



poiesis
TRUST IN SCIENCE

T2.4: Survey experiment protocol

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Project title: Probing the impact of integrity and integration on societal trust in science

Project acronym: POIESIS

Grant Agreement no.:101057253

Lead partner for this deliverable Aarhus University



Deliverable factsheet:

Project Number:	101057253
Project Acronym:	POIESIS
Project Title:	Probing the impact of integrity and integration on societal trust in science
Title of Deliverable:	Task 2.4: Survey experiment protocol
Work Package:	WP2
Author(s):	Simon Fuglsang (AU)

ABSTRACT:	This deliverable describes the design and implementation of the POIESIS survey experiment.
Keyword List:	POIESIS, Trust in Science, Survey Experiment

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7.	Associated partner	LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE	LSE	UK

Revision history:

VERSION	DATE	Revised by	Reason
0.1	29.04.24	Simon Fuglsang	First draft
0.2	07.05.24	Simon Fuglsang	Updated based on Aarhus Team feedback
0.3	10.06.24	Simon Fuglsang	Updated based on consortium feedback
0.4	09.08.24	Simon Fuglsang	Updated after ethical review and consortium discussions.
1.0	30.08.24	Simon Fuglsang	Version 1.0 uploaded to Zenodo

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1 Introduction

The POIESIS project investigates the relationship between research integrity, societal integration, and public trust in science. Core to this, is the interrogation of three widely held assumptions on the role that research practice and research policies have for the maintenance of high levels of trust in science. These assumptions were reiterated in the call that funded POIESIS, as summarized in the POIESIS project proposal (POIESIS consortium, 2021, Part B, p. 2):

- First, that “... trust depends on scientists and engineers’ capacity to demonstrate high standards of research integrity” and that breaches to research integrity, i.e., research misconduct or questionable research practices, will lead to mistrust.”
- Second, that “... citizen and civil society’s involvement in co-creating R&I agendas and contents makes research more relevant and responsive to society and strengthens co-ownership and trust.”
- Third, the call assumes that these markers of responsible research practices – integrity and societal integration – are “fostered by conducive institutional governance arrangements and policy environments”. The assumption is that institutions matter by enabling and supporting researchers to act responsibly.

However, as noted in the project proposal, and reaffirmed in work package 1 of POIESIS (Bauer et al., 2023), the level to which these assumptions reflect the reality of maintaining public trust in science are scarcely illuminated. To further our understanding of the dynamics at the core of the relationship between research institutions and public trust in science, as well as the chains of mediation that connect the two spheres, POIESIS set out to investigate four core research questions:

- RQ1: How can the nature and scale of public trust and mistrust in science be characterised and which are the factors that affect the relationship?
- RQ2: To what extent and how does the alignment of research practices with principles of research integrity (or, conversely, scientific misconduct, questionable research practices, poor or absent science communication, and/or misinformation) impact public trust in science?
- RQ3: To what extent and how does the integration of citizens and societal stakeholders in research practices (or, conversely, lack of co-creation and open science practices) impact public trust in science?
- RQ4: To what extent and how can institutions provide policies and procedures that enable researchers to act in ways that are conducive to public trust in science?

These research questions are investigated in a series of empirical studies that form a collective body of evidence designed to provide firmer ground for evaluating the assumptions highlighted above. To do so, POIESIS curates existing data and produces

a rich set of new data. This protocol outlines the implementation of one of these data streams, the POIESIS survey experiment.

The protocol starts by presenting the rationale, timeline, and implementation of the survey experiment, highlighting the responsibility held by the seven partner organisations. It then presents the research question and working hypotheses that guide the approach and defines the core concepts of the study. After this the design of the survey experiment is presented. Finally, integrity considerations are discussed.

2 Task 2.4: Survey experiment

The survey experiment is task 2.4 of the POIESIS project. This is the final of three studies in work package 2. This task studies the effect of research integrity and societal integration by implementing the experimental method.

The experimental method is at its core concerned with maximizing internal validity in the interest of making causal claims. That is, it aims to ensure that an observed relationship between two variables is the result of one of these (the independent variable) exerting a causal effect on the other (the dependant variable). Experimental approaches do so by utilizing random assignment. Treatments and control are randomly assigned to research participants, to safeguard from participant characteristics influencing selection of treatment (omitted variable bias) and ensure control over the temporality of the relationship (simultaneity), both sources of endogeneity. Due to this, experiments are viewed as the golden standard for causal inference (Angrist & Pischke, 2009).

Survey experiments are among the most widely implemented types of experiments in the social sciences. In these, participants are randomly assigned a condition within a questionnaire and are then asked to answer a number of survey questions. The conditions will be designed to stimulate some psychological process in the participants (or be a control), often in the form of text or visual stimuli. Due to random assignment of conditions, any variation in responses between experimental conditions can only be assigned to the difference in treatment.

Task 2.4 of POIESES implements a survey experiment in the seven partner countries. The experiment is a vignette experiment employing a conjoint design. Such designs are especially powerful in investigating the relative effects of multiple simultaneous treatments. This is especially attractive in this case, given the interest in both integrity, integration, the interplay between the two, and findings from prior steps of POIESIS that imply that these attributes are entangled with other attributes of research and/or research institutions.

2.1 Implementation

The survey experiment is led by Aarhus University and implemented as a single survey translated into the local languages of the partner countries. The recruitment will be done through a third party panel provider. The survey will be set up using Qualtrics. As such, Aarhus University rather than local partners will administer the data.

In the implementation of task 2.4, a series of subtask are to be carried out. These are all summarized and numbered in table 1 below. All tasks are led by Aarhus University,

and the majority of the tasks are also performed primarily by Aarhus University. Partner involvement is most pronounced in providing feedback for the design and translating and testing the survey. All partners are responsible for translating the master survey (excluding UK) and after the coding of the survey all partners will be responsible for testing the translated versions of the survey. The formal end of Task 2.4 is at the end of 2024, at submission of Deliverable 2.4.

Table 1: Tasks, responsibilities, and timeline for Task 2.4

Task	Partner(s)	Completion
2.4.1: Protocol	AU, feedback from partners	May (Draft)
2.4.2: Ethics approval	AU	May
2.4.3: Survey design	AU, feedback from partners	August
2.4.4: Translation	All partners	
2.4.5: Coding	AU	September
2.4.6: Testing	All partners	
2.4.7: Preregistration	AU	
2.4.8: Fielding	AU	October
2.4.9: Analysis	AU, feedback from partners	November
2.4.10: Deliverable D2.4	AU	December

See a further explanation of the subtasks below:

- 2.4.1. Writing of this protocol, including feedback from project partners (completed May 2024)
- 2.4.2. Ethical approval of the protocol draft at Aarhus University (approved on June 14th, 2024)
- 2.4.3. Producing the master questionnaire, the considerations at the core of this are presented in section 4 of this protocol (master questionnaire finished August 2024, in appendix)
- 2.4.4. Translating the master questionnaire into local languages by the local partner organizations, excluding UK.

2.4.5. Survey coded in Qualtrics.

2.4.6. As local versions are prepared, they are tested in local languages.

2.4.7. Analysis plan preregistered on Zenodo.

2.4.8. Survey fielded, administered by Aarhus University through a panel provider.

2.4.9. Data analysis in the fall as data collection is completed. Partners will be informed on findings and provide feedback on overall and country specific findings.

2.4.10. Deliverable 2.4 written and internally reviewed. Submission at the end of 2024.

3 Research question

The core mission of the POIESIS project is probing the assumption that efforts towards integrity and integration among researchers and research institutions is a basis of public trust in science. As demonstrated in the public deliberation workshops (Entradas et al., 2023), these assumptions are not only present amongst researchers, funders, and policymakers, but also among the participants who served as representatives of the public – though specificities vary across groups and contexts. In the research questions of POIESIS, these assumptions are translated into RQ2 and RQ3, which ask what the respective roles of research integrity and societal integration are for building trust. Furthermore, RQ4 highlights the assumption that institutions are instrumental in fostering this relationship.

The aim of the survey experiment is to employ experimental methods to test the causal effect of societal integration and research integrity on trust in science. As exemplified by the prior studies of POIESIS, these manifest themselves in multiple ways. Furthermore, a core assumption of the literature on research integrity and societal integration, is that institutional efforts in promoting and maintaining these practices are instrumental in driving public trust in science. Following this emphasis the survey experiment adopts a focus on institutional efforts and sets out to answer the research question:

- What are the effects of institutional research integrity and societal integration procedures on trust in science?

Embedded in this research question are the two implicit hypotheses that both research integrity and societal integration increases public trust in science, which serve as the two core hypotheses that guide the design of the survey experiment. Furthermore, the assumptions at the core of the current understanding of the role of research integrity and societal integration would motivate the research questions of whether these effects are present across contexts and independent from other characteristics. This motivates the following hypotheses and research questions:

- H1** Higher research integrity in research performing organizations increases trust in science
- H2** More societal integration in research performing organizations increases trust in science
- RQ1** Are the effects of integrity and integration consistent across countries?
- RQ2** Are the effects of integrity and integration moderated by each other or other university characteristics?

3.1 Relation to prior literature

As noted in POIESIS deliverable D1.2 (Bauer et al., 2023), only little knowledge on the role of research integrity and societal integration in forming and maintaining public trust in science exists. As such, the frame of reference for the POIESIS survey experiment is limited. A small group of experiments investigate the role of the replication crisis for trust in the field of psychology and potential remedies (Anvari & Lakens, 2019; Methner et al., 2023; Wingen et al., 2020), and a single study investigates the impact of failed and successful replications in the fictional case of a specific study on radiation (Hendriks et al., 2020). Alongside this, two studies investigate the role of special interests in research, specifically private company involvement, finding that this could deteriorate trust and willingness to engage with science (Critchley et al., 2015; Critchley, 2008). In the same vein, though with conflicting results, a single study investigates the relationship between open science practices and trust in science (Rosman et al., 2022). These studies all relate to research integrity and investigate how either fields of science or individual researchers' behavior and intentions affect public attitudes and trust. Less research investigates the effect of integration practices on trust in science. As noted in deliverable D1.2 (Bauer et al., 2023), some research points toward citizen science (and other forms of integration) as a potential source of trust in science, but findings are confined to specific efforts that participants self-select into.

3.2 Definitions

POIESIS adheres to an inclusive definition of **research integrity** as both the “core sins in science” but also “research practices, blending into research ethics and professional standards” (POIESIS consortium, 2021, Part B, p. 6). As such, research integrity is defined as the adherence to ethical, legal and professional standards in research. Furthermore, in operationalising research integrity, the survey experiment is informed by articulation of research integrity principles both in the specialized literature, institutional practice in fostering research integrity, and the way in which representatives of society understand and discuss research integrity.

Furthermore, POIESIS illuminates the role of **societal integration** defined as the inclusion of the public and stakeholders in research. Once again, an inclusive approach incorporating such factors as “engagement, co-creation, open science practices” (POIESIS consortium, 2021, Part B, p. 7) is adopted. As with integrity, the aim of the survey experiment is to align the operationalization of integrity not only with academic literature and institutional practice, but also the articulation of integrations identified elsewhere in the POIESIS project.

Finally, in defining **trust in science** the survey experiment is inspired by contemporary trends in studying trust. Such approaches define trustworthiness perceptions with reference to competence, benevolence, openness, and integrity (Besley et al., 2021; Hendriks et al., 2015). Particularly the two latter of these two should intuitively relate to the integrity and integration in research. As noted above, however, little evidence is available regarding this relationship. By keeping the facets of trust in mind, the survey experiment seeks to directly address the efficacy of the different aspects of how research performing organizations might shape public trust through policies and practice.

4 Design

The POIESIS survey experiment sets out to test the causal effect institutional efforts towards research integrity and societal integration on public trust in science. As such, the fundamental concern is designing treatments that provide cues indicating varying levels and forms of integrity and integration. Building on the work in WP1 and WP2, however, it is clear that operationalization of these concepts is neither obvious nor unidimensional. In designing the experiment, the treatments will be shaped by the knowledge gained in the public deliberation workshops (Entradas et al., 2023) as well as existing knowledge on organizational efforts (e.g. SOPs4RI and SUPER MoRRI; Mejlgaard et al., 2020; Ryan et al., 2021). This is done in an effort to model the experiment on the ways in which integrity and integration is articulated and understood by non-experts, as well as in a form that members of the public might encounter it (e.g. in the news) by incorporating the way in which it is articulated by research performing organizations. Doing so should provide the most true to life representation of the dynamics under investigation, heightening the ecological validity of the study. Naturally, as with any method that brings member of the public into a research setting, the setting of the experiment is inherently artificial, nevertheless the treatment should strive to mimic reality.

The aim of Task 2.4 is to experimentally test the relative influence that research integrity and societal integration in research has on public trust in science. As such, the study design should enable us to discriminate between the effects of the two separately, and the combination of the two. Moreover, the public deliberation workshops (Entradas et al., 2023) clearly indicated that multiple facets of both integrity and integration are meaningful to members of the public, and that such considerations are related to other aspects of research, notably the reputation and credibility of a given researcher and/or research institution. To enable the modelling of multiple treatments, the study will be designed as a vignette experiment employing a single-profile conjoint design (Bansak et al., 2021).

4.1 Experimental design

In the POIESIS survey experiment, participants are presented with university profiles that have randomly characteristics on attributes pertaining to integrity, integration, and prestige, presented in a randomized order. That is, respondents see a vignette that describes a university on these parameters, and then indicate how trustworthy they find this fictive university. The strength of the conjoint design is that it allows for the randomization of multiple attributes simultaneously. Furthermore, the conjoint design allows for the implementation of multiple ratings per participant, increasing the number of observations.

As with any design, this is not without tradeoffs. The most cited tradeoffs are the tension between control and cognitive burden, and the limits to participant attention across multiple ratings. Having a higher number of attributes allows for additional control, increasing the precision of the treatment effects, but a high number of attributes runs the risk of cognitive overload, introducing noise into the regressions that counteract the gains from increased control. The POIESIS survey experiment will opt for a relatively low attribute count. Moreover, the number of ratings per participant presents a second tradeoff between amount of data and respondent fatigue. For the sake of data quality, the POIESIS survey experiment will also opt for a low number of ratings (3-5).

4.2 Treatment and outcome

The first consideration in designing the treatments is the form of the **profiles**. That is, what objects are the participants rating. Based on prior work in the project and in the literature, this could be science in general, fields of science, research articles, researchers, or research performing organizations. As noted above, however, the overarching research questions of POIESIS motivates special attention on the role of institutions in the relationship between integrity, integration, and trust. As such, in the POIESIS survey experiment the profiles will be research performing organizations, in the form of fictional universities.

Each profile will have six **attributes** with randomized levels, presented in a random order. That is, randomly assigned information on six characteristics. These will be designed to manipulate perceptions regarding the integrity and integration, as well as the reputation of the university.

These randomly assign levels of integration (3 attributes) and integrity (2 attributes) for each university profile. The final attribute, prestige, is included due to reputability outside of integrity and integration being explicitly named by respondents in the public deliberation workshops (Entradas et al., 2023), but also an interest in understanding the relative effect of principles and prestige on trust in science. Climate change and Covid (the POIESIS cases), are included as prestige attributes. See the specific attributes as well as values in the master questionnaire in the appendix.

None of these attributes lends themselves to being operationalized as continuous numerical variables. However, as the expectations guiding the study do expect levels of integrity and integration to matter, the attributes will be designed as ordinal variables, which assign high, medium, or low levels on the attributes. See an example of a vignette in figure one:

Figure 1: Example vignette



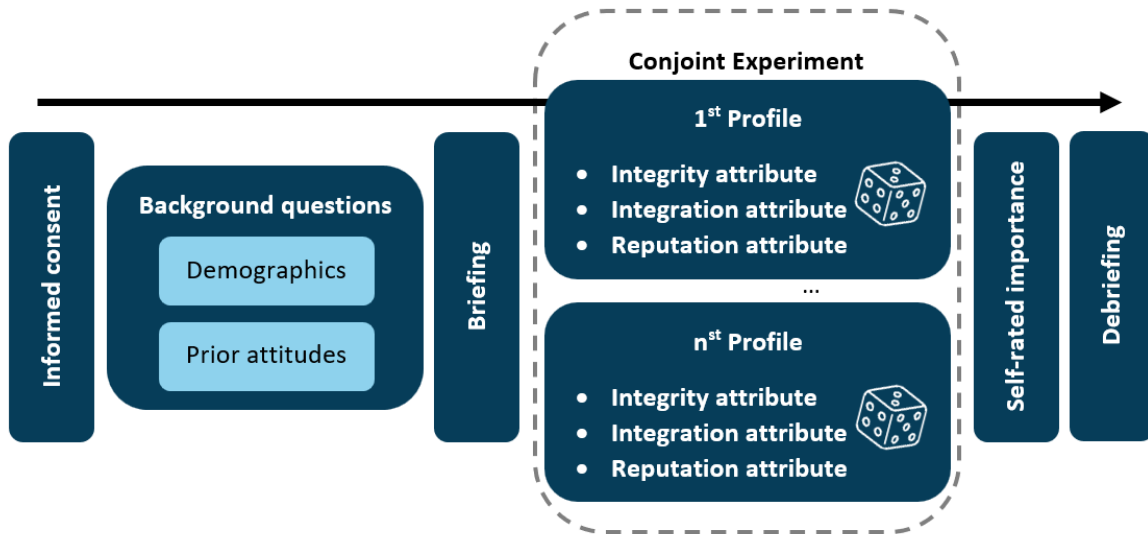
Notes: An example of a university profile the level as well as the variable is in bold for ease of evaluation.

A series of randomly generated profiles are then rated by the respondent with regards to how trustworthy they find the specific university. The number of ratings will be based on testing. The outcome measures will then ask respondents to rate the trustworthiness of the university on a direct trust measure. After the ratings, participants will be asked to rank what mattered most for their evaluation, informed by existing work on dimensions of trustworthiness (Besley et al., 2021; Besley & Tiffany, 2023; Hendriks et al., 2015).

4.3 Survey flow

Figure 2 below shows a graphical representation of the survey flow. The first page of the survey contains the informed consent form, described in further detail in section 5.1. For the sake of demonstrating sample characteristics and balance, and investigating heterogeneous effects, the survey then includes a limited set of background variables. These will be grouped into a set of demographic variables and a group of attitudinal variables. Among the attitudinal variables only variables that we have reason to expect to moderate the effect of integrity and integration are included. Participants are then briefed on the experiment, after which they participate in the experiment. Finally, participants are debriefed, disclosing the research question and providing a final opportunity for withdrawing from the study. The questionnaire aims for a completion time of approximately 10 minutes.

Figure 2: Survey flow



5 Integrity considerations

In the design of the survey experiment, utmost care is taken to minimize harm to research participants while simultaneously maximizing research quality and adhering to open science principles. The study is approved by the ethical committee at the School of Business and Social Sciences at Aarhus University. This protocol is made publicly available in the POIESIS Zenodo repository. The study will be pre-registered, to ensure transparency in the methodological and analytical approach. After publication, the data will be made publicly available through the project Zenodo repository. Participants will be made aware of this practice in the informed consent form.

5.1 Ethics

The research protocol reviewed by the ethics committee reviews is a shorter form of this protocol, adapted to the template provided by the committee. This contains a description of the study, the research question, and the ethical considerations discussed in this section. The study was approved by the ethical committee on the June 14th 2024.

The main ethical consideration is whether participants will be subject to any risk and harm. In the case of this study, participants will be rating fictional universities, and will be aware that this is the case. As such, the design does not employ any form of deception. Moreover, it is very unlikely that treatments will have any adverse effects on participants. Participants will receive an informed consent form as a prerequisite of participating in the study and will be briefed and debriefed on the experimental section of the study to ensure transparency. In addition, any participants that drop out of the study prior to debriefing will be considered to have withdrawn consent, effectively requiring consent both prior to and after study participation.

5.2 Preregistration

Prior to fielding the study is preregistered. The preregistration follows a standard format outlining hypotheses, design plan, sampling plan, variables, and analyses plan. Given any deviation from the preregistration this will be disclosed in any work based on the survey experiment.

5.3 Data handling and access

Given that data will be collected in a qualtrics project administered by Aarhus University, data handling and access will follow guidelines at Aarhus University. In accordance with existing guidelines, the data will be removed from qualtrics and stored at the Aarhus University servers after data collection completion. After publication of the results the dataset will be made publicly available for transparency and potential reuse. This practice will be disclosed to the participants in the data collection. The dataset will be prepared and shared by Aarhus University at the POIESIS zenodo repository that will also contain the annotated analysis code, as well as any other relevant information.

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7 Appendix: Master Questionnaire

Informed consent

Thank you for your interest in participating in this study.

This study investigates what makes people trust universities and research centres. The survey will take about 10 minutes to complete. The study is a part of the POIESIS project financed by the European Union's horizon Europe programme (HORIZON-WIDERA-2021-ERA-01) under grant number 101057253. Recruitment is administered by [panel]. The study is led by Aarhus University (Denmark) in collaboration with [change order to have national institution first] London School of Economics (UK), Wissenschaft im Dialog (Germany), National Technical University of Athens (Greece), Instituto Universitário de Lisboa (Portugal), Centre National de la Recherche Scientifique (France), and Agencia Estatal Consejo Superior de Investigaciones Cientificas (Spain).

Data will be fully anonymous, and the researchers behind the study will not be able to identify you or connect you to your responses. If you wish to contact the researchers behind the study, please email research responsible Simon Fuglsang at simon.fuglsang@ps.au.dk.

Data will be administered by Aarhus University in Denmark. Data will be shared among the partner organizations. After publication of the study, the data will be made public to facilitate transparency and reuse. Data will be kept indefinitely but will in no way be traceable back to you, i.e. they will be fully anonymised. Findings will be published in a public report and may be published in one or more research articles.

If you consent to the above, please indicate so by clicking “I consent” below.

While answering the survey, you may withdraw your consent at any time by leaving the survey. Any survey that is not completed is treated as having withdrawn consent and will be deleted from the final data. Complete answers will not be traceable back to you; therefore, it will not be possible to delete your answers after completion.

Background questions (Demographics)

“What is your gender?” {categorical}

- Woman
- Man
- None of the above / non-binary
- Prefer not to answer

“What is your age?” {continuous, in years}

- [entered by respondent]

“What is your highest level of education?” {categorical, needs to be adapted to national contexts}

- Primary education
- Lower secondary education (Middle school)
- Upper secondary education (High school)
- Bachelor’s or equivalent level
- Master’s or equivalent level
- Doctoral or equivalent level

“Are you professionally involved with science?” {categorical}

- Yes, I am a scientist/researcher
- Yes, I am a science student
- Yes, it is part of my work
- Indirectly or occasionally
- No/Not really

Background questions (Attitudes)

“How much trust do you have in science?” {continuous 11-point}

- Very low level of trust {0}
- Neither/nor {5}
- Very high level of trust {10}

“How much trust do you have in political institutions?” {continuous 11-point}

- Very low level of trust {0}
- Neither/nor {5}
- Very high level of trust {10}

“Where do you place yourself on a political left-right scale?” {continuous 11-point}

- Very left wing {0}

- Neither/nor {5}
- Very right wing {10}

“How religious would you say that you are?” {continuous 11-point}

- Not at all religious {0}
- Neither/nor {5}
- Very religious {10}

Briefing

“This study seeks to understand what makes people trust universities and research centres. On the following pages, you will be presented with a series of fictional universities. Please indicate how trustworthy you would find these institutions.”

Experiment

Participants will then rate 3-5 (based on testing) fictional universities on their trustworthiness. The profiles will be given random values, in the form of vignettes, on six attributes in a random order (conjoint design).

		Attribute	Value	Vignette
INTEGRITY	Abstract integrity		High	Has strict procedures to uphold honesty, transparency, and responsibility of research
			Neutral	Follows national recommendations on honesty, transparency, responsibility of research
			Low	Lacks procedures regarding honesty, transparency, responsibility of research
	Conflicts of interests		High	Has strict procedures that safeguard against conflicts of interests in research
			Neutral	Follows national recommendations on conflicts of interests in research
			Low	Lacks procedures regarding conflicts of interests in research
	Working environment		High	Has strict procedures to secure diversity and inclusion amongst staff
			Neutral	Follows national recommendations on diversity and inclusion amongst staff

INTEGRATION	Public hearings	Low	Lacks procedures on diversity and inclusion amongst staff
		High	Has strict procedures ensuring hearing the public when impacted by university research
		Neutral	Follows national recommendations on hearing the public when impacted by university research
	Public communication	Low	Lacks procedures regarding hearing the public when impacted by university research
		High	Has strict procedures securing public communication of the knowledge it produces
		Neutral	Follows national recommendations on public communication of the knowledge it produces
PRESTIGE	Low	Lacks procedures on public communication of the knowledge it produces	
	Neutral	[omitted]	
	High reputation	Is among the most prestigious universities in the country	
	Low reputation	Is among the less prestigious universities in the country	
	Covid	Played an active role in developing vaccines during the Covid-19 pandemic	
Climate change	Is leading in climate change research		

“How trustworthy do you find this university?” {continuous 11-point}

- Very low level of trustworthiness {0}
- Neither/nor {5}
- Very high level of trustworthiness {10}

Post-experiment

“Please rank how influential the considerations below were in shaping your reaction to the university profiles you just rated” {rank}

- Their level of concern for the good of public {benevolence}
- Their willingness to interact with the public {openness}

- Their commitment to ensure professional standards {integrity}
- Their ability to produce high quality research {expertise}

Debriefing

Thank you for your participation.

This study investigated how the behaviour of universities and research centres affects trust. In the experiment we randomly assigned levels of research integrity (upholding ethical, legal and professional standards) and societal integration (including and engaging society in research), and university reputation. This was done to investigate the relative weight of these factors in shaping trustworthiness perceptions.

If you wish to retract your consent, you can do so by leaving the survey. If you do so your data will be deleted, and your answer will be considered incomplete. Once you press “finish” you will not be identifiable, and you will no longer be able to retract your consent.