having redress mechanisms in place in case of problems. In education, there should be a process to handle complaints from students or parents who believe that the AI system's output is incorrect, unfair or has caused harm, so that action can be taken if necessary (e.g., by modifying the AI system's operation). Additionally, schools using AI systems should have clear internal roles for those responsible for overseeing the AI system's behaviour, interpreting its decisions, reporting errors, and taking corrective action.

To help developers and deployers design AI systems that meet the seven ethical requirements mentioned above, the European Commission's High-Level Expert Group on Artificial Intelligence published the **Assessment List for Trustworthy Artificial Intelligence (ALTAI)**[2] in 2020. This self-assessment tool translates the seven requirements into concrete questions aimed to guide the design of AI systems. The ALTAI tool should include a *Fundamental Rights Impact Assessment* (FRIA), also required by Article 27 of the Artificial Intelligence Act (2024), to identify which rights and freedoms might be affected. **Annex I** to this document consists of the first version of the ALTAI ethical self-assessment of the EYE-TEACH project research activities aimed at developing the AI-assisted ET-analysis tool.

3.2. Ethics By Design and Ethics of Use Approaches for Artificial Intelligence

The *Ethics by Design and Ethics of Use Approaches for Artificial Intelligence* (2021) guidelines builds on the ethical requirements of the above-mentioned *Ethics Guidelines for Trustworthy AI*, as well as on the work done in EU-funded projects

[2] https://op.europa.eu/s/z9ce

such as SHERPA and SIENNA. The document emphasizes that ethical compliance goes beyond mere legal conformity: while the law guarantees minimum standards, ethics anticipates broader responsibilities, such as protecting autonomy, preventing harm, ensuring fairness, and supporting societal and environmental well-being.

This guide follows the "ethics by design" approach, which requires integrating ethical criteria into every phase of AI development, from goal definition and requirements specification, through high-level design, data collection, detailed development, and testing and evaluation. Each phase includes tasks such as risk assessments, stakeholder consultation, bias audits, and explainability measures. The framework provides a five-layer model (principles, requirements, guidelines, methodologies, tools) and a six-phase development cycle. The goal is proactive prevention of ethical problems, rather than retroactive solutions. Furthermore, beyond design, ethical integrity must be maintained during project management, acquisition, deployment, and monitoring. Deployment requires updated ethics policies, staff training, and communication of limitations. Continuous monitoring and audit procedures are essential, as unforeseen ethical challenges often arise after real-world implementation.

3.3. Ethical guidelines on the use of AI and data in teaching and learning for educators

The *Ethical Guidelines on the Use of AI and Data in Teaching and Learning for Educators* (2022) aim to promote high-quality, inclusive, and ethical digital education by supporting teachers in addressing the opportunities and risks of AI in education, while ensuring compliance with the EU values and ethical requirements for trustworthy AI.

AI technologies are already embedded in education: they can personalise learning, improve assessment, and support school administration. However, their growing use raises concerns about privacy, fairness, teacher autonomy, and accountability. The guidelines provide educators with practical tools to critically evaluate and ethically integrate AI into their work, overcoming misconceptions that AI is incomprehensible, unnecessary, or intended to replace teachers. Instead, AI should enhance teaching by reducing administrative tasks and enabling personalised learning. And these applications must always be supervised, transparent, and aligned with educational values.

A set of guiding questions helps teachers assess AI systems in practice, covering issues such as whether teachers remain "in the loop," how biases are addressed, how data is protected, and who is accountable for AI decisions. Practical classroom scenarios illustrate the use of these questions in areas such as adaptive learning, essay grading, enrollment planning, and chatbots for administration. Additionally, schools are encouraged to review current AI systems, adopt clear policies, conduct pilot projects, collaborate with developers, and continuously monitor the impact of AI on learning and well-being. Involving also parents, students, and the community is essential to building trust and awareness.

Furthermore, the guidelines emphasize the need for new digital competences among educators. These include understanding the basic principles of AI, as well as data management and AI governance, ensuring ethical assessment practices, empowering students, and teaching AI ethics as part of digital literacy.

4. International standards on AI ethics

International organizations, such as the *Organization for Economic Co-operation and Development* (OECD), the *United Nations Children's Fund* (UNICEF), and the *United Nations Educational, Scientific and Cultural Organization* (UNESCO), have established global standards to provide ethical requirements for the development and deployment of AI, ensuring that it contributes to, rather than undermines, human dignity, rights, equity, inclusion, and ecological well-being. Below they are presented in chronological order, highlighting the key principles and tools for assessing and mitigating the potential ethical and social risks and benefits of AI.

4.1. OECD AI Principles

The *OECD AI Principles* (2019) are a set of five ethical requirements for trustworthy AI, designed to ensure AI systems are developed and used in a way that benefits humanity while protecting human rights and democratic values. The key requirements are:

1. **Inclusive growth, sustainable development and well-being**: AI should be developed and used to enhance human capabilities and creativity, reduce inequalities, and promote environmental sustainability.

2. **Human-centred values and fairness**: AI systems must be designed and used in ways that respect human rights, democratic values, and privacy. They should also aim to reduce bias and promote fairness.
3. **Transparency and explainability**: organizations developing AI should be transparent about the data sources, decision-making processes, and risk management strategies of their systems.
4. **Robustness, security, and safety**: AI systems need to be technically robust and secure, ensuring they operate safely and are resilient to potential attacks.
5. **Accountability**: there must be clear lines of responsibility for AI stakeholders, including developers and organizations, to ensure responsible stewardship of AI systems.

These principles, adopted by the OECD member countries and G20, established the first intergovernmental standard for AI development and governance.

4.2. UNICEF Policy Guidance on AI for Children

Inspired by the *Convention on the Rights of the Child* (1989), the *UNICEF Policy Guidance on AI for Children* (2020) outlines nine requirements for a child-centred design, development, and governance of AI systems:

1. **Support children's development and well-being**: AI systems should enhance, rather than hinder, children's physical, emotional, and cognitive development.
2. **Ensure inclusion of and for children**: AI should be designed to be inclusive and beneficial for all children, regardless of their background or abilities.
3. **Prioritize fairness and non-discrimination for children**: AI systems must not perpetuate or create new forms of discrimination against children.
4. **Protect children's data and privacy**: children's data must be handled with the utmost care to protect their privacy.
5. **Ensure safety for children**: AI systems should be safe and protect children from harm.
6. **Promote transparency, explainability, and accountability for children**: children and their caregivers should understand how AI systems work and be able to hold designers and developers accountable.
7. **Empower governments and businesses with knowledge of AI and children's rights**: the guidance aims to equip governments and companies with the knowledge to implement child-centred AI policies and practices.

8. **Prepare children for present and future developments in AI**: children need to be educated and prepared to navigate and contribute to the AI-driven world.
9. **Create an enabling environment**: this involves fostering a supportive environment where child-centred AI can flourish through collaboration and knowledge sharing.

UNICEF encourages researchers to adopt this guidance to ensure AI systems are designed with the best interests of children in mind and to deepen understanding of children's experiences with AI.

4.3. UNESCO Recommendation on the Ethics of Artificial Intelligence

The *UNESCO Recommendation on the Ethics of Artificial Intelligence* (2021) is a global ethical standard, which aims to ensure that AI serves humanity, respecting human rights and environmental sustainability. The Recommendation establishes ten fundamental principles to be followed throughout the entire AI life cycle:

- **Proportionality and do no harm**: AI systems should be used only to the extent necessary for legitimate aims, with risk assessments to prevent harm.
- **Safety and security**: systems should be resilient and protected from abuse, ensuring robustness and addressing vulnerabilities.
- **Privacy and data protection**: privacy must be maintained throughout the AI lifecycle, supported by robust data protection frameworks.
- **Multi-stakeholder and adaptive governance and collaboration**: diverse stakeholders should participate in AI governance; respect for international law and national sovereignty is essential.
- **Responsibility and accountability**: AI systems must be auditable, traceable, and subject to oversight and due diligence.
- **Transparency and explainability**: AI decisions should be transparent and interpretable at levels appropriate to the context, striking a balance with privacy and security.
- **Human oversight and determination**: final responsibility and decision-making should remain with humans, ensuring that AI does not displace human agency.
- **Sustainability**: AI systems must be aligned with sustainable development goals and weighed for their long-term ecological impact.

- **Awareness and literacy**: public understanding of AI, data, and ethics should be fostered through education, civic engagement, and media literacy.
- **Fairness and non-discrimination**: AI actors should strive for social justice, avoiding bias or exclusion, and promoting equal access to benefits.

To support the operationalization of these principles, UNESCO has developed the *Ethical Impact Assessment* (EIA)[3], a methodological tool that can guide AI project teams (in collaboration with affected communities) to foresee, assess, and mitigate potential ethical, social, and environmental impacts before deployment.

5. The Artificial Intelligence Act

The *Artificial Intelligence Act* (Regulation EU 2024/1689), also called the AI Act, published on the 12th of July 2024, provides a legal framework that employs a risk-based approach for the deployment of AI systems. Two guidelines were also published in February 2025 with the purpose to clarify the AI Act: *Commission guidelines on prohibited artificial intelligence practices* (CG, 2025a) and *Commission guidelines on the definition of an artificial intelligence system* (CG, 2025b). The following describes the history and scope of the AI Act, as well as its provisions that may be relevant to the design and deployment of an AI-based ET-analytics system.

History, scope, and risk categorization of AI systems. At the core of the AI Act is a risk-based classification system, which divides AI systems into four levels of risk. According to Recital 27 of the AI Act, this risk-based approach builds on and is in line with the above-mentioned *Ethics guidelines for trustworthy AI* (2019), which aim to guide researchers and developers in designing trustworthy and human-centered AI, based on the values on which the EU is founded. This ethical framework serves also as the basis for the definition of codes of conduct under the AI Act. Indeed, even for AI systems that pose minimal risks, providers and deployers are encouraged to develop and follow voluntary codes of conduct (Article 95, AI Act). Furthermore, providers and deployers of AI systems with limited risks have obligations of transparency (Article 50, AI Act), making humans aware that they are interacting with an AI system. Instead, AI systems that could endanger health, safety, or other

[3] https://unesdoc.unesco.org/ark:/48223/pf0000386276

fundamental rights are classified as “high-risk”, as specified in Article 6 of the AI Act, in conjunction with Annex III. Among these are biometric categorization systems especially in educational contexts. Furthermore, AI systems that could pose unacceptable threats to fundamental rights and European Union values are prohibited by Article 5 of the AI Act.

Research exemption and testing in real-world conditions. The AI Act provides multiple exemptions to its provisions for research activities. Article 2(6) excludes from the scope of the Regulation "AI systems or AI models, including their output, specifically developed and put into service for the sole purpose of scientific research and development". Additionally, Article 2(8) states that the Regulation does not apply to "any research, testing or development activity regarding AI systems or AI models prior to their being placed on the market or put into service." These clauses are intended to protect scientific exploration and innovation by allowing researchers to experiment and develop AI technologies without being subject to the regulations of the AI Act. However, Article 2(8) also specifies that "Testing in real world conditions shall not be covered by that exclusion". As clarified in Clause 32 of the Commission guidelines on prohibited artificial intelligence practices (CG 2025a), this means that once an AI system is deployed outside a controlled laboratory or simulated setting (e.g., in classrooms), it is no longer protected by the Article 2(8) research exemption.

For the EYE-TEACH project, this distinction raises important questions regarding the pilot testing activities of the AI system. According to Article 3(57) of the AI Act, 'testing in real-world conditions' means "the temporary testing of an AI system for its intended purpose in real-world conditions outside a laboratory or otherwise simulated environment". It is therefore crucial to assess whether the classroom environment in which the experimentation will take place can be considered as a "laboratory or otherwise simulated environment" rather than real-world conditions. If the controlled nature of the pilot, with informed consent, limited scope, and research supervision, allows the classroom setting to be characterized as a laboratory-like environment, then the Article 2(8) research exemption may apply.

Alternatively, even if the testing is deemed to occur in real-world conditions and thus not covered by Article 2(8), the EYE-TEACH project can rely on the broader exemption provided by Article 2(6) of the AI Act, provided that the inference or use of emotions will still be excluded from the product that will be placed on the market.

As clarified in paragraph 31 of the Commission Guidelines on prohibited artificial intelligence practices (CG 2025a), "the AI Act aims to support innovation and recognises the importance of scientific research in advancing AI technologies and contributing to scientific progress and innovation. Article 2(6) AI Act therefore provides an exclusion for 'AI systems or AI models, including their outputs, specifically developed and put into service for the sole purpose of scientific research and development'". The Guidelines, taking as example the "research into cognitive and behavioural responses to AI-driven subliminal or deceptive stimuli", also specify that research is permitted and excluded from the scope of the AI Act "despite the prohibition in Article 5(1)(a) of the AI Act". Under this exemption, activities such as emotion inference in educational settings —which would otherwise be prohibited by the AI Act when the system is placed on the market— would remain permissible during the research phase, provided that the system is developed and deployed exclusively for scientific research purposes and not for market placement or commercial service. This distinction is critical, as it ensures that any results or applications derived from the research would only become subject to the AI Act's prohibitions upon being placed on the market or put into service

AI systems for biometric data processing and emotion recognition. According to Article 3(34) of the AI Act, "biometric data means personal data resulting from specific technical processing relating to the physical, physiological or behavioural characteristics of a natural person, such as facial images or dactyloscopic data." It is worth noting that this definition differs from that provided in Article 4(14) of the GDPR, which explicitly includes the requirement that biometric data must "allow or confirm the unique identification of that natural person", whereas the AI Act omits this identifying purpose requirement.

While no official clarification has been provided by regarding this definitional difference from GDPR, Clause 251 of the *Commission guidelines on prohibited artificial intelligence practices* (CG 2025a) further elaborate on the classification of biometric data in two types: (i) physiological biometrics, based on "physical, structural, and relatively stable attributes" (such as fingerprints, iris patterns, facial contours, or the geometry of veins) and (ii) behavioral biometrics, involving dynamic patterns of behavior (such as gait, voice, typing and keystroke rhythm, and eye movements). In this context, eye tracking is considered a form of behavioral biometric data because it captures unique gaze patterns, such as fixations and

saccades. Additionally, eye tracking provides information about pupil size and its fluctuation.

Furthermore, Clause 255 of the same Commission guidelines (2025a) provide an example of risk categorization of eye tracking: the use of AI-based eye tracking by an educational institution to monitor students' gaze for purposes such as detecting the use of unauthorized materials is not prohibited, provided it does not identify or infer emotions. However, if an AI-based eye tracking system is "used to detect emotions, such as emotional arousal and anxiousness, this would fall within the scope of the prohibition", outlined in Article 5 (1)(f) of the AI Act. This highlights the need to assess not only whether biometric data is being collected, but also the purpose and context of its use.

Fundamental Rights Impact Assessment (FRIA). Article 27 of the AI Act, which comes into force on August 2, 2026, requires a FRIA to be conducted for high-risk AI systems prior to their deployment to assess their potential impact on fundamental rights. Although EYE-TEACH is a research project that may potentially benefit from the research exemption under Article 2(6)(8) of the AI Act for systems developed exclusively for scientific research purposes, we plan to conduct the FRIA, also recommended by the above-mentioned ALTAI tool, to ensure full compliance with fundamental rights protection standards, particularly given the involvement of minor students and the sensitive nature of the data processed. The Article 27 of the AI Act recognizes the existence of mandatory DPIAs under the GDPR. Therefore, the AI Act allows deployers to build upon existing DPIA when conducting the FRIA, especially when the FRIA requirements overlap with data protection concerns.

Conclusion

This first deliverable of WP4 lays the foundation for the ethical and legal framework that will guide the EYE-TEACH consortium in the development and deployment of its AI-assisted ET-analytics tool. Its primary aim is to provide project partners with a clear and comprehensive understanding of the applicable regulatory environment, clarifying both the constraints to be observed and the opportunities to be explored.

The document offers a structured analysis of the multi-layered framework relevant to EYE-TEACH, encompassing GDPR compliance, ethical standards for research

involving human participants, ethical requirements for developing a trustworthy AI system, as well as key applicable provisions of the AI Act.

The ALTAI self-assessment included in **Annex 1** illustrates the project's strong commitment to ethics- and privacy-by-design. It highlights how these principles are integrated from the early stages of system development. As a living document, the self-assessment will continue to evolve with the project, supporting ongoing reflection on ethical implications and enabling timely adaptation to new challenges.

While this deliverable will serve as a foundational reference for all partners, informing the design of research protocols, consent procedures, and technical safeguards, it also forms the basis for subsequent deliverables, as well as for the Data Protection and Fundamental Rights Impact Assessments that will be undertaken as the project progresses. More broadly, this deliverable reflects EYE-TEACH's commitment to developing an AI system that supports educational practice in full compliance with European values, legal obligations, and ethical standards.

Through proactive compliance, ongoing stakeholder engagement, and a design process rooted in ethical principles, the EYE-TEACH consortium is well-positioned to deliver an AI-assisted educational tool that exemplifies best practices in trustworthy AI. This framework ensures that innovation remains aligned with the protection of fundamental rights, the promotion of human dignity, and the real educational needs of students and teachers across Europe.

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Annex 1: EYE-TEACH Ethics self-assessment

Introduction

The goal of the EYE-TEACH project is to develop an artificial intelligence (AI) assisted eye-tracking (ET) pilot system to support educators in assessing and improving students' reading comprehension skills. Given the sensitive nature of this application domain —which involves processing biometric data from students, often minors, in educational contexts— it is essential to ensure that the technological solutions developed adhere to the highest ethical and trustworthiness standards.

This document presents a systematic ethical assessment of the EYE-TEACH project using the Assessment List for Trustworthy Artificial Intelligence (ALTAI), the self-assessment tool developed by the EU High-Level Expert Group on Artificial Intelligence. ALTAI translates the ethical principles of trustworthy AI into concrete and actionable questions, structured around seven fundamental requirements: (i) human agency and oversight, (ii) technical robustness and safety, (iii) privacy and data governance, (iv) transparency, (v) diversity and non-discrimination, (vi) societal and environmental well-being, and (vii) accountability.

Following an ethics-and-privacy-by-design approach, this self-assessment aims to demonstrate how EYE-TEACH seeks to integrate ethical considerations from the outset and at every stage of project activities, identifying and mitigating the specific risks of using artificial intelligence and eye tracking technologies in educational contexts, and providing a framework for the responsible development of the AI-assisted ET-analytics tool. This approach not only ensures compliance with current ethical guidelines but also prepares the project for future European regulatory requirements, including those foreseen by the AI Act.

ALTAI REQUIREMENT #1 Human Agency and Oversight

Is the AI system designed to interact, guide or take decisions by human end-users that affect humans or society?

The AI system (AI-assisted ET-analytics tool) is designed to interact with teachers and guide them to make decisions in the classroom through a dashboard. The AI system interacts with the teacher through visualizations, alerts and recommendations for teaching instructions. The system will provide tailored information to both teachers and students. Specifically, it will deliver insights to teachers into their learners' reading processes and progress, offering targeted recommendations to guide educators' instructional interventions. While the main information will be provided to the teachers, the possibility of interacting with the AI system by students is being evaluated. The system could offer them content and explanations, especially for small tasks, to support their understanding and therefore their progress in reading comprehension.

Could the AI system generate confusion for some or all end-users or subjects on whether a decision, content, advice or outcome is the result of an algorithmic decision?

No, the AI system will always make it clear when the dashboard visualisations, recommendations, and outcomes are a result of algorithmic decisions. Furthermore, to avoid any confusion in this regard, specific indications on the AI systems' decision-making process will be included in the guidelines planned by EYE-TEACH project's workplan for teachers and stakeholders on how to use the AI-assisted ET-analytics tool.

Are end-users or other subjects adequately made aware that a decision, content, advice or outcome is the result of an algorithmic decision?

Yes, both teachers and students will be informed that the AI system's outcomes are the result of an algorithmic decision. This can happen in many ways, such as through an on-screen notification or even via a message asking the teacher whether the system should proceed with a decision or an update, etc.

Could the AI system generate confusion for some or all end-users or subjects on whether they are interacting with a human or AI system?

While there is unlikely to be any confusion for end users, the AI system will provide clear messages via the dashboard indicating that the outputs are algorithmically generated and based on AI models.

Are end-users or subjects informed that they are interacting with an AI system?

During the testing activity of the AI pilot system (WP2), teachers and students will be made aware that they are interacting with an AI-based system. If the AI system makes decisions which affect students (e.g., when the tool makes interventions and changes materials to students), this can also be communicated to the students. The guidelines and training materials elaborated within EYE-TEACH will also inform end-users who are interacting with an AI-based system.

Could the AI system affect human autonomy by generating over-reliance by end-users?

Yes, the AI-assisted ET-analytics tool could generate over-reliance by teachers for interpreting eye movements. Furthermore, they could over-rely on eye movements as a comprehensive metric to assess learning performance and reading comprehension.

Did you put in place procedures to avoid that end-users over-rely on the AI system?

EYE-TEACH partners will provide teachers with guidelines and training materials on how to use the AI-assisted ET-analytics tool and how to interpret the eye movements metrics. This will help to avoid the risk that end users over-reliance on the AI system by being aware of both potentials and risks of using eye movement metrics for educational assessment.

Could the AI system affect human autonomy by interfering with the end-user's decision-making process in any other unintended and undesirable way?

No, our goal is to ensure that teachers retain full autonomy in decision-making, while being supported by the AI system through tailored recommendations for

intervention. Therefore, the design approach to the user interface and the interactions between the AI system and the end users require that the teachers be actively involved in data interpretation and decision-making.

Did you put in place any procedure to avoid that the AI system inadvertently affects human autonomy?

The system's interaction/interface design follows the principles of human-centered AI, including a balance between human autonomy with computer automation, and the active involvement of teachers in the design process. The AI system can act autonomously in limited tasks, but the relevant interventions and final decisions that impact students' learning behaviors are made by teachers.

Please determine whether the AI system:

is a self-learning[4] or autonomous system[5]?

No, according to the definitions of the ALTAI glossary, the AI pilot system cannot be considered fully self-learning and autonomous. In fact, the AI model is able to recognize patterns in the training dataset and update its learning process using new real-world data collected in classrooms, with the supervision of EYE-TEACH developers and researchers responsible for data curation. Based on this, the AI system can make algorithmic decisions and recommendations and even plan to act autonomously in specific and limited tasks that require teachers' approval.

is overseen by a Human-in-the-Loop[6]?

Yes, teachers will be directly involved in some decision-making processes: e.g., they can accept, reject, or modify AI pilot system's outcomes.

[4] **Self-learning** (or self-supervised learning) AI systems recognize patterns in the training data in an autonomous way, without the need for supervision.
[5] An **autonomous AI system** is an AI system that performs behaviors or tasks with a high degree of autonomy, that is, without external influence.
[6] **Human-in-the-loop** refers to the capability for human intervention in every decision cycle of the system, which in many cases is neither possible nor desirable.

is overseen by a Human-on-the-Loop[7]?

Yes, EYE-TEACH has planned several ongoing sessions to receive input from teachers on the design of the AI pilot system (WP1), as well as to monitor and evaluate its performance and outcomes (WP2).

is overseen by a Human-in-Command[8]?

Yes, EYE-TEACH researchers, developers and educational scientists are responsible for designing the AI system's purpose and functionalities (e.g., selecting pedagogically relevant features) and for overseeing the overall activity of the tool, as well as its legal and ethical impact. Additionally, the AI-assisted ET-analytics tool is designed to allow teachers to decide when and how to use it, based on their own experience and the specific educational contexts in which they operate.

Have the humans (human-in-the-loop, human-on-the-loop, human-in-command) been given specific training on how to exercise oversight?

As part of the scientific results of EYE-TEACH, teachers and educators will receive educational materials focused on eye movement metrics. These materials will be developed as guidelines aimed at raising awareness and providing training on how to interpret and use the eye movement metrics through AI-assisted educational systems. In particular, these guidelines will provide insights on how to effectively collaborate with the AI system and leverage the dashboard features, and will include instructions on how the end users can override AI's decisions, request justification for AI system's recommendations or report potential risks arising from AI's behavior.

Did you ensure a 'stop button' or procedure to safely abort an operation when needed?

Yes, teachers will always be able to interrupt the AI system and disable any recommendations and specific dashboard features. Even when the AI system plans

[7] **Human-on-the-loop** refers to the capability for human intervention during the design cycle of the system and monitoring the system's operation.

[8] **Human-in-command** refers to the capability to oversee the overall activity of the AI system (including its broader economic, societal, legal and ethical impact) and the ability to decide when and how to use the system in any particular situation.

to provide output autonomously, it can be designed to alert the teacher that it needs validation to proceed.

Did you take any specific oversight and control measures to reflect the self-learning or autonomous nature of the AI system?

The AI system is designed to clearly communicate if any of the underlying AI models are updated or trained on new data, the quality of which will be previously assessed. Additionally, the system will always notify end users whether it can act autonomously.

ALTAI REQUIREMENT #2 Technical Robustness and Safety

How exposed is the AI system to cyber-attacks?

The AI system could be exposed to cyberattacks through its hidden prompts, which are instructions embedded in the internal system's prompt to define how the AI system should behave. Although hidden prompts exist for reason of consistency (i.e., they ensure the model always responds in a certain way), safety (i.e., they can encode rules such as "Don't provide harmful instructions") and control (i.e., they allow developers to manage the model outputs without having to constantly rewrite the same instructions), they could pose the backdoor for attackers who might attempt to extract or overwrite these hidden instructions.

Did you put measures in place to ensure the integrity, robustness and overall security of the AI system against potential attacks over its lifecycle?

To ensure the security of the AI system, developers can take several measures to protect the hidden prompts. Such measures include: (i) checking input by converting it into pure text (e.g., markdown, json, so that hidden prompts are easily detected), (ii) explicitly instructing the model to never display hidden instructions, regardless what the user asks for, (iii) keeping system prompts logically separate from user inputs so they cannot be overridden, (iv) adding rejection rules to training or refining the model to reject attempts to expose or modify its hidden prompts, (v)

regularly testing the system with simulated attacks to check whether hidden prompts can be revealed (red-teaming).

Did you define risks, risk metrics and risk levels of the AI system in each specific use case?

Yes, the EYE-TEACH project is developing a risk management process that will include identified risks and their mitigation strategies, as well as the ongoing identification and assessment of any emerging risks. A non-exhaustive list of potential risks arising from using eye movement data to train an AI system aimed at assessing reading comprehension and learning processes may include: (i) overinterpretation, (ii) lack of generalizability, (iii) measurement noise, and (iv) context dependence. Additional potential risks related to use of the AI system in real-world educational setting may include: (i) compromised individual privacy and data security, (ii) unbalanced power dynamics toward vulnerable individuals, (iii) over-reliance on AI system outputs, and (iv) loss of autonomy and control in human decision-making.

Did you put in place a process to continuously measure and assess risks?

WP4 is dedicated to defining an ethical framework for the responsible collection, analysis, and use of eye movement data with AI-assisted systems, ensuring that these technologies improve educational outcomes without compromising the fundamental rights and freedoms of research participants. Therefore, research ethics and data protection experts support the organisations involved in EYE-TEACH in monitoring and assessing potential risks arising from experimental research activities, in accordance with relevant ethical guidelines and regulations at European and national levels.

Did you inform end-users and subjects of existing or potential risks?

Yes, the potential risks identified will be included in the information sheet written in plain and accessible language for research participants. The aim is to provide them with a clear understanding of all aspects of the research activities they are invited to participate in before signing the informed consent form. Additionally, to raise awareness of the different kinds of potential risks and related mitigation strategies when using eye movements metrics in combination with AI models, training materials and guidelines will be developed to support teachers and other

stakeholders in the responsible use of the developed AI-assisted ET-analytics tool.

Could a low level of accuracy of the AI system result in critical, adversarial or damaging consequences?

The AI-assisted ET-analytics tool may make inaccurate inferences which could affect the teachers' interpretations and their classroom instructions. However, in case of low accuracy, the AI system is designed to not act autonomously and to communicate the uncertainty of the output to the teacher.

Did you put in place measures to ensure that the data (including training data) used to develop the AI system is up-to-date, of high quality, complete and representative of the environment the system will be deployed in?

The AI system will make use of existing, curated, and documented eye-tracking datasets that are relevant to reading comprehension tasks. Therefore, within WP2, 3 and 4, EYE-TEACH researchers implemented a structured data selection and curation process to ensure that the datasets used to develop and train the AI system are scientifically relevant, technically feasible, and ethically compliant. This process includes collaboration with domain experts to assess each dataset's suitability from multiple perspectives. Furthermore, to guarantee that the data is up-to-date and representative of the environment in which the system will be deployed, the research team is developing a data management framework that will be regularly updated with an overview of the task and data collected in each database. A series of standard quality assurance checks will also be applied which, depending on data availability, may include: verification of calibration accuracy, missing data checks, and assessment of sampling rate consistency. Moreover, the AI system can make use of new training data (such eye-tracking and log data) collected in classroom settings when teachers and students interact with the AI system. This new data, once its quality has been assessed and documented, can be used to update and improve the models already trained.

Did you put in place a series of steps to monitor, and document the AI system's accuracy?

Yes, as part of the W2 and WP3 activities, documentation and reporting methods for eye-tracking datasets' quality and AI models' accuracy accompany the implementation of the AI system. These reporting methods will be used for all stages of the AI system development and deployment.

Did you consider whether the AI system's operation can invalidate the data or assumptions it was trained on, and how this might lead to adversarial effects?

Yes, it may happen that eye-tracking data collected in classrooms differs from the eye-tracking data used to train the AI models, or that such real-world data is noisy and incomplete, with missing values, due to many technical and environmental factors, including hardware malfunctions, incorrect calibration, sensor displacement or sudden head movements, changes in lighting conditions, etc. These factors could lead to potentially inaccurate recommendations of the AI system. Therefore, the quality of collected data should be assessed before using it to train the AI system's predictions.

Did you put processes in place to ensure that the level of accuracy of the AI system to be expected by end-users and/or subjects is properly communicated?

The AI system will communicate the accuracy levels of its outputs to teachers. Additionally, the guidelines for teachers will include explanations on how to handle and interpret AI recommendations with low confidence level.

Did you put in place verification and validation methods and documentation (e.g., logging) to evaluate and ensure different aspects of the AI system's reliability and reproducibility?

Eye movement metrics with most potential for tracking learning processes will be tested and validated in both laboratory and educational settings, through pilot studies and data collection. As a result, the feasibility and reliability of the AI-assisted ET-analytics pilot system will be verified. Additionally, reproducibility will be ensured through the documentation of the collected data and trained models, as

well as the experimental settings. By using the same code and data included in the EYE-TEACH documentation, anyone can achieve the same results under the same conditions.

Did you put in place a proper procedure for handling the cases where the AI system yields results with a low confidence score?

The AI system pilot will alert teachers in case of model inferences and results with low confidence scores.

Is your AI system using (online) continual learning?

Yes, students' eye-tracking data and log data of teachers' interactions with the AI system during testing activities (e.g., how they interact with the interface, what buttons they push, what visualizations they choose, etc.) could be used to re-train the underlying AI models. However, this should be done offline to ensure reliability before deploying the retrained model.

Did you consider potential negative consequences from the AI system learning novel or unusual methods to score well on its objective function?

The underlying AI models will rely on specific and distinctive features (such as eye tracking metrics) to make inferences. As part of WP3, during the development of the AI system and before its deployment, the AI models will be tested to ensure that the learned behaviours and features used for predictions are also meaningful to teachers.

ALTAI REQUIREMENT #3 Privacy and Data Governance

Did you consider the impact of the AI system on the right to privacy, the right to physical, mental and/or moral integrity and the right to data protection?

Yes, the impact of the AI system on human rights was considered in planning EYE-TEACH activities. In particular, within WP4 a comprehensive Data Protection

Impact Assessment (DPIA) will be conducted in accordance with GDPR requirements to systematically evaluate privacy risks and implement appropriate safeguards. Additionally, a Fundamental Rights Impact Assessment (FRIA) will be carried out based on the requirements of the Article 27 of the AI Act. Although EYE-TEACH is a research project that may potentially benefit from the research exemption under Article 2(6) of the AI Act for systems developed exclusively for scientific research purposes, we take a precautionary approach in conducting the FRIA to ensure full compliance with fundamental rights protection standards, particularly given the involvement of vulnerable subjects (students) and the sensitive nature of the data processed.

Is your AI system being trained, or was it developed, by using or processing personal data (including special categories of personal data)?

Yes, the EYE-TEACH AI system involves both training and testing phases that handle personal data differently. For the training of AI algorithms, the project utilizes publicly available datasets that are declared as anonymous, thereby avoiding the processing of personal data during the model development phase. However, for testing purposes to verify the effectiveness of the trained algorithms, data will be collected directly from schools involving students and teachers. These testing data will be pseudonymised in accordance with Article 89 GDPR, which provides specific safeguards for processing personal data for scientific research purposes. This approach ensures that while the AI system can be effectively validated in real educational environments, appropriate privacy protections are maintained throughout the testing and validation process.

Did you put in place any of the following measures, some of which are mandatory under the General Data Protection Regulation (GDPR), or a non-European equivalent?

Data Protection Impact Assessment (DPIA)

A DPIA will be conducted in accordance with Article 35 of the GDPR, which mandates such assessments when processing operations are “likely to result in a high risk to the rights and freedoms of natural persons,” particularly when involving “use of new technologies, taking into account the nature, scope, context

and purposes of the processing." The EYE-TEACH project falls under this requirement due to its use of innovative eye-tracking technologies combined with AI models for processing special categories of personal data as defined in Article 9 GDPR from students, often minors, in educational contexts. This combination of new technologies, sensitive data processing, and vulnerable data subjects clearly presents potential high risks to fundamental rights, making a DPIA legally required to systematically assess privacy risks and implement appropriate safeguards.

Designate a Data Protection Officer (DPO) and include them at an early state in the development, procurement or use phase of the AI system.

All project partners acting as data controllers are required to designate a Data Protection Officer (DPO) under Article 37 of the GDPR based on their organizational characteristics and processing activities. In accordance with Article 25 GDPR (Data Protection by Design and by Default), the DPOs of the respective controllers are actively involved in the EYE-TEACH project from the early development stages. This involvement is further mandated by Articles 35(2) and 39(1)(c) GDPR, which require DPOs to provide advice on DPIAs and monitor compliance with data protection obligations. Additionally, given the sensitivity of the data processed and the vulnerability of the data subjects involved, the project itself has established a dedicated WP4 specifically focused on ethical and legal aspects, led by sector experts. This comprehensive approach ensures that privacy considerations are embedded throughout the project lifecycle, from system design and development to implementation and deployment, thereby guaranteeing that data protection principles are integrated into all project activities involving personal data processing.

Oversight mechanisms for data processing (including limiting access to qualified personnel, mechanisms for logging data access and making modifications).

While detailed system specifications are still under development, comprehensive oversight mechanisms for data processing are planned to be implemented throughout the EYE-TEACH system. The system will incorporate Role-Based Access Control to ensure that data access is restricted to qualified personnel with appropriate roles and privileges. All data access and modification activities will be systematically logged to maintain a complete audit trail. Additionally, logging

mechanisms will extend to AI algorithmic activities to enable detection of potential improper decisions or bias in the system's operations. These oversight measures will provide comprehensive monitoring and accountability throughout the data processing lifecycle, ensuring both compliance with data protection requirements and the integrity of AI-driven decision-making processes.

Measures to achieve privacy-by-design and default (e.g., encryption, pseudonymisation, aggregation, anonymisation).

While detailed technical specifications are still being finalized, privacy-by-design and by-default measures will be implemented throughout the EYE-TEACH system. Pseudonymisation will be implemented as required by Article 89 GDPR for data collected in schools, with schools maintaining the identifying data while only pseudonymised data is used for processing and analysis. This approach ensures that data processing activities can be conducted without direct access to personally identifiable information, thereby minimizing privacy risks while enabling the research and educational objectives of the project. Additional privacy-enhancing techniques such as data aggregation and appropriate encryption measures will be evaluated and implemented as the system specifications are refined, ensuring comprehensive protection of personal data throughout the processing lifecycle.

Data minimisation, in particular personal data (including special categories of data).

Data minimisation principles will be strictly applied throughout the EYE-TEACH project, particularly concerning personal data and special categories of data. The specific data types to be collected have not yet been determined, as this will depend on the eye-tracking tools selected for implementation. Different eye-tracking technologies vary significantly in their data collection approaches - some record actual eye images while others process the image data online and only store measurements based on these image-based calculations. The project will prioritise the selection of eye-tracking tools that, while producing the necessary data to infer relevant information about learning processes, collect the minimum amount of personal data required to achieve the educational and research objectives. This approach ensures compliance with the data minimisation principle under Article 5(1)(c) of the GDPR while maintaining the

effectiveness of the AI-assisted educational analytics system. Further details regarding specific data types and collection methods will be provided in subsequent versions of this document as technical specifications are finalised.

Did you implement the right to withdraw consent, the right to object and the right to be forgotten into the development of the AI system?

Participants in EYE-TEACH research activities will be informed about the scope of the project and the objectives of the experimental activity in which they are involved, as well as about their interaction with the AI system and its characteristics, using: (i) an information sheet written in plain and accessible language (with visualisations used where necessary, especially for minors), and (ii) in person before requiring consent via an informed consent form. The legal consent for minor participants will be obtained from parents/legal guardians, while the researchers will make sure that minors give their assent to participate without any pressure from parents/guardians or teachers. Participants' fundamental rights will be guaranteed by providing them with information on how to express their dissent and withdraw their consent to participation in the research activity and to the treatment of their data.

Did you consider the privacy and data protection implications of data collected, generated or processed over the course of the AI system's life cycle?

Yes, the privacy and data protection implications of data collected, generated, and processed throughout the AI system's lifecycle have been thoroughly considered. A key concern in AI systems is the potential difficulty in revoking consent or removing personal data once algorithms have been trained, as this can compromise model integrity. However, EYE-TEACH addresses this challenge through its data architecture: the training phase utilizes anonymous public datasets, while testing is conducted on pseudonymised data in accordance with Article 89 GDPR. This approach ensures that no directly identifiable information about data subjects is incorporated into the AI models, thereby minimizing privacy risks and potential long-term implications for data subjects' rights. Nevertheless, the project includes a dedicated experimentation phase during which any unforeseen privacy or data protection issues can be identified and addressed. This proactive approach allows for the implementation of additional

safeguards if needed, ensuring robust protection of data subjects' fundamental rights throughout the system's operational lifecycle.
In this regard two key measures will be adopted. In addition to the DPIA (WP4) mentioned above, a Data Management Plan (DPM) has already been released in the deliverable D6.1, which establishes project-wide data management practices and regulations for collecting, handling, sharing, and preserving data according to FAIR research data principles. Both the DPIA and the DMP will be updated during the project whenever it encounters significant changes. Additionally, the DPOs from all partner organizations responsible for collecting, handling, sharing and preserving data will be asked to provide advice on DPIAs, as required by Articles 35 and 39 of GDPR. The involvement of DPOs, particularly with regard to the most critical processing of personal data, could also lead to the updating and revision of the DMP.

ALTAI REQUIREMENT #4 Transparency

Did you put in place measures that address the traceability of the AI system during its entire lifecycle?

As part of WP3, the AI pilot system will track the data, model and decision lineage. Before deployment, models and data will be documented and their quality will be assessed. Additionally, during deployment, model inferences, model parameters and input data will be logged for further assessment.

Did you put in place measures to continuously assess the quality of the input data to the AI system?

After being trained with publicly accessible and anonymized eye-tracking datasets, the AI model will be tested on student data from the specific tasks and related environments (laboratory and classroom), as planned in WP2 and WP3 activities. Before deployment, students' eye-tracking data will be checked before being used as an input to retrain the model. To ensure the quality of input data, pre-processing methods will be used for missing and noisy data. If the input data fails the check, it will not be used for model inferences.

Can you trace back which data was used by the AI system to make a certain decision(s) or recommendation(s)?

Yes, the AI pilot system will record and trace which data is used to make specific decisions or recommendations. Local explanations, a specific type of explainable AI methods which describe how the model made a specific inference, will provide insight into the specific rules and features that influenced the model's inferences. This can be communicated in various ways, including through graphs, notifications, annotations, natural language messages (e.g., "the model predicts that the student has low reading engagement because he or she blinked a lot.").

Can you trace back which AI model or rules led to the decision(s) or recommendation(s) of the AI system?

Yes, the AI pilot system will always be able to communicate which model and data are used for each visualization, decision, recommendation. Global explanations, a type of explainable AI method which describes the AI model's general behaviour, can provide insight into how the model uses data to make an inference.

Did you put in place measures to continuously assess the quality of the output(s) of the AI system?

The AI pilot system will monitor and record the confidence metrics for model inferences, which can be communicated to teachers and other stakeholders in several ways: for example, a low-confidence model inference can be displayed in red, while an accurate, high-confidence inference can be displayed in green. Additionally, a message can be provided with the confidence level of the model (e.g., 75% confidence that the student is experiencing a reading comprehension difficulty).

Did you put adequate logging practices in place to record the decision(s) or recommendation(s) of the AI system?

The AI pilot system will keep track of all the input data used to make an inference, as well as the model's output data and parameters (e.g., model sensitivity, hyperparameters, confidence levels).

Did you explain the decision(s) of the AI system to the users?

Teachers will be able to request, for example, by pressing a "Why" button next to the model's prediction, explanations and additional information from the AI system for any of its decisions (local explanations) or for the AI model's behaviour in general (global explanations).

Do you continuously survey the users if they understand the decision(s) of the AI system?

The design of the AI system will include built-in mechanisms to ensure that teachers understand its processes and outputs, including interpretable decisions. Teachers will be able to communicate to the AI system if they do not understand a visualization, recommendation or decision.

In cases of interactive AI systems (e.g., chatbots, robo-lawyers), do you communicate to users that they are interacting with an AI system instead of a human?

Yes, teachers will always be aware that they are interacting with an AI system. This can be achieved through the design of the system in several ways: e.g., a robot avatar can appear to remind the teacher that he or she is interacting with an AI based system. Alternatively, a text statement such as "recommendations and visualizations are the results of algorithmic processes" can be displayed before each interaction.

Did you establish mechanisms to inform users about the purpose, criteria and limitations of the decision(s) generated by the AI system?

Yes, the AI pilot system is designed to make input data and model decisions transparent to the users. The explanations provided by the AI system and the associated training materials will inform the teachers about the potential impact of a decision, as well as on technical limitations of the AI pilot system.

Did you communicate the benefits of the AI system to users?

Yes, the benefits will be communicated in two ways. The AI pilot system will communicate the specific benefit of following a model's decision and recommendation (e.g., what-if explanations). Additionally, the guidelines for

teachers and stakeholders will address the general benefits of using the developed AI-assisted ET-analytics tool in educational contexts.

Did you communicate the technical limitations and potential risks of the AI system to users, such as its level of accuracy and/ or error rates?

Yes, the AI system will be designed to communicate the performance metrics of the underlying models, as well as cases where the AI model may underperform. Additionally, the system can communicate the confidence levels for specific decisions.

Did you provide appropriate training material and disclaimers to users on how to adequately use the AI system?

Yes, the AI system will be accompanied by training materials and guidelines on how to collaborate and interact effectively with it, making appropriate use of its dashboard's features.

ALTAI REQUIREMENT #5 Diversity, Non-discrimination and Fairness

Did you establish a strategy or a set of procedures to avoid creating or reinforcing unfair bias in the AI system, both regarding the use of input data as well as for the algorithm design?

As part of our data curation process (WP2, 3 and 4), EYE-TEACH researchers are systematically retrieving and documenting contextual metadata and ethical-legal requirements for each dataset within a dedicated data framework. This will allow the research team to assess potential sources of bias —such as lack of diversity in participant demographics or language representation— and to make informed decisions about dataset inclusion and data collection priorities. In addition, data-level bias mitigation strategies are being discussed and planned, including the possible use of synthetic data integration and augmentation to address imbalances or underrepresentation in specific groups. These efforts aim to ensure that the training data is as inclusive and representative as possible, reducing the risk of the AI

pilot system reinforcing existing inequalities. Furthermore, WP6 developed a Gender Action Plan (GAP) to ensure the integration of an intersectional gender approach in all the project's phases, so that inequalities are not created or reinforced and existing gender biases are addressed.

Did you consider diversity and representativeness of end-users and/or subjects in the data?

To guide the design of the AI pilot system, an online workshop has already been organized in May 2025 with the participation of teachers and educators working in various European countries and at different educational levels, as part of the activities of WP1 and WP2.

Did you test for specific target groups or problematic use cases?

The AI pilot system will be tested in specific environments (such as laboratories and classrooms) with teachers and students.

Did you research and use publicly available technical tools, that are state-of-the-art, to improve your understanding of the data, model and performance?

EYE-TEACH developers will use existing toolkits and libraries for bias detection and mitigation, including IBM's AI Fairness 360 (AIF360), Microsoft's FairLearn, as well as explainability methods, including SHAP, LIME and InterpretML.

Is your definition of fairness commonly used and implemented in any phase of the process of setting up the AI system?

EYE-TEACH developers will follow existing fairness metrics, including group fairness (statistical parity), individual fairness, and equalized odds differences.

Did you ensure a quantitative analysis or metrics to measure and test the applied definition of fairness?

Fairness checks will be performed on existing or collected datasets and models before model training. To ensure fair model predictions, bias detection and mitigation techniques are used, including reweighing and fairness-aware model training.

Did you establish mechanisms to ensure fairness in your AI system?

During model development, EYE-TEACH researchers and developers are following documentation and reporting methods for data fairness and transparency, as well as fairness check and bias mitigation. As a result, the AI model will not make decisions based on sensitive characteristics, such as gender and socioeconomic background. Moreover, explainability and interpretability methods are used to ensure unbiased decision-making and fair outcomes.

Did you ensure that the AI system corresponds to the variety of preferences and abilities in society?

The AI pilot system is designed in collaboration with teachers from different educational levels and European countries to gain insights of teachers' needs and preferences when using the tool for their unique teaching practices and specific contexts.

Did you take the impact of the AI system on the potential end-users and/or subjects into account?

Within WP1, 2 and 3, the AI pilot system is designed based on findings from literature reviews of similar tools, as well as on teachers' requests, confidence, and technological readiness. This is done through co-design sessions and controlled experiments with teachers to evaluate the usability of the tool in specific contexts and refine the dashboard's design features.

Did you assess whether the team involved in building the AI system engaged with the possible target end-users and/or subjects?

EYE-TEACH project starts and ends with engaging stakeholders and end users, such as teachers and educators, for the model development and deployment. For example, the selection of meaningful eye-tracking metrics as model features is based on literature reviews and workshops with teachers.

Did you consider a mechanism to include the participation of the widest range of possible stakeholders in the AI system's design and development?

As part of WP5, EYE-TEACH project aims to reach a broad spectrum of stakeholders and foster a community connecting primary and secondary education, industry, civil society, and policy makers to ensure the maximum uptake and exploitation of the project outputs.

A core ecosystem of stakeholders, consisting of researchers from various fields, developers and companies specializing in education technologies has already involved teacher representatives in the design and development of the AI-assisted ET-analytics tool. Additionally, during the testing of the pilot AI system, students' feedback will be taken into account to improve its functionalities, accuracy and usability.

ALTAI REQUIREMENT #6 Societal and Environmental Well-being

Does the AI system impact human work and work arrangements?

The AI-assisted ET-analytics tool can have a positive impact on teachers' work. EYE-TEACH's goal is to support educators in their teaching strategies and to improve their working conditions, especially in large classrooms with students with varying reading abilities levels.

Did you adopt measures to ensure that the impacts of the AI system on human work are well understood?

EYE-TEACH has planned numerous activities to engage teachers and educators and help them understand how they could use the AI system and in which contexts it could best assist them. Additionally, the training materials and guidelines will address the potential impact of using the developed AI system on education professionals.

Did you ensure that workers understand how the AI system operates, which capabilities it has and which it does not have?

Both qualitative and quantitative methods will be used to assess teachers' perception of what the AI system can do (e.g., visualizations and decisions), as well as teachers' cognitive load and performance while using the AI system.

Could the AI system create the risk of de-skilling of the workforce?

No, teachers will gain novel insights into their student's learning processes via the AI system, equipping them with better understanding of effective teaching strategies. Using the AI system will require new scientific knowledge about eye-tracking measures, as well as technological expertise and thorough understanding of all the system's capabilities and limitations, to avoid the risk of overreliance on the AI system's decision-making process.

Did you take measures to counteract de-skilling risks?

The goal of the EYE-TEACH project is to design an AI-assisted ET-analytics tool to support teachers, rather than replace them, as well as to help students improve their reading comprehension skills. Therefore, from the very beginning of the project, teachers are actively involved for feedback and requirements on the design of the AI system.

Does the system promote or require new (digital) skills?

Yes, while the AI pilot system will be designed to be as intuitive as possible, teachers will be guided by EYE-TEACH researchers during the testing phase on how to exploit its features and how to interpret the data visualizations and algorithmic decisions.

Did you provide training opportunities and materials for re- and up-skilling?

Yes, an important outcome of the project is the creation of training materials and guidelines for teachers and other stakeholders. These guidelines will provide a comprehensive overview for effectively engaging with the AI system (technical literacy), and for adapting teaching strategies to improve students' reading comprehension.

Could the AI system have a negative impact on society at large or democracy?

No, because reading comprehension is a fundamental citizenship skill, a responsibly designed and used AI-assisted ET-analytics tool can have a positive impact on both individual education, employment, and society at large.

ALTAI REQUIREMENT #7 Accountability

Did you establish mechanisms that facilitate the AI system's auditability (e.g., traceability of the development process, the sourcing of training data and the logging of the AI system's processes, outcomes, positive and negative impact)?

To ensure the AI pilot system's auditability, training datasets and trained models are assessed and documented before its deployment. During deployment, the AI system tracks input data, model parameters and outputs, as well as the potential impact of following a model decision or recommendation.

Did you ensure that the AI system can be audited by independent third parties?

The logged data (such as training data, model input-output-parameters, and outcomes) can be accessed by EYE-TEACH stakeholders, including researchers and educators, as well as to experts for auditing and ethics review processes.

Did you foresee any kind of external guidance or third-party auditing processes to oversee ethical concerns and accountability measures?

In addition to the CNR researchers, experts in ethics and privacy who lead WP4, EYE-TEACH established an external Ethics and Legal Advisory Board, composed by experts from international universities, which is responsible for overseeing how researchers and developers address the ethical and legal issues raised by the project's activities.

Did you consider establishing an AI ethics review board or a similar mechanism to discuss the overall accountability and ethics practices, including potential unclear grey areas?

EYE-TEACH participates in an Ethics review process led by the European Commission with experts appointed by it. This review will be conducted mid-project (M15) and at its conclusion (M36).

Did you establish a process to discuss and continuously monitor and assess the AI system's adherence to this Assessment List for Trustworthy AI (ALTAI)?

Within the activities of WP4, CNR coordinated an initial completion of this ALTAI by the key partners involved in EYE-TEACH (such as the Universities of Turku, Antwerp, Valencia, the Open University of the Netherlands, and DFKI). Further completion of this ethics self-assessment, aimed at updating the questions already answered and at addressing the remaining relevant ones, is planned before the first mid-term ethics review of the project (M15) as part of the deliverable D4.2/D7.1. The last completion of the ALTAI self-assessment will be carried out at the end of the project (M36).