

Example DPIA for Online Proctoring

Part of Intellectual Output 5



*Improving Access to Higher Education through State-of-the-Art Assessment
Technology and Procedures*



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1 INTRODUCTION

This document is the result of work done as part of deliverable package Intellectual Output 5 of the Erasmus+ funded project Online Proctoring for Remote Examination (OP4RE).

An important aspect of online proctoring is concerned with privacy and data protection. What rules and regulations govern the legal justification for the use of online proctoring. In which situations is online proctoring allowed to be used and how can compliance with the rules and regulations be demonstrated. Intellectual Output 5 of the OP4RE project seeks to answer this question.

An important part of demonstrating justification is the perform a so-called **Data Protection Impact Assessment** (DPIA). In this assessment, in a systematic way, the various aspects of online proctoring with a perspective on the goal of data processing, the legal basis of the data processing, the categories of data, the processing methods of the data, the rights of the data subjects, the risks involved in the processing of the data and mitigating measures to prevent illegal access, modification or loss of the data are described and weighed. A DPIA serves to lay-down the discussions and conclusions of internal discussion in the organisation of a data controller which can be used to justify the use of online proctoring for the different internal and external stakeholders amongst which the national data protection authority.

For online proctoring further, the aspect of academic integrity (fraud) is of utmost importance. Ensuring academic integrity to protect the reputation of the Higher Education Institution by ensuring that exams are fair for all students, valid and reliable is a core task. For that reason, errors that could occur in the proctoring of Candidates with regards to establishing (correct suspicion and proof of) fraud must be mitigated to the highest extent also. Illegitimate access to data, modification or destruction of data are therefore also considered in a DPIA for online proctoring with respect to academic integrity.

The Chapters that are provided below follow the general systematic of setting up a DPIA based on the general European Model and are written as if it was for the Vrije Universiteit Amsterdam (VU) using the ProctorExam platform of the OP4RE commercial partner ProctorExam.

Data Protection Impact Assessment document

1 A DESCRIPTION OF DATA PROCESSING

Describe in detail the proposed data processing, the means of data processing and the interests in the processing of the data.

1.1 PROPOSAL

The ProctorExam platform enables *Candidates* (individuals who have to sit an exam) to remotely get access to an exam on the Candidate's computer without having the need to travel to the VU.

- On video, the platform captures the environment where the Candidate is located, the sounds and noises (audio) and everything that is happening on the screen (screen capture, still captures).
- As images, the platform captures an ID-photo of the Candidate.
- Finally, as images, the platform captures an identification card (ID-card) of the Candidate.

For a more detailed explanation of online proctoring we refer to Chapter 2 of the 'Start Report' of the Erasmus+ project 'Online Proctoring for Remote Examination (OP4RE)' and Intellectual Output 2 of the OP4RE project..

The report can be found here:

https://research.vu.nl/ws/portalfiles/portal/39908260/StartReportOP4RE_extended.pdf

The complete online proctoring process consists of several phase that the VU and Candidates have to go through.

Phase 1	Student has enrolled at the VU and has hence agreed to the VUs Terms and Conditions. Using a CSV file with Candidate names and e-mail addresses or via an LTI connection, Candidates are uploaded in the ProctorExam platform and scheduled for a specific exam by a Teacher or an Administrator of the VU.	
Phase 2, <i>Consent and Onboarding</i> on ProctorExam platform	Candidates have to give consent for each exam using online proctoring. The VU collects these consent statements in a separate database. If students do not give consent, they will be assigned to a physical proctoring session on site.	The Candidate prepares for sitting an exam via online proctoring.
Phase 2a: Onboarding	Using e-mail or e-mail generated with the ProctorExam platform, Candidates are invited for an exam by the VU Teacher or VU Administrator. The Candidate clicks on the unique onboarding link for each Candidate and each exam in the e-mail. The Candidate is then led by the ProctorExam application to walk through each separate step to make sure their system and devices are able to work with the online proctoring system	preferably more than seven days before the exam is to take place. No data is recorded in this phase.
Phase 2b	If needed, the Candidate installs ProctorExam software on the	

	computer in the Chrome Browser as a Plug-in.	
Phase 2c	If needed, the Candidate installs software on his/her mobile phone (iPhone or Android) from the Apple App Store or the Google Play Store.	
Exam Preparation		
Phase 2d	The Candidate goes to the ProctorExam instance of the VU and the procedure is executed, led by the ProctorExam system .	
Phase 2d1	If needed, the Candidate gives consent	(for now)
Phase 2e	The Candidate makes sure that video, sound, screen recording and voice operate.	
Phase 2f	The Candidate films the environment (walls, floor, ceiling, behind computer, under computer, under table) in which the Candidate will sit the exam.	
Phase 2g	The Candidate shows if there is no possible unallowed hearing/communication device in the Candidates ear	(to skip for the VU for now) Client in middle east, can you make sure that a female proctor proctors female students.
Phase 2h	The Candidate makes a photo of his face for identification purposes.	
Phase 2i	The Candidate makes a photo of an ID card for identification purposes.	
Exam		Execution Phase
Phase 2j	The student starts the exam	
Phase 2j1	Webcam video is stored, phone cam video is stored, screen recording is stored	
Phase 2j2	In case of Live proctoring, a proctor will monitor the exam process.	The VU will only uses Live proctors who are employed or hired by the VU and work under VU conditions and guidelines. The VU will not make use of proctors from other companies.
Phase 2k	The students ends the exam.	
Post Exam		
Phase 3	The recorded video and identification information is reviewed.	The VU will only uses reviewers and teachers who are employed or hired by the VU and work under VU conditions and guidelines. The VU will not make use of reviewers from other companies.
Phase 3a	In case of no suspicion of fraud: data will be destroyed manually by the VU teacher or the VU Administrator. In the back-office functionality of ProctorExam the VU teacher and VU administrator can perform this action for each Candidate.	
Phase 3b	In case of suspicion of fraud: the VU Teacher or VU Administrator downloads and stores the data on a compliant storage device (conform the VU Data Management Policy), for the purpose of human/exam board inspection. After inspection and conclusion of the suspected fraud, the data needs to be destroyed as soon as possible.	

Table 1 Phases of the Proctoring Process

The ProctorExam platform has a comprehensive user interface for the University to schedule time-slots for exams, decide on the type of online proctoring modality (Live Proctoring, Record and Review or Classroom) and add necessary instructions or attachments for Candidates.

ProctorExam implemented a security by design restrictive user-roles architecture prohibiting mass data access

(see also section 4 D). The following roles exist:

- Super User (ProctorExam) - Able to access all information from all institutes;
- Administrator (VU personnel) - Able to access all information from specific institute;
- Teacher (VU personnel) - Able to access all information from exams they co-manage;
- Global Proctor (ProctorExam) - Able to access all information related to proctoring of test takes sent to global proctoring queue;
- Institute Proctor (VU personnel) - Able to access all information related to proctoring of test takes sent to institute monitoring queue,
- Global Reviewer (ProctorExam) - Able to access all information related to reviewing of tests sent to the global reviewing queue,
- Institute Reviewer (VU personnel) - Able to access all information related to reviewing of tests sent to the institute reviewing queue
- Auditor (VU personnel) - Able to access specific student sessions and exam sessions

1.1.1 ALLOWED USE CASES AT THE VU

The use of ProctorExam for the VU is limited to the following use-cases:

1. Online proctoring for prospective students who want to enter the VU and have to take selections tests or certification tests for that purpose.
2. Online proctoring for students with disabilities who have given consent for online proctoring as it relieves issues with accessibility and usability with exams taken on-campus.
3. Online proctoring for students of the Vrije Universiteit or Students who study or studied at the Vrije Universiteit in exchange programmes AND need to do re-sit exams.
4. Online proctoring for regular Bachelor or Master students of the Vrije Universiteit consenting in taking an exam from home in online proctored conditions.

Additionally:

- The Candidate can be located during the online proctored exam in any country of the EU/EEA and or countries with an adequate level of data protection as determined by the EU Commission/Privacy Shield.
- Countries that are deemed to have insufficient privacy guarantees as listed in the document of the OP4RE project "Online Proctoring, GDPR and Transborder Flow of Data" date May 2019, by authors Prof. Arno Lodder and Assistant Prof. Tijmen Wisman of the Vrije Universiteit Amsterdam may not be included in the online proctoring operations.
- Personal data is not processed with technical means (so, no biometrics processing is involved), but authentication and proctoring is solely based on human intervention.
- The human intervention activities are only carried out by designated VU personnel.

The described four use-cases limit the application of online proctoring at the Vrije Universiteit and hence the risks involved mitigation the violation of the freedom and rights of the data subjects.

1.2 PERSONAL DATA

List all categories of personal data that are to be processed. Indicate per involved party, what data of them will be processed. Categorize the data as follows: ordinary, special, or legal identification number.

1.2.1 ORDINARY PERSONAL DATA

1. ProctorExam and the VU processes the name and e-mail address of Candidates that use the

ProctorExam platform to sit exams. This type of data can be considered as “ordinary”.

1.2.2 SPECIAL CATEGORIES OF PERSONAL DATA

2. ProctorExam and the VU process video footage of Candidates that use the platform to sit exams. This video footage contains images of the students and must be considered as “special” as they can reveal racial, religious and medical information.
3. ProctorExam and the VU process photo's that contain images of the Candidates and must be considered as "special" as they can reveal racial, religious or medical information about a data subject.

However, given the argumentation by authors Prof. Arno Lodder and Assistant Prof. Tijmen Wisman of the Vrije Universiteit Amsterdam as laid down in the document “Online Proctoring, GDPR and Transborder Flow of Data, date May 2019” the video footage and the ID photo do not necessarily have to be treated as a special category of data.

Risk mitigating measure of ProctorExam: In cases 2. and 3., ProctorExam does not process the special categories of personal data as a (directly readable) information strings, thus mitigating exposure.

1.2.3 PERSONAL IDENTIFICATION NUMBERS

4. ProctorExam and the VU processes identification cards for identification purposes. De Vrije Universiteit will only use two modalities:
 1. *VU Student Card or Visiting University Student Card*

For processing of data of Candidates studying at the VU, Candidates will only be asked to use the student card from the VU or - in case of international students studying (temporarily) at the VU - the student card of their home university will be used. This is fully conform the regular purpose of the VU student card as can be found on:
<https://vunet.login.vu.nl/services/pages/practicalinformation.aspx?cid=tcm%3a164-438821-16>
 2. *Regular national identification cards*

For processing of data of Candidates that do not (yet) study at the VU or liaised HEIs, Candidates will be asked to show a national identification card with a ID-photo on it, but the VU will explicitly instruct these Candidates to cover their possible legal identification number, such that this data is not collected.

 - a. In case Candidates do not cover their legal identification number, the image of this card is destroyed as soon as identification has taken place by a live VU proctor or a VU reviewer.

Risk mitigating measure of ProctorExam: In cases 4.1. and 4.2., ProctorExam does not process the legal identification number as a (directly readable) information string.

Risk mitigating measure of ProctorExam: The data that is collected is only visible and accessible to:

1. VU Teachers associated with a particular exam to which the Candidate belongs.
2. Specialised VU Administrators (being able to access all exams of the VU).
3. ProctorExam super-users (being able to access all exams on the ProctorExam platform).

Further:

1. Students cannot access each other's information.
2. Teachers cannot access data of students that are not assigned to the exams of the teachers.

1.2.4 OTHER DATA

On the captured videos of the Candidates, other types of data can be recorded that are not special categories of

data or even personal data but that can be regarded to be sensitive or private: objects in the captured video can reveal personal information. In particular in the **Preparation phase** (see section 1.1) in which the Candidate has to film details of the home environment, personal artefacts can be captured that the Candidate may consider to be sensitive or private.

ProctorExam also collects some data automatically, as described in their "Privacy Statement" to be found at: <https://proctorexam.com/privacy/> . ProctorExam may process and store *information of the used browser and operating system of the Candidate and IP address are logged*. ProctorExam also logs with their Google Chrome extension the web-addresses of the sites the Candidate may visit during the run of a proctoring session to be able to detect unpermitted visits to websites that could yield as fraudulent behavior for sitting an exam. ProctorExam uses this data to make the services work on all devices, to aid troubleshooting, and to document user behaviour relevant to the integrity of the exam. ProctorExam also logs user-related events on the system to support and control the workflow. For instance, they log an event if staff members view or alter exam sets.

1.2.5 DATA CLASSIFICATION (BIV)

Given the nature of the personal data collected and the goals of online proctoring, the VU performed a Data Classification. This classification can be found in document 'Example Data Classification for Online Proctoring'.

AVAILABILITY	High
INTEGRITY	High
CONFIDENTIALITY	High

This classification resulted into the decision perform the current DPIA.

1.3 DATA PROCESSING

List all of the proposed ways of data processing.

- The above mentioned personal data is either imported by the teacher using a "comma-separated values file" or entered manually into the ProctorExam back office.
- In phases 2a to 2c (onboarding process), no data is collected.
- At the time of the exam, video footage from the student's screens, webcams, and mobile phones, including an photo and identification card, is collected and stored on ProctorExam servers according to steps 2d to 2j1.
- After the exam, the video footage of the student's screens, webcams, and mobile phones, including an photo and identification card, is viewed on the basis of *human intervention* by a VU Reviewer, VU Teacher, VU Exam board member or VU Administrator.
- For Exam board decision purposes, data (video footage, ID photo or identification card images) may be downloaded to a privacy compliant data storage device by VU Teachers and VU Administrators (see the VU intranet for descriptions of privacy compliant data storage devices and required use).

Recording and captures of the proctoring session can only be accessed via the ProctorExam back office functionality. This data can only be accessed by two groups of users:

- Reviewers or live proctors of the VU;
- Teachers, administrators and super-users of the VU.

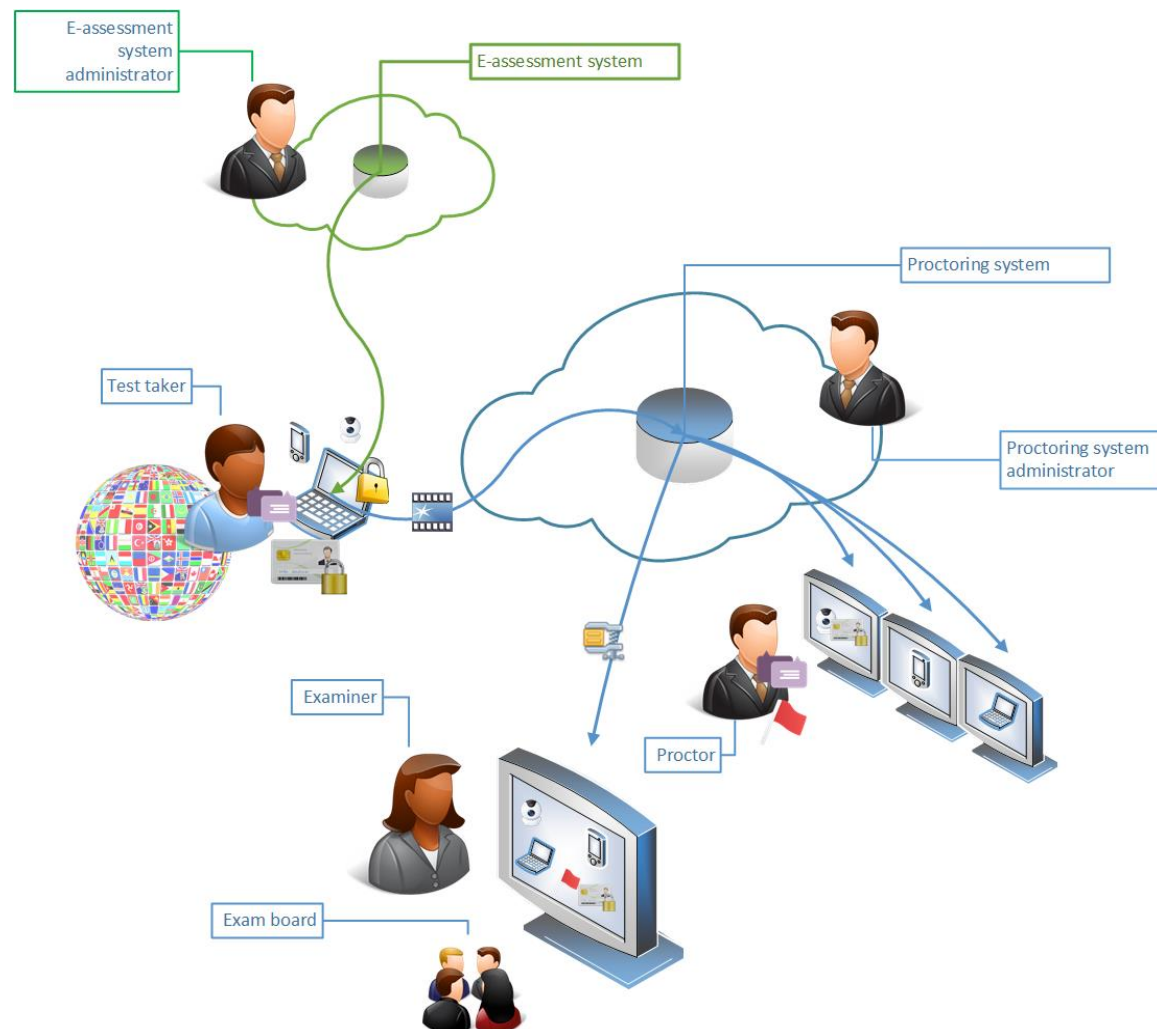
To access the ProctorExam platform, the student can use any operating system including Linux. The student will

have to use Google Chrome and will be asked to add the ProctorExam screen sharing plugin extension. In the case of using the smartphone or tablet for extra security and camera, the ProctorExam app needs to be downloaded from the google Playstore or the Apple Appstore. The plug-ins will not record any other information then is needed for online proctoring. It will not place additional software on the Candidate's computer or mobile phone, it will not place software to control, store, search or execute other functions.

The overall architecture of the platform is further composed of several interacting elements:

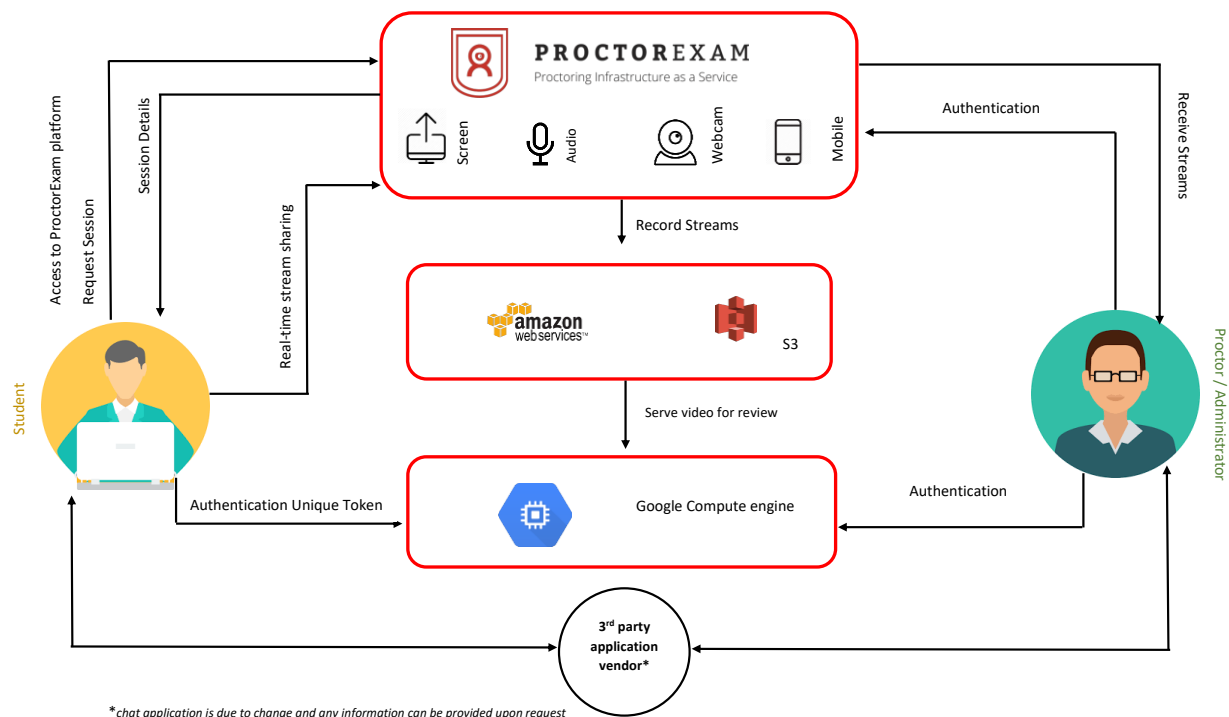
- the ProctorExam server and its databases;
- the student's workstation on which the student is writing the exam;
- the VU Teachers' and Exam board workstation;
- the VU Administrators' workstation.

The diagram below shows the set-up.

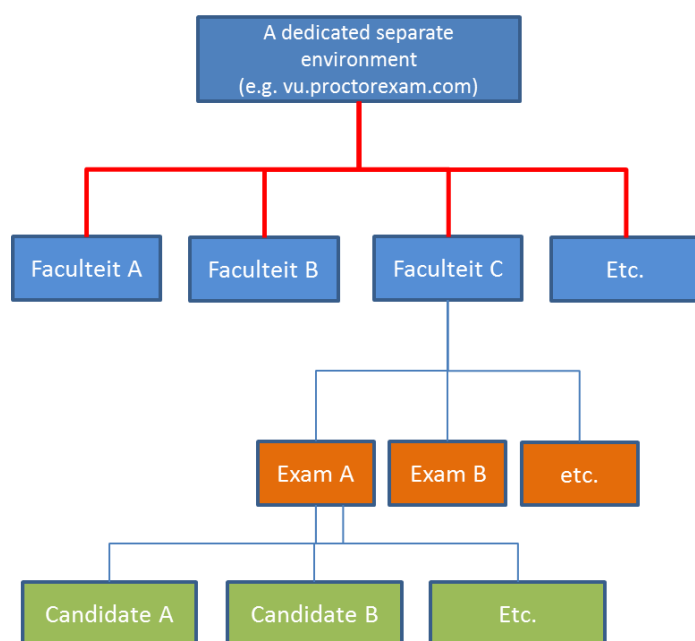


The interconnection between the different elements is done through the internet network via secure protocols (https).

The diagram below shows the technical architecture and the main data flows within the ProctorExam system.



The diagram below shows the set-up of access to the ProctorExam platform for a specific client. For the VU it will be set-up as shown in the diagram.



ProctorExam instance (coherent set of hardware on AWS and Google. Controlled by the ProctorExam super user and the VU Administrator.

Portals for Specific Clients, each with separate datatables. Controlled by the VU Administrator.

Exams with groups of Exam Candidates and VU Teachers or Examboard members.

Exam sessions for individual Candidates and Reviewed or Live proctored.

1.4 PROCESSING PURPOSES

Describe the purpose of the data processing.

The purpose of the data processing is to allow students to take digital exams (selection tests, exams) at non-physical proctored locations (as opposed to human proctored university exam rooms), e.g. their home or from abroad. ProctorExam serves as a method of fraud-detection in order to ensure the integrity of the exam. The integrity of the exam entails that the Candidate is the person he/she claims to be (so identification is necessary) and that the Candidate provides answers to the exam without committing fraud by employing prohibited behaviour or means. For the latter, visual inspection (monitoring) of the exam process is needed.

In short: In order to **detect** and **prevent** fraud during an exam, it is

1. **necessary** to remotely **identify** a test-taker and
2. **monitor** the exam process.

Conclusion: the processing of the data mentioned in section 1.2 *is strictly necessary and inevitable* for these purposes.

The processing of sensitive personal data is prohibited in principle. However, there is an exemption in the Netherlands to this prohibition in article 25 of the Dutch Implementation Law of the GDPR (UAVG). This article states that:

The processing of sensitive personal data (revealing racial or ethnic origin) is not prohibited when:

- For the purposes of identifying the data subject the processing of personal data revealing racial or ethnic origin is inevitable.

Thus, for the purpose online proctoring (detecting and identifying exam fraud) the processing of video footage and a photo of the examinee is not prohibited because the processing of video footage and a photo of the examinee is unavoidable for remotely identifying the examinee.

1.5 INVOLVED PARTIES

List the parties that are involved in the data processing.

The following parties are involved in the data processing:

- Vrije Universiteit Amsterdam: data controller
- ProctorExam (service provider): data processor
- Amazon Web Services (micro-service provider): sub-processor
- Google Inc. (micro-service provider): sub-processor

Organization	Individuals with access to data	Category of personal data
Vrije Universiteit Amsterdam	Teacher for a specific exam	All personal data of students sitting the specific exam
Vrije Universiteit Amsterdam	Administrator	All personal data of all VU students registered in ProctorExam

ProctorExam	Chief Technical Officer (CTO), technicians	All personal data
ProctorExam	Super User	All personal data
ProctorExam	Proctors/reviewers	Student video footage
Amazon Web Services	None	Student video footage
Google Inc.	None	none

1.6 INTERESTS IN DATA PROCESSING

Describe all interests that the controller and others have in the proposed data processing.

The interest of the VU is to allow Candidates (students or prospective students) to make their exams remotely and to open education to a wider public. The ProctorExam platform enables students to remotely get access to an exam on their own computer without having the need to travel, whilst allowing the VU to check if any fraud is committed during the exam.

Interests:

Data Controller (VU)

- To make education more accessible for test-takers by offering them exams remotely via online proctoring.
- Prevent and detect fraud in remote exams via online proctoring (also see recital 47 of the GDPR, stating purposes of preventing fraud are deemed to be legitimate interests).

Data subject (Candidate)

- Special and sensitive personal data not being processed illegitimately (see below)
- Sitting an exam remotely decreases costs and offers enhanced chances to lower the bar for access to education and gain admission to the VU.

Third parties

Other Candidates

- Ensuring the integrity of exams even when they are remotely obtained, which in turn ensures the legitimacy and value of degrees obtained by other Candidates.

Employers, general audience

- Ensuring the integrity of exams even when they are remotely obtained, which in turn ensures the transparency and trustworthiness of qualification of degrees that employers and general audience can rely on.

1.7 PROCESSING LOCATIONS

The ProctorExam solution is hosted on AMAZON's AWS EU Central (Frankfurt) and Google Cloud Europe-west1 and europe-west4 (Netherlands and Belgium) cloud architecture.

The servers are therefore located in the European zone.

ProctorExam uses one third-party service, namely TAWK.TO for user chat support and ticketing system; this service is hosted by AWS Ireland. With tawk.to however, no personal data of data subjects is processed.

1.8 METHODS OF DATA PROCESSING

Describe how and by what (technical) means and methods personal data are processed. Indicate whether there is (semi) automated decision making, profiling or big data processing and, if so, describe what this consists of.

Ordinary personal data (name and e-mail address) is either:

- imported by the VU Teacher or VU Administrator using a “comma-separated values file” via the back office of ProctorExam
- entered manually by VU Teacher or VU Administrator into the ProctorExam back office.
- entered by means of a connection with the VU LMS (Canvas) which is based on the IMS LTI standard (learning tools interoperability). This connection is a standard for multiple connections of educational software tools for the VU LMS Canvas. The legal grounds and policies related to the LMS of the VU apply for that part of online proctoring.

Special categories of data (video footage, ID photo and identification card) are transferred via secure https from the computer of the data subject to the ProctorExam servers.

Special categories of data are further only processed by *human intervention*: individuals of the VU watch video footage in streaming format and images via secure https protocols on their computers.

There is no processing of special categories of personal data *with technical means* as referred to in article 4, 14 AVG: so biometric data is not processed (see for example <https://www.pmpartners.nl/avg-biometrische-gegevens/>).

Data of other data subjects are not merged and analyzed for decision making purposes for individual data subjects and no other form of (semi-) automated decision making regarding data subjects are made. Also (therefore), no profiling or big-data processing is undertaken.

1.9 LEGAL AND POLICY

Identify the laws and regulations, with the exception of the AVG and the Richtlijn, and the policy with possible consequences for the proposed data processing.

- The Wet op het hoger onderwijs en wetenschappelijk onderzoek (WHW) is the most important law in this area. Within the VU, this law is translated to the Regels en Richtlijnen Examencommissie and the Regeling Aanmelden en Inschrijven.
- Also, the VU reglement verwerking Persoonsgegevens studenten Vrije universiteit amsterdam apply to the use of the ProctorExam platform:
https://www.vu.nl/nl/Images/ReglementVerwerkingPersoonsgegevensStudenten2018_tcm289-430309.pdf.
- Regulations of the College van Beroep voor Examens (COBEX). Information can be found here:

<https://www.vu.nl/nl/over-de-vu/contact-routebeschrijving/adressen-en-telefoonnummers/geschillenloket/beroepsprocedure/index.aspx> .

- Regulations with respect to education and exams for each separate Faculty of the Vrije Universiteit (Onderwijs- en examenreglement) as for example can be found here:
<https://sbe.vu.nl/nl/opleidingen/roosters-en-reglementen/onderwijs-en-examenregelingen/index.aspx>.

The use of the ProctorExam platform does not conflict with these laws and regulations.

1.10 STORAGE PERIOD

Decide on and motivate the storage periods of the personal data.

ProctorExam does not automatically destroy data as this could lead too easy to errors and unwanted (mass) destruction of data threatening the main purpose of online proctoring.

However, personal data must and can be destroyed as soon as it no longer serves the purpose of the data processing: the decision of the VU that suspected fraud has not occurred or when an actual fraud case has come to a final verdict.

Personal data information passing through the ProctorExam platform must be destroyed (deleted) by the VU Teacher or VU Administrator *manually*. Destruction of data can be carried out at any moment. This allows compliance with the requirement that personal data of a data subject can be destroyed upon the data subjects request when retracting consent.

Data will be destructed:

1. directly after a decision has been made by the VU Teacher or VU Administrator that there is no suspicion of fraud.
2. after 7 weeks if no further action was taken by the VU (VU Teacher or VU Administrator) after a recorded exam. 7 weeks is deemed sufficient for the VU to perform all needed activities for the purpose of performing a first round of review for possible fraud with online proctoring.
3. directly after downloading video footage for review by VU Exam board members. Data must be downloaded and stored according to the VU Research Data Management Policy (see: https://vunet.login.vu.nl/_layouts/SharePoint.Tridion.WebParts/download.aspx?cid=tcm%3a165-749091-16)
4. directly from a compliant data storage device after a final decision of the VU Exam board or COBEX has been reached regarding a suspect case of fraud.

It is the responsibility of the VU to have procedures in place and monitor the destruction of the data by VU Teachers and VU Administrators. The procedures are described in the *VU Manual for Online Proctoring*.

Back-ups are made daily

The VU annually audits the content of personal data on the Platform. A report is sent to the CIO of the VU by default.

If data are destroyed, the data will also be destroyed on the successive back-up services of the ProctorExam platform within 14 days.

2 B. ASSESSING LEGAL BASIS OF DATA PROCESSING

Assess the legal basis, necessity and purpose of the proposed data processing operations and the rights of the data subject.

2.1 LEGAL BASIS

Determine the legal grounds on which the data processing is based.

Contract deemed *not* appropriate

- The data processing that online proctoring entails is not strictly necessary for the performance of a contract between the Candidate and the data controller.

Legitimate interest deemed *not* appropriate

- Article 6 (1) (f) of the GDPR may be deemed appropriate, as it provides that personal data may be lawfully processed if it is *strictly necessary* for the purposes of the legitimate interests pursued by the controller or by the third party or parties to whom the data are disclosed, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject (test-taker) which require protection.

- In the Netherlands, in response to this prohibition to process special categories of data, article 25 of the Dutch Implementation Law of the GDPR (UAVG) states that:

*The processing of sensitive personal data (revealing racial or ethnic origin) is not prohibited when for the purposes of identifying the data subject the processing of personal data revealing racial or ethnic origin is **inevitable**.*

- Given the processing purpose as described in section 1.6 'The processing of the data [...] is *strictly necessary and inevitable* for these purposes.', the legal ground of Legitimate interest could be chosen.
- However, to the knowledge of the VU, such an exception to Article 6 (1) (f) has *only* be made in Germany (Bundesdatenschutzgesetz § 25) but not in other countries of the EU.
- Therefore we deem Legitimate interest not appropriate as a legal basis for the described use case of section 1.2.

Consent deemed appropriate

- Consent is deemed an appropriate legal basis for the data processing. Freely obtained consent may not be possible because the test-taker may feel that there is an imbalance of power between him/her and the VU. In order to comply with the regulation that consent must be given freely, the VU must at all times also offer Candidates the opportunity to come to the VU and sit an exam under physical proctoring conditions.
- Freely given consent, requires that consent can be freely revoked. However, if the Candidate withdraws his or her consent before the review of the examination by data controller has been concluded the examination process is hindered. In the cases a Candidate withdraws his or her consent, the VU declares the exam attempt of the student as void. The VU distracts 1 instance of the possibilities for the Candidate to sit successive (re)-sits according to the regular examination regulations of the VU *on campus*. This regulation will be made public to the Candidates via the regular channels, but in any case in the VU Education and Exam regulations that the VU by law is obliged to establish.

2.2 SPECIAL CATEGORIES OF PERSONAL DATA

If special or criminal personal data are processed, assess whether one of the legal exceptions to the ban on

processing applies. When processing a legal identification number, assess whether this is permitted.

See section 1.2.

2.3 ADHERING TO THE GOAL OF DATA PROCESSING

If the personal data are processed for a purpose other than that originally collected, assess whether such further processing is in accordance with the purpose for which the personal data were originally collected.

The personal data are not processed for any purpose other than the purpose for which they were originally collected as stated in section 1.4.

ProctorExam will not use the personal data to sell or use to third parties.

ProctorExam anonymizes data before making secondary use of them in statistics.

2.4 NECESSITY AND PROPORTIONALITY

Assess whether the proposed data processing operations are necessary for the purposes of the processing. In any case, take into account proportionality and subsidiarity.

- a) Proportionality: is the invasion of privacy and the protection of personal data of the data subjects proportionate to the processing purposes?
- b) Subsidiarity: cannot the processing objectives reasonably be achieved in another way that is less harmful to the data subjects? Please indicate the alternatives considered.

The ProctorExam platform enables *Candidates* (individuals who have to sit an exam) to remotely get access to an exam on the Candidate's computer without having the need to travel to the VU.

As ensuring the integrity of exams is of utmost importance for both Candidates for exams (data subjects) and the VU (the data controller), the data controller is expected to go to quite a length with procedures and measures and the Candidate to comply with the regulation to prevent or detect fraud. This is already the case as can be deduced from the number of laws, procedures and guidelines to ensure integrity of exams that are in place for regular physically on-site proctored exams. The processing of the data mentioned in section 1.2 is therefore strictly necessary and inevitable for the purposes of the data processing.

- a) Proportionality: when processing the data of students in this system, there is a possible disadvantage to the privacy of students. However, for them, too, the goal of ensuring the integrity of an exam while limiting cost and increasing opportunities to take exams and get access to the VU seems to justify the processing.
- b) Subsidiarity: the online proctoring methods can of course be facilitated by letting Candidates visit a physical location to sit an exam and not process any special categories of data. Currently such opportunities are offered in two modalities (a and b), but could be extended (c and d):
 - a. A Candidate travels to the VU to take an exam. This incurs travelling and possible accommodation cost for the Candidate. Especially when the Candidate is abroad, this can be quite a sum of money.
 - b. A Candidate travels to a Dutch Embassy or to a local University (as in: the country where the Candidate resides). The VU then has to set up arrangements with these HEIs to have them set up a proctoring room with appropriate equipment (computer) and proctors to monitor the Candidate while taking the exam. The VU has to offer in a secure way the exam to the

Candidate which is technically not easy. This form of examination comes at the expense of quite some cost for the VU, but also still for the Candidate.

- c. The VU sends a proctor to the student where he or she lives. The exam is then proctored also at home for the student. It may be evident that this form of proctoring is unrealistic, at least because it would be far too expensive.
- d. A proctor at the VU monitors a Candidate taking an exam with real-time video-streaming technologies (using the Candidates webcam and screen recording devices), but no data is actually collected and stored on a server. This seems a feasible opportunity, but not a single data transfer can do without somehow storing information. Also, as proctoring Candidates using these devices is less user-friendly and much less controllable by quality assurance personnel, this form is less secure then storing this data for a limited number of weeks for better review opportunities.

All in all, these other modalities are less convenient or incur disproportional cost either for the Candidate or for the VU and hence limit opportunities to take exam or get access to the VU.

15. Rights of data subjects

Specify how the rights of the data subjects involved will be implemented. If the rights of the person concerned are restricted, determine on the basis of which legal exception this is permitted.

There is no restriction of the rights of the data subjects. ProctorExam undertakes through the processor agreement all reasonable measures to ensure that data subjects can always exercise their rights. There is a privacy statement present which is in accordance with all applicable laws and regulations. This contains instructions on how data subjects can exercise their rights, including, but not limited to, the removal of personal data at the request of the data subject.

3 C. DESCRIPTIONS, ASSESSMENT AND MITIGATIONS OF RISKS FOR THE STAKEHOLDERS (DATA SUBJECTS AND VRIJE UNIVERSITEIT AMSTERDAM)

Describe and assess the risks for the rights and freedoms of data subjects of the proposed data processing operations. In doing so, take into account the nature, scope, context and purposes of the intended data processing operations

3.1 RISKS AND MITIGATIONS

For HEI read: Vrije Universiteit Amsterdam

For Proctoring Service Provider read: ProctorExam

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
A. Illegitimate access	Exam	Fraud	Candidate	- Theft or redirection of tests during session (Man-in-the-middle/browser attack): session is intercepted by other person changing the answers or communication the answers. Expectation that this will not affect the privacy of	- Candidate cannot take exam. - Candidate is unaware of this situation and faced with a totally aberrant score or other	idem - If this illegal behaviour of malicious individuals gets out into the media, serious deterioration of reputation of the HEI - Can be an incidental occurrence. - Can be a	Impersonation of one student by another	Limited	1	Limited	1	1	- Check if proper Proctoring Service Provider website is used checking https sign in browser - Check directly after exam at HEI if data is not compromise	- Proctoring Service Provider follows the guidelines, (in particular top 10 guidelines) of OWASP. - Proctoring Service Provider keeps track of complying with OWASP guidelines. - Proctoring Service Provider performed a Penetration conducted by UHertfordshire Spring 2018. Results can be found online at Proctoring Service Provider website. PEN test is conducted each year. - Password on Proctoring Service Provider has to be at least 8 characters long, contain one	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
				other Candidates. - Reputation risk for HEI.	consequences - Candidate may face penalties of not being awarded justly acquired credit or access to higher education	systematic occurrence if attack method is posted online and easy to execute by 'normal' individuals.							d. lowercase and one uppercase letter, one number, one special character. Example : *_Val1dP4ssw0rd_* - Proctoring Service Provider is aware of cheating possibilities as for example described here https://jakebinstein.com/blog/on-knuckle-scanners-and-cheating-how-to-bypass-proctortrack/ . Mitigation is increased considerably by the extra Mobile phone cam to film the candidates surrounding when taking the test. Also, the combination of the three video streams reduces the possibilities to cheat dramatically. Further, having candidates film the room before the exam starts and the review by experienced proctors mitigates these changes greatly also.		
A. Illegitimate access	Exam	Data Protection	Candidate	Proctor can see what the Candidate does on the Candidates computer or mobile device after the exam, because screen sharing remains	- HEI: Obligation to inform Candidates and the National DPA of the illegitimate	idem - If this illegal behavior of proctors gets out into the media, serious deterioration of reputation of the HEI	idem	Negligible	0	Limited	1	0	Read and follow-up detailed instructions to: - Double check to close the proctoring	Read and follow-up detailed instructions to: - avoid reviewing video footage after having ended the exam. Giving the data controller administrative rights to manually delete video footage on demand including back-ups	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
				on or the Proctoring Service Provider App is not closed.	access.	<ul style="list-style-type: none"> - Can be an incidental individual violation of rights and freedom if a proctor watches by coincidence. - Can be an incidental but systemic violation of rights and freedom if a proctor by repetition watches Candidates. 							session by closing the Browser. - Disable/uninstall all proctor software after the exam.	- Proctoring Service Provider implemented a security by design restrictive user-roles architecture prohibiting mass data access. The following roles exist: Super User - Able to access all information from all institutes, Administrator - Able to access all information from specific institute, Teacher - Able to access all information from exams they co-manage, Global Proctor - Able to access all information related to proctoring of test takes sent to global proctoring queue, Institute Proctor - Able to access all information related to proctoring of test takes sent to institute monitoring queue, Global Reviewer - Able to access all information related to reviewing of tests sent to the global reviewing queue, Institute Reviewer - Able to access all information related to reviewing of tests sent to the institute reviewing queue Auditor - Able to access specific student sessions and exam	

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact*Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
													sessions		
A. Illegitimate access	Exam	Data Protection	Candidate	Unwillingly sharing of confidential details in the webcam video (e.g. objects in the home environment) or in the screen recording.	- HEI: Obligation to inform Candidates and the National DPA of the illegitimate access.	idem - Can be an incidental individual violation of rights and freedom if a proctor watches by coincidence. - Can be an incidental but systematic violation of rights and freedom if a proctor watches this systematically - If this illegal behaviour of proctors gets out into the media, serious deterioration of reputation of the HEI	idem	Limited	1	Important	2	2	Read and follow-up detailed instructions to: - Hide any confidential information, e.g. objects in the room you take the test in or images and files on your computer desktop.	- Provide Candidate with detailed instructions to hide any confidential information from view by covering or removing these objects such that this data is not collected. - Destruct the data as soon as possible.	Negligible
A. Illegitimate	Post-exa	Data Protection	Candidate	Data (video, photo, ID card) not	- HEI: Obligation	- Deterioration of		Negligible	0	Important	2	0		- Have a process in place in which every week destruction of data is	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
Unauthorized access	Initial	Online	Candidate	Access to data destroyed after agreed term.	to inform Candidates and the National DPA of the illegitimate access.	the reputation.		Low	0	Low	0	0	monitored at the HEI.		Low
A. Illegitimate access	Post-examination	Data Protection	Candidate	Theft of Candidate identity by Proctor, Super User of Proctoring Service Provider, Teacher	<ul style="list-style-type: none"> - Candidate: The Candidate may receive spam or various solicitations. - Candidate: The Candidate may be mistakenly be linked to any (il)legal activity of the thief. - HEI: 	<ul style="list-style-type: none"> - Unless the student uses the same password for all his private and professional accounts, taking into account the data collected by the service provider (name, first name, e-mail address) the impact for the student cannot go beyond spam. - If, on the other hand, the user takes the same password for all his private and professional accounts, the 		Negligible	0	Important	2	0	<ul style="list-style-type: none"> - Use different passwords for each online service they use - Follow up instructions to hide the identification number 	<ul style="list-style-type: none"> - Inform the Candidate to use a different password for the online proctoring if possible. - Create different user-role in order to create a structured firewalled environment as oppose to access to all data. Proctoring Service Provider offers these roles. - Create a log file of user-actions in order to retrieve actions of every user on the application in order to retrieve a paper trail of misconduct - Destruct the data as soon as possible. 	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
					Obligation to inform Candidates and the National DPA of the data theft.	impacts can be greater, such as the usurpation of social network accounts, the theft of bank data, sending malicious emails in the student's name, etc.									
A. Illegitimate access	Post-exam	Data Protection	Candidate	Theft of Candidate identity data from the provider (at individual or large scale).	<ul style="list-style-type: none"> - Candidate: The Candidate may receive spam or various solicitations. - In case of abuse of identification number and ID photo: Candidate may encounter 	<ul style="list-style-type: none"> - Unless the student uses the same password for all his private and professional accounts, taking into account the data collected by the service provider (name, first name, e-mail address) the impact for the student cannot go beyond spam. - If, on the other hand, the user takes the same password for all 	For example: The provider's information system is the victim of a theft of data contained in its databases by an attacker exploiting a vulnerability of the	Maximum	3	Limited	1	3	<ul style="list-style-type: none"> - Use different passwords for each online service they use - Follow up instructions to hide the identification number 	<ul style="list-style-type: none"> - Inform the Candidate to use a different password for the online proctoring if possible. To prevent theft by the HEI/Proctoring Service: <ul style="list-style-type: none"> - Use LTI connection to service so there is no need for a different password and protection is the responsibility of the producer system (currently not in place at the HEI). - Commitment of the service provider to comply with the IT security rules communicated by the university. To prevent theft by the Proctoring Service: 	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the Proctoring service provider.	New likelyhood
					financial or legal problems. - HEI: Obligation to inform Candidates and the National DPA of the data theft. Deterioration of the reputation.	his private and professional accounts, the impacts can be greater, such as the usurpation of social network accounts, the theft of bank data, sending malicious emails in the student's name, etc. - HEI: Deterioration of the reputation.	platform and motivated by the desire to harm.						- Use of the ISO 27018 certified AWS cloud infrastructure to prevent theft. - Follow OWASP guidelines for secure webapplication design. Proctoring Service Provider follows the top 10 guidelines of OWASP. - Perform Penetration Tests once a year. See for example PEN test ... - Create different user-role to create a structured firewalled environment as oppose to access to all data. Proctoring Service Provider offers these roles. - Proctoring Service Provider creates log-file of user-actions to retrieve actions of every user on the application to retrieve a paper trail of misconduct	
A. Illegitimate access	Post-exam	Data Protection	Candidate	Theft of individual audio-visual recordings of the examination	- Candidate: Infringement of the Candidate's image rights if the recordings are broadcast.	- HEI: Deterioration of the reputation.	- Hackers get access to video data - Hackers get access to video data and post it on the	Limited	1	Limited	1	1	To prevent theft by the Proctoring Service provider: - Commitment of the service provider to comply with the IT security rules communicated by the university. - Use of the ISO 27018 certified AWS cloud infrastructure to prevent theft. - Follow OWASP guidelines for	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
					- HEI: Obligation to inform Candidates and the National DPA of the data theft.		internet							secure web application design. Proctoring Service Provider follows the top 10 guidelines of OWASP. - Proctoring Service Provider performs Penetration Tests each year.	
A. Illegitimate Access	Exam	Fraud	HEI	Candidate swaps with another person who impersonates them and takes the test in their place	- HEI will award unjustified grades and certificates.	- HEI: Deterioration of the reputation.	- Swap with twin sister or brother - Swap with ID photos - Swap with previously recorded video	Negligible	0	Negligible	0	0		University issues own personal photo ID cards for registered students. Checking of the student when they enter the University.	Negligible
A. Illegitimate access	Post-exam	Data Protection	Candidate	Theft of a number or all audio-visual recordings of the examination	- Candidate: Infringement of the Candidates' image rights if the recordings	- HEI: Deterioration of the reputation.	- Hackers get access to video data - Hackers get access to video data and	Negligible	0	Negligible	0	0		To prevent theft by the Proctoring Service: - Commitment of the service provider to comply with the IT security rules communicated by the university. - Use of the ISO 27018 certified AWS cloud infrastructure to prevent	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
					are broadcast. - HEI: Obligation to inform Candidates and the National DPA of the data theft.		post it in the internet						theft. - The three pieces of personal information relating to the student_session are name, email, individual_info and are hashed using SHA1. - Follow OWASP guidelines for secure web application design. Proctoring Service Provider follows the top 10 guidelines of OWASP. - Perform Penetration Tests once a year. See for example PEN test ... - Logging of user actions in order to keep a documented trail		
A. Illegitimate access & Data Disappearance	Exam	Data Protection	Candidate	A third party has access during set-up and execution of an exam.	- HEI: Obligation to inform Candidates and the National DPA of the illegitimate access. Deterioration of the reputation.	- HEI: Deterioration of the reputation.	- Example 1: Proctor "brings friends" to watch Candidate - Example 2: Proctor gives password to 'friend' to control panel Consequence	Limited	1	Limited	1	1	Read and follow-up detailed instructions to: - Use a unique password for your exam, never use one that you also use for other applications.	- The proctoring service has developed a Code of conduct for Proctors. - Proctors are located in private and secured area for viewing of the exam. - Proctors are regularly vetted regarding security procedures as laid down in the Code of Conduct for proctors - Open-door policy. Universities should be able to physically check locations - Universities should have the ability to only license the technology and provide inhouse proctors in order to	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
							nce - Third party sees password of exam during log in - Third party can modify or delete video data.							greatly diminish security risks by keeping all human interaction in-house	
C. Data disappearance	Pre-exam	Data Protection	Candidate	Last minute system software updates on home computer or mobile phone disrupt exam software	- Individual Candidates can have problems taking an exam.	- HEI: Deterioration of the reputation.		Limited	1	Limited	1	1	Read and follow-up detailed instructions to: - Test the proctor software on the computer and the network that will be used to take the exam one week prior to exam to	The proctoring service provider provides detailed instructions to the Candidate: - In writing via the proctoring service website - In writing via the HEI website - With video's or animations - In the intake and onboarding procedure - Availability of 24/7 support	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
													make sure it works. - Test the proctor software on the computer and the network that will be used to take the exam two hours prior to exam to make sure it works.		
C. Data disappearance	Pre-exam, exam	Data Protection	Candidate	Unavailability of the platform or network for all Candidates	- Candidate: Unable to initiate or continue the exam. - HEI: Deterioration of the HEI's reputation and confidence		- During the exam, a network failure at one of the service providers occurs preventing all Candidates from continuing	Negligible	0	Negligible	0	0	Read and follow-up detailed instructions to: - be aware of this risk and be aware of possible actions in the event of a failure at	- The proctoring service provider informs the Candidate and the HEI of risk of outage or interruption of service and what the Candidate should do in the event of a failure at the beginning or during the examination. - The proctoring service provider regularly conducts various forms of penetration testing (see example conducted in 2018 by University of Hertfordshire)	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelyhood	Score	Score (Impact* Likelyhood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
					in its digital services. Impact on the examination schedule.		their exam. - An exceptional weather failure or event disables the AWS data centre hosting the Proctoring platform. - The Proctoring Platform is the victim of a cyber attack that makes it unavailable.						the beginning or during the examination (Candidate guide). - The proctoring service provider keeps itself regularly up to date and adapts to the procedures of AWS and Google in case of such an event. - The proctoring service provider has a communication protocol available and ready for execution for such an event. - The HEI administrators and Proctoring Service Provider administrators have access to the service provider's support. - A service level agreement is in place. - Incident reports will always be produced as soon as possible to allow the administrators to make a decision and inform Candidates in the event of a problem.		
C. Data disappearance	Pre-exam, exam	Data Protection	Candidate	Unavailability of an internet connection for an individual Candidate	- Candidate: Unable to initiate or continue the exam.		- During the exam, a network failure occurs preventing	Negligible	0	Negligible	0	0	Read and follow-up detailed instructions to: - be aware	- The proctoring service provider informs the Candidate of this risk and what the Candidate should do in the event of a failure at the beginning or during the examination. - The proctoring service provider	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
					- HEI: Deterioration of the HEI's reputation and confidence in its digital services. Impact on the examination schedule.		an individual Candidate from continuing their exam. - An exceptional weather failure or event disables internet access for an individual Candidate. - The computer of mobile phone of a Candidate is victim of an attack.						of this risk and be aware of possible actions in the event of a failure at the beginning or during the examination .	<p>informs the Candidate that system performance of online proctoring system is monitored every minute and that Candidates:</p> <ul style="list-style-type: none"> -- in case of failure need to provide the HEI with exact dates and times of the outage -- that the system log-files of the proctoring system will be sent to the Candidate for the time of the outage which could also show that other Candidates were able to take exams -- that in the latter case the the responsibility lies with the Candidate -- that in case an outage was detected in the proctoring system, compensation will be rewarded in the form of an extra free of charge exam opportunity. <p>- The proctoring service provider regularly conducts various forms of penetration testing (see example conducted in 2018 bij University of Hertfordshire)</p> <p>- The proctoring service provider keeps itself regularly up to date and adapts to the procedures of AWS and Google in case of such an event.</p>	

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
													<ul style="list-style-type: none"> - The proctoring service provider has a communication protocol available and ready for execution for such an event. - The HEI administrators and Proctoring Service Provider administrators have access to the service provider's support. - A service level agreement is in place. - Incident reports will always be developed as soon as possible to allow the administrators to make a decision and inform Candidates in the event of a problem. 	
C. Data disappearance	Post-exam	Data Protection	Candidate	Loss of an individual audio-visual recordings of the examination	<ul style="list-style-type: none"> - Candidate: possibility that an exam is declared void as a consequence of missing data - HEI: Obligation 		- A proctor by accident deletes one or a few recordings.	Negligible	0	Negligible	0	0	<ul style="list-style-type: none"> - Commitment of the Proctoring service provider to comply with the IT security rules communicated by the university. - Use of the ISO 27018 certified AWS cloud infrastructure to prevent theft. - Follow OWASP guidelines for secure web application design. Proctoring Service Provider follows the top 10 guidelines of OWASP. - Perform Penetration Tests once a year. See for example PEN test at 	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
					to inform Candidates and the National DPA of the data theft. Deterioration of the reputation.									http://partners.proctorexam.com/wp-content/uploads/2018/12/System-Resilience-Penetration-Test-Report-OP4RE.pdf ...	
C. Data disappearance	Post-exam	Data Protection	Candidate	Loss of a number or all audio-visual recordings of the examination	- Candidate: possibility that an exam or multiple exams are declared void because of missing data - HEI: Obligation to inform Candidates and the National DPA of the	Deterioration of reputations of HEI if discovered	- A proctor by accident deletes a number of recordings - A system administrator (for example at AWS, Google or Proctoring Service Provider) by accident deletes a number of	Negligible	0	Negligible	0	0		- Commitment of the service provider to comply with the IT security rules communicated by the university. - Use of the ISO 27018 certified AWS cloud infrastructure to prevent theft. - Follow OWASP guidelines for secure web application design. Proctoring Service Provider follows the top 10 guidelines of OWASP.	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
					data theft.		or all recordings . - A system administrator or by accident deletes a number of or all recordings .								
D. Test Fairness	Post-exam	Test Fairness	Candidate	Misinterpretation of Candidate's behaviour/facial expressions/movements by proctor during exam	- Candidate: possibility that an exam or multiple exams are misclassified as fraud	- Candidate can be unjustly hindered or denied access to higher education, course degree or a degree	Proctors are too strict in interpretation of video footage	Important	2	Negligible	0	0	Read and follow-up detailed instructions to: - Behave in a normal way.	Provide detailed instructions to Proctors: - Be aware to avoid any kind of bias based on gender, ethnicity, religion or otherwise - Provide opportunities for Candidates to review their own video's. Candidates can be allowed access to their own recordings and other data in the proctoring system. - Provide opportunities for Candidates to review their own video's in the follow-up process in case of suspicion of fraud (see functional description of online proctoring of Start Report OP4RE)	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
E. Fraud	Exam and Post-exam	Fraud	HEI	Exam fraud: - Google glass or normal glasses? - Earpiece connected to supporter or hearing aid? - Extra monitor/computers - Other people, papers, notes out of camera sight - Accessing files/internet during exam - Toilet visit	- HEI will award unjustified grades and certificates - When fraud is exposed it can deteriorate the reputation of the HEI	- Deterioration of reputations of HEI if discovered	See Risk/Threat	Important	2	Important	2	4	Inform the HEI pro-actively that you wear glasses or earpieces. Read and follow-up detailed instructions during the intake and authentication procedure for the online proctored exams to additionally: - Take off glasses and have them recorded during the set-up procedure - Take off earpieces	With online proctoring, visiting the toilet is prohibited. Candidates are instructed explicitly about this. Proctors and reviewers are instructed to check this explicitly. With online proctoring, having other people in the room is prohibited. Candidates are instructed explicitly about this. Proctors and reviewers are instructed to check this explicitly. Inform the Candidate to contact the HEI when they might have glasses or earpieces that could be regarded as fraud supporting devices Have well balanced and detailed instructions during the intake and authentication procedure for the online proctored exams: - Already in place via https://docs.google.com/document/d/1OI3X3_Z49wpy8NM16H5uGLcAxXeamCF8H52LB3-u890/edit?usp=sharing : -- Make sure the room is well lit -- Film the room 360 degrees around -- Film the ceiling	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelyhood	Score	Score (Impact* Likelyhood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
													and have them recorded during the set-up procedure - Stow additional computer screens away or cover them visibly	-- Film under the table -- Film the computer -- Film under the computer -- Film your ears -- Film the table and make sure that no prohibited materials are on the table or in the room And add to this additionally as future checks (not currently supported in Proctoring Service Provider): - Take off glasses and have them recorded during the set-up procedure - Take off earpieces and have them recorded during the set-up procedure - Stow additional computer screens away or cover them visibly The Proctoring Service Provider software automatically collects all URL's that have been accessed via the Google Chrome instance that the Candidate uses. The proctor and reviewer can access this in list form. The proctor inspects the screen recording to assess whether the Candidate did not access prohibited	

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
													computer resources.		
E. Fraud	Exam and Post-exam	Fraud	HEI	Exam fraud: - Twin brother/sister makes the test instead of the intended person - When fraud is exposed it can deteriorate the reputation of the HEI	- HEI will award unjustified grades and certificates - When fraud is exposed it can deteriorate the reputation of the HEI			Negligible	0	Negligible	0	0	Inform the HEI proactively that you are part of twin	Inform the Candidate that they should report upfront to the HEI that they are part of a twin couple.	Negligible
E. Fraud	Exam	Fraud	HEI	Identity theft during the examination				Negligible	0	Negligible	0	0	- Proctors do a close check of the ID photo in combination with the webcam video. - HEI should execute a double ID verification process, for example invite Candidates involved in suspicious exam to the HEI administration office face-to-face - Proctors do a close check of the identity document. - Viewing the video footage to check if the student who took the exam is		Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelihood
													the correct one.		
E.Fraud	Post-exam	Data Protection	Candidate	Incorrectly detect an attempted fraud by the Candidate	- Candidate: Infringement of the Candidate's rights and freedoms		During an exam, the technology or internet connection has temporary outages. The video streams are interrupted intermittently for a few seconds are more. This could easily be flagged as an attempt of fraud. However, close and holistic assessment of the rest of the	Negligible	0	Negligible	0	0	The candidate must do its very best to ensure enough bandwidth and quality of internet connection and functioning devices.	- Double check with Exam Boards	Negligible

Category	Phase	Type of Risk	Risk for	Risks/Threat description	Direct consequence	Impact	Illustration	Impact/ Seriousness	Score	Likelihood	Score	Score (Impact* Likelihood)	Controls/Measures Mitigating the risk by the	Controls/Measures Mitigating the risk by the HEI and Proctoring service provider.	New likelyhood
							footage may indicate that the student did not do anything suspicious or fraudulent.								

4 D. DESCRIPTION OF THE MEASURES PROPOSED

Describe the measures proposed to address the risks described above of the proposed data processing operations for the freedoms and rights of data subjects.

4.1 SECURITY MEASURES

Assess which technical, organisational and legal measures can reasonably be taken to prevent or reduce the risks described above. Describe which measure addresses which risk and what the residual risk is once the measure has been implemented.

See table of Chapter 3.

4.2 RESIDUAL RISKS

Though most risks can be countered or mitigated, experiments have shown that there are two main risks for the institution that are very hard to counteract.

1. Candidates who copy questions and answers illegally (for example film exams with small camera's, make screen dumps, record screen activity) and subsequently distribute questions and answers illegally
2. Candidates that hook up external monitors that individuals (other than the Candidate) can view and that those individuals accordingly pass-on answers via for example ear-pieces or other means to the Candidate. Also, these individuals could conduct illegal question and answer copying

4.3 GENERAL MEASURES

The general ProctorExam security measures as can be found in Annex 2 of the standard ProctorExam Processor Agreement. These are:

4.3.1 PHYSICAL ACCESS CONTROL

Technical and organizational measures to prevent unauthorized persons from gaining access to the data processing systems available in premises and facilities (including databases, application servers and related hardware), where Personal Data are processed, include:

- Establishing security areas, restriction of access paths;
- Establishing access authorizations for employees and third parties;
- Access control system (ID reader, magnetic card, chip card);
- Key management, card-keys procedures;
- Door locking (electric door openers etc.);
- Security staff, janitors;
- Surveillance facilities, video/CCTV monitor, alarm system;
- Securing decentralized data processing equipment and personal computers.
- Encryption of personal computers

4.3.2 VIRTUAL ACCESS CONTROL

Technical and organizational measures to prevent data processing systems from being used by unauthorized

persons include:

- Referred user invitation system
- Password complexity requirement
- Automatic expiration of login status
- Creation of one master record per user, user master data procedures, per data processing environment;
- Certificate protection on all SSH
- Client to Server encryption on the line
- Specific access roles per service
- On the fly signing for WebRTC service

4.3.3 DATA ACCESS CONTROL

Technical and organizational measures to ensure that persons entitled to use a data processing system gain access only to such Personal Data in accordance with their access rights, and that Personal Data cannot be read, copied, modified or deleted without authorization, include:

- Control authorization schemes(Password Authentication)
- Differentiated access rights (superuser, administrator, teacher, proctor, reviewer);
- Monitoring and logging of accesses;
- Reports of access;
- Access procedure;
- Deletion procedure;
- Encryption.
- Siloing of organizations' data

4.4 DISCLOSURE CONTROL

Technical and organizational measures to ensure that Personal Data cannot be read, copied, modified or deleted without authorization during electronic transmission, transport or storage on storage media (manual or electronic), and that it can be verified to which companies or other legal entities Personal Data are disclosed, include:

- Encryption/tunneling;
- Logging;
- Transport security.

4.5 ENTRY CONTROL

Technical and organizational measures to monitor whether data have been entered, changed or removed (deleted), and by whom, from data processing systems, include:

- Logging and reporting systems;
- Audit trails and documentation.

4.6 CONTROL OF INSTRUCTIONS

Technical and organizational measures to ensure that Personal Data are processed solely in accordance with the Instructions of the Controller include:

- Unambiguous wording of the contract;
- Formal commissioning (request form);
- Criteria for selecting the Processor.

4.7 AVAILABILITY CONTROL

Technical and organizational measures to ensure that Personal Data are protected against accidental destruction or loss (physical/logical) include:

- Backup procedures;
- Database replication
- Multi-AZ Application distribution
- Data stored remotely
- Firewall system
- Disaster recovery plan
- Availability monitoring system

4.8 SEPARATION CONTROL

Technical and organizational measures to ensure that Personal Data collected for different purposes can be processed separately include:

- Separation of databases;
- "Internal client" concept / limitation of use;
- Segregation of functions (production/testing);
- Procedures for storage, amendment, deletion, transmission, archival of data for different purposes.
- Separation of client roles
- Separation of applications for customers

MonitorEDU review.

5 BALANCING TEST

If the measure does not fully cover the risk, explain why the residual risk is acceptable.

Despite the described measures to mitigate and eliminate any occurrence of illegal data access, modification or destruction to a negible likelihood, there are still possibilities for a data breach.

Considering:

- the minimal likelihood of illegitimate processing; and
- the legitimate interest of the controller (Vrije Universiteit Amsterdam);

we consider that the legitimate interest of the Vrije Universiteit Amsterdam overrides the interests or fundamental rights of the data-subject (Candidate), whilst it furthermore is in the interest of the Candidate to

have remote access to exams and education.

We consider the rest risks as acceptable because in particular:

- The data-subject (Candidate) is offered the possibility to opt-in to a remote exam via online proctoring with clear consent information and is always offered the opportunity to take an exam at the Vrije Universiteit with online proctoring.
- Data are destroyed directly (1) after review or (2) reaching a verdict in case of suspicion of fraud or (3) after 7 weeks, including weekly audits.
- If data are downloaded by the Vrije Universiteit, they are only stored on secure storage devices compliant with the Vrije Universiteit data storage regulations.
- The ProctorExam system runs in fully compliant European cloud infrastructure of AWS and Google.
- The VU administrator and VU teachers will be trained before being allowed to use the system.
- Online proctoring possibilities will only be used in EER countries or countries with comparable levels of data protection, according to <https://confluence.vu.nl/display/VPC/Derde+landen+met+een+passend+beschermingsniveau>
- The Candidates will have ample opportunity for onboarding and setting-up their systems with clear instructions.

And when a data breach occurs:

- In case of a data breach, ProctorExam has a data breach protocol as described in Annex C of the Processor Agreement. In short, this procedure entails that ProctorExam takes up the obligation to inform the data controller within 24 hours. Detailed information, including forms for reporting data breaches can be found here: <https://partners.proctorexam.com/corporate-and-partners-documentation/> or directly here: <http://partners.proctorexam.com/wp-content/uploads/2018/11/Privacy-Security-document.pdf>

Password for access is: XXXXX

2 RESIDUAL RISKS

With regards to residual risks with respect to fraud, the HEI and ProctorExam are fully aware of the residual risks being unable to detect (1) Candidates who illegally copy questions and answers and subsequently distribute them illegally or (2) Candidates that hook up external monitors that individuals (other than the Candidate) can view and that those individuals accordingly pass-on answers via for example ear-pieces or other means. Irregular patterns of clicking by the Candidate may reveal this form of fraud and Proctors and Reviewers are instructed to pay careful attention to this kind of fraud.

5.1 SUGGESTIONS FOR MITIGATING ANXIETY

The OP4RE project identified the following factors that increase anxiety and chances of technical and procedural phases and developed suggestions for mitigating anxiety problems.

Phase	Step	Details	Factors increasing anxiety and increasing chance of failures (based on experiences from the OP4RE experiments)	Mitigation
Pre-exam	Orientation	Test taker orientates on the option to take a remote exam.	<ul style="list-style-type: none"> No information on website. Incorrect information on website. Too little specific information on website. 	<ul style="list-style-type: none"> Double check all information on the website. Make sure that the information is presented in the most accessible and comprehensible manner. Provide a practice test.
	Onboarding	HEI sends out information via e-mail to the student to set-up the students system (computer, internet, webcam, mobile phone, speaker, microphone).	<ul style="list-style-type: none"> Students do not receive e-mails (spam filter) Students do not open e-mails Students do not click on appropriate links in e-mails to start onboarding process Students start to perform the onboarding process too late 	<ul style="list-style-type: none"> Make sure the HEI communication e-mailsystem is not regarded as a dangerous source (spam). Work with an e-mail system that can detect whether students click on the necessary links (e.g. MailChimp analytics possibilities). Consider offering multiple communication channels for students: <ul style="list-style-type: none"> SMS WhatsApp Monitor in the Proctoring system if students have started and finished the set-up procedure <ul style="list-style-type: none"> Resend e-mails when no timely onboarding has been performed by the student.
		Via the proctoring system e-mails are sent out to have the tests-taker	idem	idem

		set-up the system		
	Just before exam	<p>The student starts the exam process from the start up to the actual presentation of the exam questions. This process includes:</p> <ol style="list-style-type: none"> 1. Login to the proctoring session with a URL or using credentials. 2. Starting webcam, screenharing and possible mobile phone video. 3. Make a picture of themselves. 4. Make a picture of an ID document. 5. Recording the environment to show that no cheating will take place (walls, ceiling, floor, under table etc.). 6. Click on a link to start the exam. 7. Login to the exam. 	<ul style="list-style-type: none"> • Students change their technical environment after the onboarding process (for example move to a room with less performing internet or a country with restricted internet options such as China, Arabic Emirates, Iran). • Students do something strange during the process, for example scan a QR code with the non-proctoring app. • Students get stuck at a certain step (for example webcam check) and do not know how to proceed. • Students with head scarfs might want to skip the step in which they have to show their ears. Mak clear if skipping a step is allowed. <p>In the experiments of OP4RE, this procedure could take between 5 minutes and 25 minutes for students.</p>	<ul style="list-style-type: none"> • Clearly communicate to students not to change technical environment as compared to onboarding situation (in particular the speed and type of internet connection). • Design software in such a way that steps can be skipped without the consequence not to be able to start the exam. <ul style="list-style-type: none"> ◦ Inform students what the consequences are of skipping a step, e.g. stricter review of suspicious behaviour by a proctor or reviewer • Provide real-time support by the proctor if possible. • Communicate to students clearly four timing issues: <ol style="list-style-type: none"> 1. The time to start the proctoring set-up process and identification/authentication process and that this can and should be performed in 20 minutes, also that after this process a waiting time might be possible for being allowed to start the actual exam. 2. The time at which the actual exam starts. 3. The duration of the exam or the actual finishing time of the exam. 4. The time to get feedback on possible suspicious fraudulent behaviour.
Exam	During exam	Students start the actual exam with the e-assessment software provided by the exam provider.	<ul style="list-style-type: none"> • Students run in to problems with logging in into the e-assessment system. • Students have pop-up blockers. • Students do not know their login 	<ul style="list-style-type: none"> • Make sure to inform students to turn-off pop-up blockers (in the text with the link). • Do not let clickable links open in a new window. • Make clear agreements between the proctoring provider and the

			<p>credentials.</p> <ul style="list-style-type: none"> Students have other problems related to the exam itself. <ul style="list-style-type: none"> In the OP4RE project it turned out that the responsibility to take care of student problems lies for the proctoring system with the proctoring provider and for the exam at the exam provider. For students this difference is not self-evident. Students call for assistance via a chat window but the proctor or support staff react not immediately. Students call for assistance via a chat window but the proctor or support staff react in a different language than the mother tongue of the students. 	<p>exam provider who is responsible for what part of the communications and what part of problem solving for the student.</p> <ul style="list-style-type: none"> Communicate on the website or just before the start of the exam about these differences. Make sure that the proctoring provider has support in the mother tongue of the students. Make sure that students are reassured about the response time as soon as they call for assistance. <ul style="list-style-type: none"> Do expectation management: communicate on the support website that the online assistance has limited capabilities Do emphasize the responsibility of the student to do a full run of a practice test Do emphasize to the student to prepare everything and that they are responsible for a flawless exam on their side of the technology set-up.
	Finishing exam	Students submit final answers.	<ul style="list-style-type: none"> Students are not sure if they have actually submitted the answers into the e-assessment system. Students do not finish the exam via the correct button and simply close the proctoring window. 	<ul style="list-style-type: none"> Provide enough feedback via the user-interface.
Post-exam	After exam	Students receive the assessment concerning possible suspicion of fraud.	<ul style="list-style-type: none"> Students are not sure if they may have behaved suspicious Students might wrongly think they did not behave suspicious (in 	<ul style="list-style-type: none"> Provide confirmation e-mails Provide an assessment of suspicion of fraudulent behavior never later than the communicated time

particular in a not live proctored
situation).

5.2 EXAMPLE INSTRUCTIONAL MATERIALS

You will need:



Laptop or Desktop



Google Chrome.



A photo ID.



(if required) A smartphone or tablet.



Steady internet connection

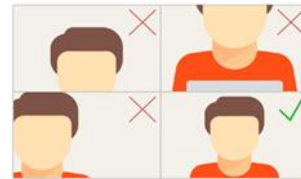
Before your exam, make sure that:



Your room is well lit.
During the exam:



You are alone.



Your cams are positioned right.



No extra devices.



No headphones.





No talking (or singing).




No toilet breaks.

Figure 1 Infographic by Western Governors University

HOW TO PREPARE FOR AN ONLINE PROCTORED ASSESSMENT

- 
1 DO A WEBCAM AND SYSTEM CHECK.
 Accessible on the Assessment Center page in your Course of Study.
- 
2 TAKE A PRACTICE TEST.
 Want to try a practice run? Click the "Assessment Center" button on the assessment tab of your course of study, and then click "Try It Now."
- 
3 SCHEDULE IT.
 Don't wait until the last minute! You can schedule an assessment after approval from your mentor.
- 
4 ENSURE STABLE INTERNET CONNECTION.
The #1 problem for students! Even the best wireless connection can be unstable, especially with other people using your WiFi. For best results, limit the number of other users on your network. Using an Ethernet cable may also help.
- 
5 FIND A PRIVATE LOCATION.
 Find a quiet, distraction-free location where you can focus and do your best.
- 
6 GET READY TO START.

✓ Valid, government-issued, photo ID	✗ Dual extended monitors
✓ White board (no paper)	✗ Talking aloud
✓ Calculator (no online calculators or cell phones)	✗ Others in the room
- 
7 YOU'RE READY TO TAKE YOUR ASSESSMENT.
 Good luck!

STEP 1 Technical Requirement test

Check Requirements

- ☐ Microphone
- ☐ Speakers
- ☐ Webcam
- ☐ Mobile
- ☐ Screenshot

STEP 2 The exam set-up

You will now be guided through the following steps:

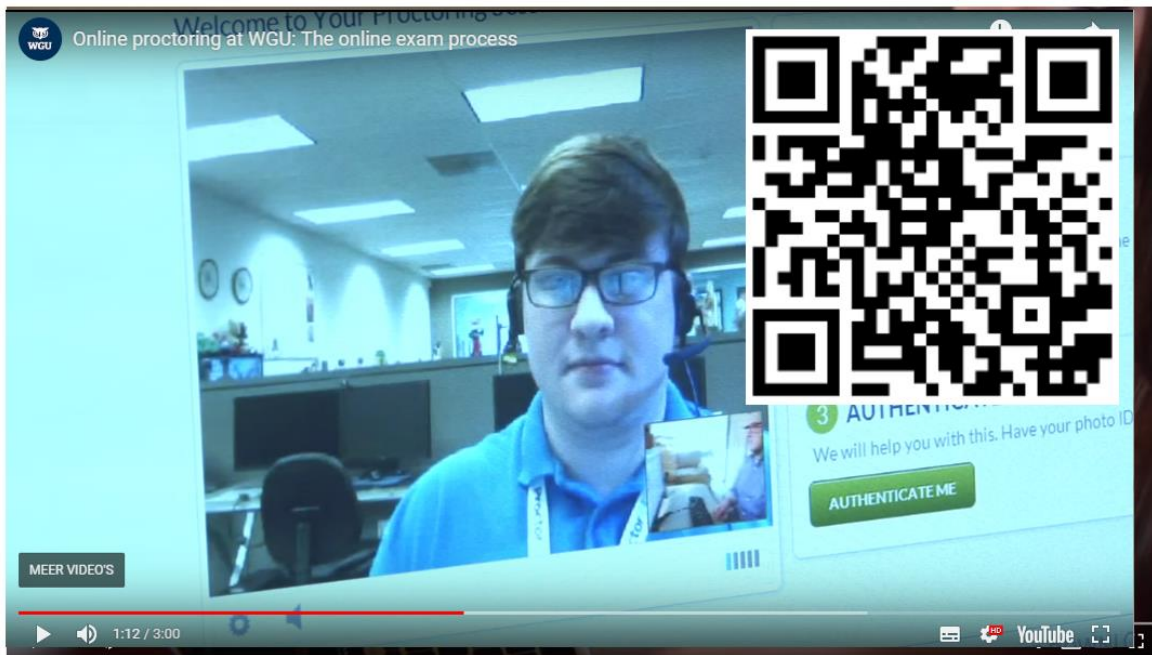
1. Identify yourself
2. Set up your smart device
3. Show your surroundings
4. Set up your cameras

Continue

STEP 3 Start exam

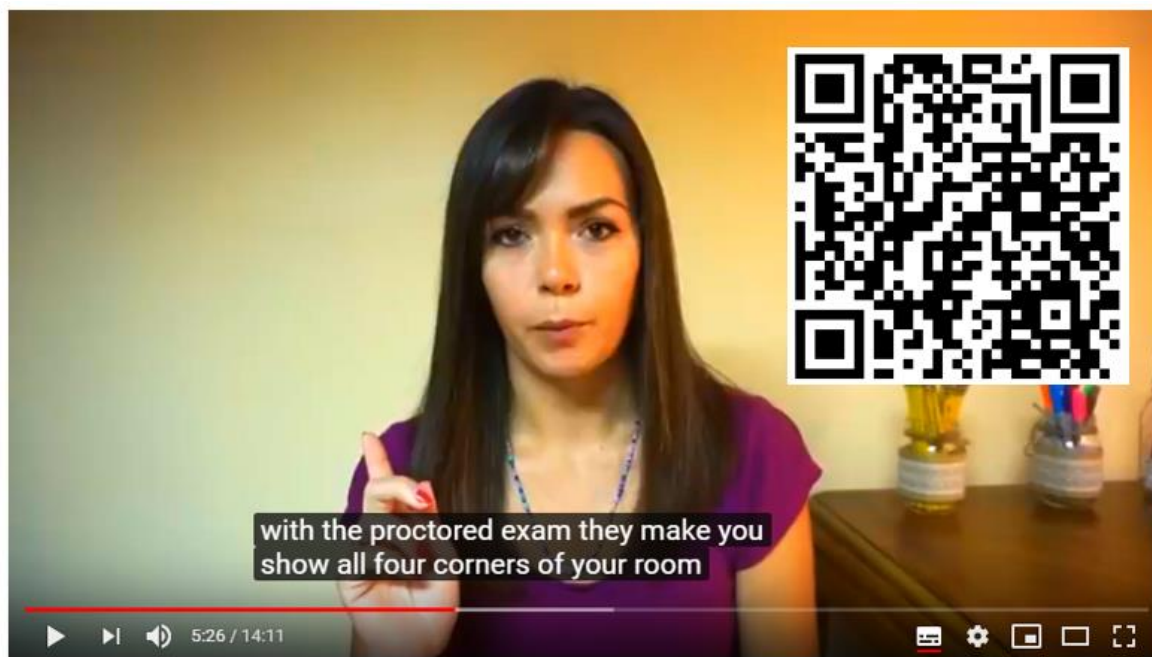


Figure 2 Instruction video by Western Governors University



Your First Test - What to Expect with Online Proctoring External Webcam

Figure 3 Video from student of Western Governors University



WGU Proctored Exams & Update

Figure 4 Instruction video by Fontys University of Applied Science teacher



Figure 5 Instruction video by PearsonVUE

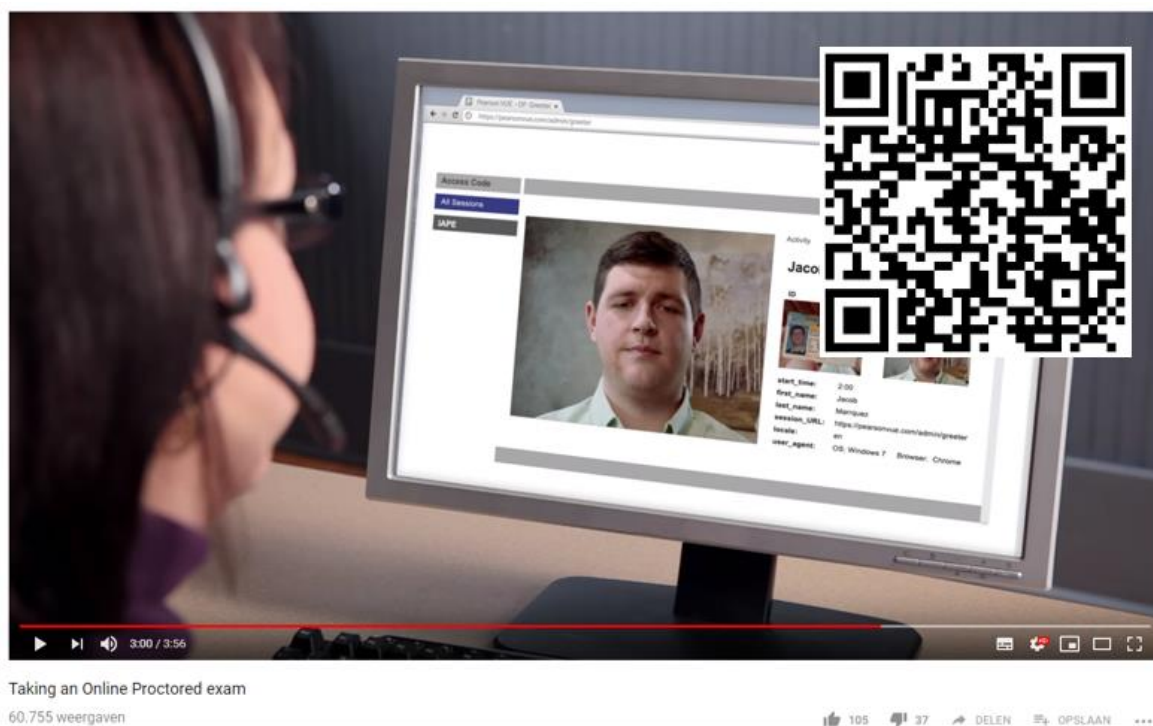
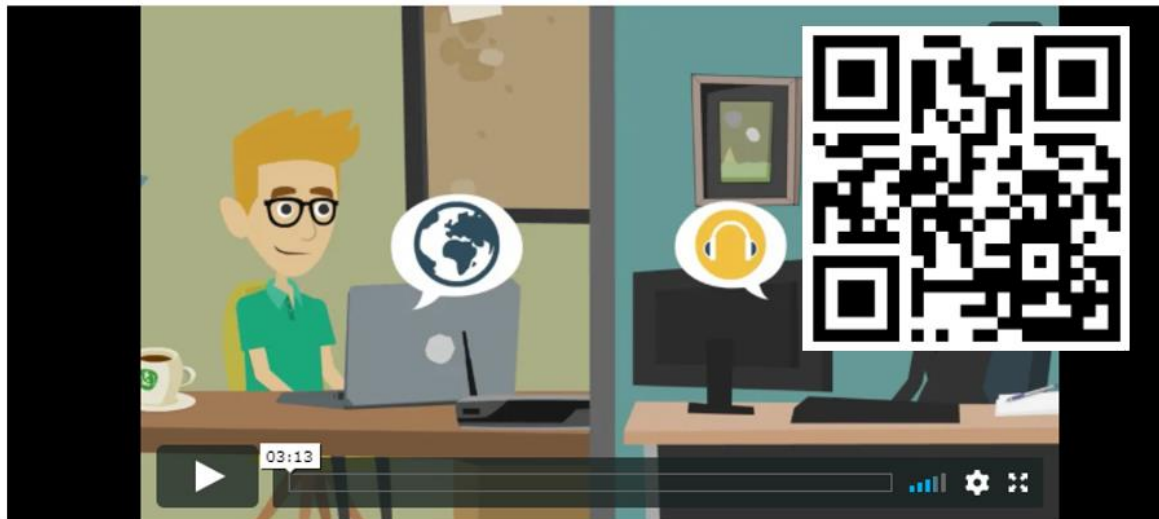


Figure 6 Instruction video by Questionmark Perception



Questionmark Online Proctoring - The Candidate Journey

5.3 ACADEMIC INTEGRITY

5.3.1 FALSE NEGATIVES: FAILURE TO DETECT ACADEMIC DISHONESTY

5.3.2 FALSE POSITIVE: INCORRECT ALLEGATION OF ACADEMIC DISHONESTY

5.4 PROCEDURAL FAILURES

5.4.1 POOR COMMUNICATION ON THE PART OF THE INSTITUTION

2.1.1.1 *No communication*

2.1.1.2 *Too late/Too soon communication*

2.1.1.3 *Unclear communication*

2.1.1.3.1 Too much information

2.1.1.3.2 Too little information

2.1.1.3.3 Ambiguous information

5.4.2 POOR COMMUNICATION ON THE PART OF THE CANDIDATE

2.1.1.4 *Not reading email*

2.1.1.5 *Email in spam box*

5.5 TECHNOLOGICAL FAILURES

going to toilet

Having ears displayed by students wearing scarf ...

3 MITIGATING STUDENT ANXIETY

5.6 COMMUNICATION BEST-PRACTICES

5.6.1 EMAIL

5.6.2 WEBSITE

5.6.3 GRAPHICS

5.6.4 VIDEO'S AND ANIMATION

5.7 PRACTICE PRINCIPLES

5.8 TECHNOLOGICAL FAILURES

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1 COLOFON

This Start Report is part of the Erasmus+ KA2 project 'Online Proctoring for Remote Examination'.

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