



# SURVEY VALIDATION

Delphi Study to validate the survey exploring academic awareness and engagement with data-driven practices.

Professional Learning Ecologies for Digital  
Scholarship: Modernizing Higher Education by  
Supporting Professionalism

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## Introduction

The datafication is an emergent phenomena connected to the evolution of digital tools and environments. Indeed, since the technological infrastructures show nowadays greater capacities of information processing, the data left by the users on the web can be collected and processed massively and at unprecedented scale. Moreover, the application of Artificial Intelligence to data processing has generated innovative forms of analysing, finding patterns, aggregating and visualizing information extracted from basic data.

In the field of higher education, it has already been pointed out that the appropriation of data in relevant ways requires data literacy among both students and academics (Wasson, Hansen, & Netteland, 2016). Technical and technological literacy, in terms of computing and statistical abilities have to be advanced as part of data literacy. However, critical literacy, in the sense of social and political contextualization of the data produced, handled and used with social and political purposes, is also highly relevant. Particularly in the case of academics, data literacy may be connected to new forms of professionalism guiding research, teaching and learning in digital contexts.

However, while data literacy (encompassing a critical, open and networked vision of data) is becoming a central component in lifelong learning and civic education (Pangrazio & Selwyn, 2019; Raffaghelli, 2017a), it seems that there is a dearth of first-hand conceptual and empirical research on faculty development. This might be due to the fact that the problems related to data are diversified, given that academics operate in the two complex fields of research and teaching, as explained above. In relation to research, data is connected with the discourses of open science and open data in research. In relation to teaching, data comes from pedagogical practices and teachers' and students' activities and interactions in online and blended learning. These are two different universes with different research specificities. But data-driven practices imply forms of awareness that are potentially transversal and connected to DS, in a context of HE modernization and with digital and derived data-driven practices at the core.

*How should the professional development of academic staff be designed and developed so as to introduce transformative and critical use of digitalized data and ensure a positive impact on DS as an essential component in HE modernization?*

This research question is addressed within this project by analysing, designing, developing, deploying and testing a professional learning ecology supporting data literacy among academics and relating it to short-term impacts. The chosen methodological approach encompasses mixed methods research developed in three phases: an initial desk research phase and two phases of design-based research. In the desk research phase, the constructs are defined. Moreover, a survey will collect the necessary information to elaborate the scenarios and framework of competences for data literacy among academics. While the two areas of research and teaching will be taken into account, the instrument will provide the opportunity to select one or other as the main area of activity. This is particularly important considering that many professional roles at the beginning of a career in academia exclusively cover either research or teaching.

*In this document, we introduce the results on a 1st phase of experts' consultation with the aim of validating the survey.*

## Delphi Study

The Delphi technique was originated in the 1950s by the RAND Corporation and has been used in research since the 1970s to elicit expert opinions regarding complex problems as well as to generate consensus and predictions (Linstone & Turoff, 1975; Okoli & Pawlowski, 2004; Rowe & Wright, 1999). In contrast to other decision-aiding tools, the Delphi study keeps the participating experts anonymous with the use of questionnaires and the statistical aggregation of group response, therefore reducing peer influence (Rowe & Wright, 1999). After more than fifty years of its inception, the Delphi technique remains widely used. A search in the ProQuest Digital Dissertation Database conducted by Skulmoski et al. (2007) revealed that, from 1981 to 2003, at least 280 dissertations had used this method. One of the main areas of research was education. Furthermore, in a previous article, Clayton (1997) enumerated a large number of studies in education that employed the Delphi technique for different purposes ranging from curriculum development, to identifying features of effective practices, to foreseeing policies in education.

The number of rounds and participants in a Delphi study depends on the research objectives. Delbeq, Van de Ven and Gustafson (1975) observe that two or three rounds are sufficient for most studies, and further iterations may lead to exhaustion (Schmidt, 1997; Walker & Selfe, 1996). As for participants, groups as small as four can perform satisfactorily (Brockhoff, 1983). The survey validation at hand will involve two rounds and the participation of seven experts. Following the recommendations of Adler and Ziglio (1996) the experts were selected considering their fields of research and institutional experience. In fact, the mentioned areas were representative of the subtopics embedded in the whole current research proposal, namely data literacy as emerging element of digital scholarship. The experts selected and responding to the first phase of the Delphi covered the following areas of knowledge and research:

Areas of Expertise	Number of Experts (N=7)
Educational Technologies	7
Social Media in Education and Professional Learning	2
Faculty Development	3
Assessment and Evaluation in Education	1
Educational Quality	2
Higher Education	7
Digital Scholarship	4
Information Science and Scientometrics	1

All experts were seniors covering several positions as permanent staff, tenured professorships and project coordinators. Six experts had 20-25 years of experience in their respective fields, with international careers and publications. Two of the experts were in technical and research positions respectively, with about 10-15 years of seniority.

The selection of experts also sought geographical coverage. The engaged experts could be said to cover mainly the European region, but at least three of them come from different transnational regions ensuring a global vision over the survey.

Geographical Coverage	Number of Experts (N=7)
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Europe (Spain & Italy)	4
China	1
Latin America (Argentina)	1

As for the gender, the experts accepting the invitation were 4 females and 3 males, in a not perfectly balanced but yet representative distribution of the educational landscape.

The experts were invited to review the Survey's theoretical approach, as well as the instrument adopted (a questionnaire). Upon their acceptance, one or two interviews followed to discuss several dimensions of theoretical coherence and quality of the survey. The invitations were sent along April, and the interviews followed in between late April and May 2019.

The dimensions chosen to address the experts' analysis on the survey were:

1. Appropriate coverage of the research topic (academics' critical data literacy)
2. Alignment between theoretical analysis and the research constructs
3. Operationalization of research constructs through the instrument (questionnaire)
4. Clearness of the questionnaire structure, divided into components and subcomponents.
5. Questionnaire's wording appropriateness in relation to the targeted respondents
6. Support to the participants' understanding of and engagement with the research topic while responding the questionnaire.
7. Single questionnaire components and questions' clearness: simple and direct access to the requested information. This implies that the respondent can recall practices, not express opinion, or declare not to be informed on a topic.
8. Single questionnaire components and questions' easiness: quick understanding of type of answer and the related scale, so as the response does not entail interpretation/ judgement (trying to understand how to reply the question) by the user beyond the specific content.

In the following, the results of the experts' consultation are presented using the order of the above introduced dimensions.

The annexes 1 and 2 in this document present the original inputs provided to the experts.

### 1. Appropriate coverage

#### *Appropriate coverage of the research topic (academics' critical data literacy)*

Frequencies	N=7	Mean Score	4,43
Completely Disagree	0	Exp1	4
Rather Disagree	0	Exp2	4
Neither Agree or Disagree	0	Exp3	5
Rather Agree	4	Exp4	4
Completely Agree	3	Exp5	4
		Exp6	5
		Exp7	5

The experts found that the theoretical presentation of the topic was adequate and covered the intended research problem, namely, the need of developing academics' critical data literacy. However, most comments were convergent on the fact that the above mentioned research problem relates to such an emergent phenomenology that it is hard to see in perspective what

has to be included or excluded. The problem of data literacy is not new, but it is highly specific, and it is unfolding in several ways as the introduction points out. Therefore, the introduction is theoretically complex to read. This issue is connected with the following operationalization of constructs, which can be manifold.

*There are two or three things at a general level, I do not assume it as a criticism but as a reflection that I do myself, at some point I can have doubts, I question it and I am not sure, on this subject. Nobody has ever thought about this, and it may be that in the teaching staff there is a high number that has never thought about it (Exp1)*

*... I know what is said with certain concepts, like Open Data Portals, but someone might have no idea ... Do we want to understand the absolute lack of awareness? ...I insist, (in the survey) everything is very detailed, but I don't know how much certain passages will be clear to all, both in the part of the research and of teaching (Exp5)*

*We cannot say that the scholar studying classic Ancient times or the medieval historian knows that AI stands for Artificial Intelligence and what type of data do you refer to (Exp2)*

Moreover, some of them retained that their level of awareness on the topic was raised by the same survey introduction; and at least three of the experts expressed that their knowledge was limited to only specific issues of the survey.

In one case to the concept of learning ecologies was under the lens, and the Expert 1 requested to have it better explained in the introduction.

*... we twisted around this issue many times here, the ecology of learning is what each one cultivates, instead (in the introduction) you talk about ecology as a context, an ecology of learning that supports the academics' data literacy. This can be seen as bit contradictory. I understand that what is meant here is what the guidelines are, what is shared by academics that allow them to develop certain innovative practices, that is, data-based practices, right? This should be clearer (Exp1)*

All in all, as it is showed in the punctuations given to the theoretical introduction, the experts considered relevant and original a research approach dealing with the topics of datafication in the academic profession.

*I think this is a really interesting topic...many people is doing research on learning analytics, but this is new...I think that this is a perfect topic for you since you have a background in teacher education. How the academics change and there career development needs in the era of Big Data, AI or datafication, everything, these are a real problem of our time. Very good choice! (Exp3)*

## 2. Alignment between theory and research constructs

The experts where generally satisfied with the alignment between the survey's theoretical basis and the research constructs selected, as it can be appreciated from the scores given to this dimension.

*The introduction seems clear to me; It is understandable, it allowed me to understand the whole questionnaire, but it is complex in theoretical terms. It was more useful to me starting from the questionnaire, reading the questions I understood the concepts mentioned in the introduction (Exp5). So yes, there is alignment.*

### *Alignment between theoretical analysis and the research constructs*

Frequencies	N=7	Mean Score	4,71
Completely Disagree	0	Exp1	5
Rather Disagree	0	Exp2	5
Neither Agree or Disagree	0	Exp3	5
Rather Agree	2	Exp4	4
Completely Agree	5	Exp5	4
		Exp6	5
		Exp7	5

However, one of the experts' suggestions condensed most of their opinions on the need of underpinning complex and new concepts. The Expert 2 suggestion was to indicate, at the beginning of the questionnaire, at least the definition of "Data", and in some of the cases, to disambiguate terms such as "traditional research methods" or "massive extraction" or "Open/Dynamic". This suggestion led to the modification of the survey adding an initial definition of the term "Data" and examples in brackets to disambiguate terms.

Also the Expert 3 insisted on the need of "Add traditional tools and terms that the academics that are less familiar (with data practices) can connect to when responding. You need to keep the working familiar with traditional practices". The Expert 5 agreed, indicating that her concern was the lack of response from some colleagues for finding the phenomena mentioned at operational level as "invisible" or too far from their current experience.

*If a colleague answers the first two questions, or even if he doesn't, you can see if he has entered that "advanced practice" dimension, so to speak. For example ... if you publish the data in progress, you already know that this is a person who works at threshold levels of excellence. But I doubt it, I think they will all say no, even if the formulation of the question is correct, for many are unaware of these advanced systems. (Exp5)*

### 3. Operationalization

#### *Operationalization of research constructs through the instrument (questionnaire)*

Frequencies	N=7	Mean Score	4,43
Completely Disagree	0	Exp1	5
Rather Disagree	0	Exp2	4
Neither Agree or Disagree	1	Exp3	5
Rather Agree	2	Exp4	3
Completely Agree	3	Exp5	4
		Exp6	5
		Exp7	5

All experts a generally adequate scheme of operationalisation of constructs through the questions. The components and subcomponents in the questionnaire made evident the intention of direct the respondents' attention to phenomenological universes connected with specific concepts. Namely, the data practices and the learning ecologies connected to the data practices.

There were some terms and options which raised some concern, in any case.

Firstly, both Expert 2 and 5 asked for information relating the set of options connected to the disciplinary fields (Questionnaire's First section, Respondents' Personal and professional profile). The set of options selected came from the European Research Council and was closely connected to the European Commission goals along the research framework programme (H2020). Indeed, this type of classification could make sense in the EU context but was not relevant in other geographical areas. Therefore, this list of options was removed and replaced by the UNESCO nomenclature of disciplinary fields (consultable here: <http://skos.um.es/unesco6/00/html>)

Relating research data practices, the Expert 7 suggested to add the FAIR data principles which were not present as some of the tools to address Open Data quality evaluation. He also raised the problem of the continuing evolving nature of the tools in the sector of information science and scientometric tools available as part of digital scholarship support. However, he also agreed that the survey covered appropriately most emergent data practices in research.

*It is difficult to pass to open data at institutional level and therefore it is difficult that the colleagues get to the concrete practices. The European Union is now saying that since 2020 the funding will not be provided unless the publication of the data is planned. I did not the FAIR parameters in the questionnaire, those should be highlighted in the "Research Evaluation" subcomponent (Exp7)*

As for the "data literacy" construct, the Expert 3 pointed out the need of improving the operationalization of the concept "students' data literacy", asking about the connections with the DigCompEdu Model. This request led to remove some options of the subcomponents of "Data Practices in Teaching in Learning" to concentrate the statements relating students' data literacy into the dimension "Promote Students' Data Literacy".

*In general is ok, but I do have a question on Appendix A. I think the last part there, relating the Learners' Data Literacy, there are several elements there. I think DL is kind of umbrella term and includes other many elements. Do you think you should revise that term in the column? (...) There are two possible solutions, either you change the name in the dimensions (column). Or either you mention this at a point in the survey, that we are dealing with students' data literacy only in one dimension and the rest relates to academics (Exp3)*

The expert 6 was critical relating the operationalisation of data practices in teaching and learning and particularly in the case of assessment. According to her area of expertise, the statements adopted in this area related mostly a teacher' centred approach, whereas a more participatory vision of students' engagement with data practices in teaching and learning would have been desirable. Also the Expert 2 expressed the need of adding statements representing this area.

*In teaching, perhaps it is not just the production of data that interests us, but how data is used in the relationship with the students, in the lesson, why talk about only producing educational data? (Exp6)*

*I think that, as you indicated this question "I analysed students' ability to integrate data into narrative or visual presentations and make sense of them" it is also interesting adding something relating data and, for example, artificial intelligence as socio-technical process. Also*

including the issue of ethical concerns of collecting student data for educational evaluation and research, what do you think? (Exp2)

This important concern led to the modification of the components and subcomponents in the section devoted to data practices in teaching and learning. Several statements were modified, one removed and two added in order to include data practices, as phenomenology, dealing with the students' critical awareness and engagement.

#### 4. Instrument Clearness & Wording

*Clearness of the questionnaire structure, divided into components and subcomponents; including wording appropriateness.*

Frequencies C= Clearness / W= Wording	N=7		Mean Score	4,50    3,83	
	C	W		C	W
Completely Disagree	0	0	Exp1	5	5
Rather Disagree	0	0	Exp2	4	3
Neither Agree or Disagree	0	2	Exp3	5	4
Rather Agree	3	4	Exp4	4	4
Completely Agree	3	1	Exp5	4	3
			Exp6	5	4
			Exp7	5	4

Some of the aspects of clearness and wording have been mentioned in the prior paragraphs since the data literacy in faculty, as emergent topic and its phenomenology, frequently generated experts' request of including "more familiar terms", "definition of words adopted frequently in the research or teaching practice", and so forth.

Indeed, as already emerged in the other dimensions of analysis in this report, one crucial aspect to address clearness was the experts' suggestion of implementing statements showing a more familiar phenomenology and hence acknowledged terminology. In practice, this implied to add statements dealing with "current practices" in each of the questions relating data practices (Subcomponent 1 for both the component research and the component teaching), as a starting point relating a progression from more common to the newest data practices and cultures.

The subcomponent on the Learning Ecologies was less criticized since the statements were considered simpler and more immediate to the actual experience of any adult/professional learner.

As for the wording, the experts' concern related mostly English terms and its translation to other languages in which the survey was designed to circulate (Spanish, Italian, and Chinese). The term "science" and "scientific production", even if present in policy documents consulted to create the set of operational statements, was deemed to have an "elitist" background connected to hard sciences and/or STEM. The expert 2 and 7 suggested the usage of "research" as a term with broader coverage of academic endeavour.

The wording was, in any case, one of the issues with lowest scores, which led to numerous interventions relating the type of terms adopted (more inclusive, more representative of the collective of the several disciplines in research and teaching, more explicit and concrete).



## 5. Participants' Support

*Support to the participants' understanding of and engagement with the research topic while responding the questionnaire.*

Frequencies	N=7	Mean Score	3,71
Completely Disagree	0	Exp1	4
Rather Disagree	0	Exp2	3
Neither Agree or Disagree	3	Exp3	5
Rather Agree	3	Exp4	3
Completely Agree	1	Exp5	3
		Exp6	4
		Exp7	4

This dimension showed the lowest score, and indeed led the experts to point out several criticalities in the instrument which ended up in relevant changes.

As initial and most relevant issue, all experts considered that the survey was complex and long, therefore discouraging for busy respondents as the target group of researchers and academic teachers. However, when asked to concrete edits to moderate the lengthiness, most experts agreed that the statements were all coherently connected with the research questions and were the operational representation of the problem under study.

This issue lead to discuss a number of proposals from the experts in order to resize the instrument. Amongst these, it was suggested:

- 1- To introduce a synthesis of the questionnaire's structure in the presentation, indicating the length and time requested to complete the survey.
- 2- Adding a progress bar, visible to the respondent, for her to understand how long will it take to accomplish the survey.
- 3- To remove most open questions and leave only one box for open text answers where the respondent can generally comment on any of the dimensions of interest.
- 4- To highlight using bold characters or colours the most important concepts in order to support focus on the questions' content.
- 5- To promote respondents' engagement and motivation by offering systems of feed-back at the end of the questionnaire
- 6- To split the questionnaire into two parts, one devoted to the component RESEARCH and the second to TEACHING.

The option 5 was suggested by the expert 6, who was really sceptical about the need of keeping the two main components merged in one very lengthy questionnaire. One of his arguments related the fact that it would be extremely interesting to understand sole researchers' data literacy as separate aspect of the teaching endeavour (e.g., the cases of young PhD students, research assistants, or senior researchers from national structures or industry). This perspective was supported by the Expert 2. Either way, at the university level, we would deal with staff engaged only or mainly in teaching activities, like teaching assistants, or adjuncts. To this regard, having a complex and weighty structure with two parts only to capture one type of roles (tenured professors devoted to both research and teaching) was not economical to the sake of capturing the evolving problem of research data literacy as well as data literacy in teaching and learning in Higher Education.

*So I think that due the somehow diversified groups of staff engaged in research and teaching...you also have to consider, as you said, that the discussion of data literacy has followed to strands, Research Data literacy and data literacy for teaching and learning...so given this evolution, I think you could split the questionnaire in two parts. I know it is an issue for you'll lost the comparisons for the tenured that do both research and teaching, but arrived to this point, I think it's better to engage the people to complete the survey until the end (Exp5)*

Apart of taking into consideration all items from 1 to 4, the digital presentation of the questionnaire was effectively allocated into two separated parts. As strategy, the questionnaires will be distributed separately according to the agreements of research collaboration, which are commented in the section "Conclusions and Prospective Actions" in this report.

Another issue connected to the problem of supporting the respondents to understand the research topic and to learn from their same activity of completing the survey, was offering immediate feedback. This issue, more complex in technological terms, was explored taking into consideration the affordances offered by three digital tool which could be used to implement the online questionnaire, as well as the possibilities of data visualization.

As a result of this exploration over Google Forms, Monkey Survey and Qualtrics, it was decided to adopt this last, for its flexible possibilities of accessibility and digital support to the respondent. Amongst the affordances, it is possible to show a Response Summary and to send the response results via email. Moreover, Qualtrics' can be connected to Tableau to allow the participant to see the aggregated responses in real time.

These two strategies are being implemented technologically at the moment of redacting this report and will be tested further, as support to self-diagnosis and addressing self-directed learning by the participants.

## 6. Questions' Clearness and Easiness

### *Single questionnaire components and questions' clearness and easiness*

<b>N=7</b>	<b>Clearness</b>	<b>Easiness</b>
Data Practices in Research	4,14	4,71
Learning Ecologies supporting Data Practices in Research	4,57	4,43
Data Practices in Teaching	4,00	4,57
Learning Ecologies supporting Data Practices in Teaching	4,43	4,71

	Completely Disagree	Rather Disagree	Neither disagree or agree	Rather Agree	Completely Agree	Total
<b>CLEARNESS</b>						
Data Practices in Research	0	0	0	6	1	7
Learning Ecologies supporting Data Practices in Research	0	0	0	3	4	7
Data Practices in Teaching	0	1	1	2	3	7
Learning Ecologies supporting Data Practices in Teaching	0	0	1	2	4	7
<b>EASINESS</b>						
Data Practices in Research	0	0	0	2	5	7
Learning Ecologies supporting Data Practices in Research	0	0	0	3	4	7
Data Practices in Teaching	0	0	1	1	5	7
Learning Ecologies supporting Data Practices in Teaching	0	0	0	2	5	7

The evidence in this dimension is more complex, as it can be observed, for each of the subcomponents (under research and teaching, as well as connected to the data practices and the learning ecologies) was presented to the experts for evaluation.

As we can observe, the easiness was almost in all cases evaluated positively, indicating that both the scales and the presentation of the statements was appropriate along the several subcomponents of the survey. In this regard, the experts agreed that the Likert scale connected to the frequency of data practices and professional learning activities, interactions and resources search and sharing was adequate to retrieve a more objective representation over the subjective report by the respondents. As unique suggestion, the Expert 2 and 4 pointed out the need of adding some instructions addressing the participant understanding over the type of scale used. In fact, this was applied adding to each of the questions a brief instruction on which values were represented at the scale used and how to answer the question.

When coming to clearness, the problems of terminology, distribution of the statements characterizing data practices and the use of conjunctions to present some complex data practices were criticized. This applied particularly to the case of TEACHING where the universe of phenomena represented was deemed more fragmented and ambiguous.

*I tried to impersonate the user who may be far from these issues and asks "what is Open Data". I would use "Re-use" Open Data as Open Educational Resources. And in any case, these terms refer to highly specific universes of practice (Exp2).*

*Reading the questions in the teaching part, I have the feeling that there is an idea of teaching as a production of something, leaving aside the whole aspect of student activities. If you read the questions related to table 2, I mean, there are questions in which the teacher uses the data and offers them to the students. But I lack the dimension in which data is built, in an environment the student works and reaches some milestones and uses the data too. This speaks of a perspective on teaching; here, I would be more aware, more careful with these aspects (Exp6)*

*It is not clear when you say "institutional assessment" if you mean the standard institutional quality assessment of a course, it seems that it is the university that evaluates your course. Rereading these questions I could answer them in different ways. Perhaps one should say, that the data for teaching could come from the institutional context, can be produced by the teacher, or gathered outside (social media). And the teacher is able of approaching and using these three sources of data...(Exp5)*

The interventions aimed at correcting the operationalisation as well as the overall instrument clearness were connected with the issues raised in the specific sections.

## Conclusions and prospective actions

In this document, we have presented the analysis of the first phase of a Delphi study aiming at validating an instrument to be adopted in a broader study on data literacy as emergent component of digital scholarship.

We have described the procedures of experts' selection and balance as group contributing to a broad field of expertise; the instruments under analysis; and the inputs given to trigger experts' reflection. The dimensions of analysis were focused on the appropriateness of the theory and the methodological choices made in order to operationalise the complex constructs embedded in the research goals and questions. Moreover, aspects of clearness, easiness and support provided to the respondent to promote her better experience along the survey were also considered.

All in all, the results showed a positive trend, if we take into consideration that most scores given to the several dimensions were moderate to high. However, it is important to mention that overall, two aspects puzzled experts the more: the topic complexity and fragmentation, and the questionnaire's length. Both elements ending in a potential respondent frustration and disengagement instead of the sought effect of engagement, informal learning and reflection, along the process of responding the survey.

In fact, it was overall agreed that datafication is a very recent phenomenon very recent across the digital spaces populated by academics in their professional activity either as researchers and as educators. This creates a number of connected phenomena and relative practices which are more or less advanced according to disciplinary fields, experience and contextual opportunities to become more or less awareness and active relating to critical approaches to data-driven practices.

The experts commented, corrected and made several proposals in order to correct the two issues above, in terms of: wording or the use of more familiar terms in order to underpin in a more evident way the phenomenology; gradual presentation of the innovative concepts; more inclusive terms with regard to the practices connected with the students' as partners (and not subjects) of learning.

As for the lengthiness, important considerations led to modifications such as the survey presentation, offering information on the entity of the effort requested to complete it, as well as the progress of the answers. Most importantly, it considered the selection of a technological tool that includes advanced features supporting the respondent's feedback on the progress and the end of the survey.

The process of implementation of the survey is advanced at the time of delivery of this initial report.

The report has not been delayed in its release due to the fact that the upcoming phases include experts' feed-back on the new format, as well as empirical validation by a reduced number of respondents.

Therefore, what is envisaged at this stage, is:

- A- A new, brief round of critical comments on the online version, in the several languages.
- B- A subsequent empirical validation based upon 50-80 cases, applying statistical coefficients to analyse the validity and reliability of the several items.

Eventually, the results of this following stage will imply final modifications and release for the broader survey implementation.

## References

- Adler, M., & Ziglio, E. (1996). *Gazing into the oracle : the Delphi method and its application to social policy and public health*. Jessica Kingsley Publishers. Retrieved from [https://books.google.it/books/about/Gazing\\_Into\\_the\\_Oracle.html?id=jo1Z1JZlrKIC&redir\\_esc=y](https://books.google.it/books/about/Gazing_Into_the_Oracle.html?id=jo1Z1JZlrKIC&redir_esc=y)
- Atenas, J., Havemann, L., & Priego, E. (2015). Open Data as Open Educational Resources: Towards Transversal Skills and Global Citizenship. *Open Praxis*, 7(4), 377–389. <https://doi.org/10.5944/openpraxis.7.4.233>
- Boyer, E. L. (1990). *Scholarship reconsidered: priorities of the professoriate* (Vol. 1997). San Francisco, CA: Carnegie Foundation for the Advancement of Teaching.
- Boyer, E. L., Moser, D., Ream, T. C., & Braxton, J. M. (2015). *Scholarship Reconsidered: Priorities of the Professoriate*. San Francisco, CA: Wiley&Sons.
- Brockhoff, K. (1983). Group processes for forecasting. *European Journal of Operational Research*, 13(2), 115–127. [https://doi.org/10.1016/0377-2217\(83\)90072-3](https://doi.org/10.1016/0377-2217(83)90072-3)
- Clayton, M. J. (1997). Delphi: a technique to harness expert opinion for critical decision-making tasks in education. *Educational Psychology*, 17(4), 373–386. <https://doi.org/10.1080/0144341970170401>
- Daniel, B. (2015). Big Data and analytics in higher education: Opportunities and challenges. *British Journal of Educational Technology*, 46(5), 904–920. <https://doi.org/10.1111/bjet.12230>
- Daniel, B. K. (2017). Big Data in Higher Education: The Big Picture. In *Big Data and Learning Analytics in Higher Education* (pp. 19–28). Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-319-06520-5\\_3](https://doi.org/10.1007/978-3-319-06520-5_3)
- Delbecq, A., Van de Ven, A., & Gustafson, D. H. (1975). *Group Techniques for Program Planning: A guide to nominal group and Delphi Process*. *Group & Organization Studies*. Illinois: Scott Foresman Company Glenview. Retrieved from <https://sites.google.com/a/umn.edu/avandeven/publications/books/group-techniques-for-program-planning>
- EMC Education Services. (2015). *Data Science & Big Data Analytics*. Indianapolis, IN, USA: John Wiley & Sons, Inc. <https://doi.org/10.1002/9781119183686>
- Ferguson, R. (2012). Learning analytics: drivers, developments and challenges. *International Journal of Technology Enhanced Learning*, 4(5/6), 304–317. Retrieved from [http://oro.open.ac.uk/36374/1/IJTEL40501\\_Ferguson Jan 2013.pdf](http://oro.open.ac.uk/36374/1/IJTEL40501_Ferguson%20Jan%202013.pdf)

- Goodfellow, R. (2014). Scholarly, digital, open: an impossible triangle? *Research in Learning Technology*, 21. <https://doi.org/10.3402/rlt.v21.21366>
- Hey, A. J. G. (2009). *The fourth paradigm : data-intensive scientific discovery*. Microsoft Research.
- Kitchin, R. (2015). *The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences* (Vol. 1). London: Sage. <https://doi.org/10.1017/CBO9781107415324.004>
- Knight, S., Buckingham Shum, S., & Littleton, K. (2014). Epistemology, Assessment, Pedagogy: Where Learning Meets Analytics in the Middle Space. *Journal of Learning Analytics*, 1(2), 23–47. Retrieved from <https://doi.org/10.18608/jla.2014.12.3>
- Li, J., Greenhow, C., & Askari, E. (2016). Scholars in the Digital Age. In *Research 2.0 and the Impact of Digital Technologies on Scholarly Inquiry* (Vol. 36, pp. 1–16). IGI Global. <https://doi.org/10.4018/978-1-5225-0830-4.ch001>
- Linstone, H. A., & Turoff, M. (1975). *The Delphi method : techniques and applications*. (H. A. Linstone & M. Turoff, Eds.). Boston, MA: Addison-Wesley Pub. Co., Advanced Book Program.
- Manca, S., Caviglione, L., & Raffaghelli, J. E. (2016). Big data for social media learning analytics: potentials and challenges. *Journal of E-Learning and Knowledge Society*, 12(2). <https://doi.org/https://doi.org/10.20368/1971-8829/1139>
- Nunn, S., Avella, J. T., Kanai, T., & Kebritchi, M. (2016). Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review. *Online Learning*, 20(2). <https://doi.org/10.24059/olj.v20i2.790>
- Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management*, 42(1), 15–29. <https://doi.org/10.1016/J.IM.2003.11.002>
- Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), 751–760. <https://doi.org/10.1093/scipol/scs093>
- Pangrazio, L., & Selwyn, N. (2019). ‘Personal data literacies’: A critical literacies approach to enhancing understandings of personal digital data. *New Media and Society*, 21(2), 419–437. <https://doi.org/10.1177/1461444818799523>
- Pearce, N., Weller, M., Scanlon, E., & Kinsley, S. (2010, December 12). Digital Scholarship Considered: How New Technologies Could Transform Academic Work. *In Education*. Retrieved from <http://ineducation.ca/ineducation/article/view/44/508>
- Perrotta, C., & Williamson, B. (2018). The social life of Learning Analytics: cluster analysis and the ‘performance’ of algorithmic education. *Learning, Media and Technology*, 43(1), 3–16. <https://doi.org/10.1080/17439884.2016.1182927>
- Prinsloo, P., & Slade, S. (2017). An elephant in the learning analytics room. In *Proceedings of the Seventh International Learning Analytics & Knowledge Conference on - LAK '17* (pp. 46–55). New York, New York, USA: ACM Press. <https://doi.org/10.1145/3027385.3027406>
- Raffaghelli, J. E. (2017a). Alfabetizzare ai dati nella società dei big e open data: una sfida formativa. *Formazione&Insegnamento - European Journal of Research on Education and Teaching*, 25(3), 279–304. [https://doi.org/107346/-fei-XV-03-17\\_21](https://doi.org/107346/-fei-XV-03-17_21)
- Raffaghelli, J. E. (2017b). Exploring the (missed) connections between digital scholarship and faculty development: a conceptual analysis. *International Journal of Educational Technology in Higher Education*, 14(1), 20. <https://doi.org/10.1186/s41239-017-0058-x>
- Raffaghelli, J. E. (2018). Open Data for Learning: A case study in Higher Education. In A. Volungeviciene & A. Szűcs (Eds.), *Exploring the Micro, Meso and Macro Navigating between dimensions in the digital learning landscape. Proceedings of the EDEN Annual Conference, 2018* (pp. 178–190). Genoa, Italy:

- European Distance and E-Learning Network. <https://doi.org/978-615-5511-23-3>
- Raffaghelli, J. E., & Manca, S. (2019). Is there a social life in Open Data? Open datasets exploring practices in Educational Technology Research. <https://doi.org/10.5281/ZENODO.2538011>
- Redecker, C., & Punie, Y. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu. Joint Research Centre (JRC) Science for Policy report*. <https://doi.org/10.2760/159770>
- Rowe, G., & Wright, G. (1999). The Delphi technique as a forecasting tool: issues and analysis. *International Journal of Forecasting*, 15(4), 353–375. [https://doi.org/10.1016/S0169-2070\(99\)00018-7](https://doi.org/10.1016/S0169-2070(99)00018-7)
- Schmidt, R. C. (1997). Managing Delphi Surveys Using Nonparametric Statistical Techniques. *Decision Sciences*, 28(3), 763–774. <https://doi.org/10.1111/j.1540-5915.1997.tb01330.x>
- Scott, A. (2014). *Open data for economic growth*. World Bank. Retrieved from <http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf>
- Skulmoski, G. J., Hartman, F. T., & Krahn, J. (2007). *The Delphi Method for Graduate Research The Delphi Method for Graduate Research 2*. *Journal of Information Technology Education* (Vol. 6). Retrieved from <http://jite.org/documents/Vol6/JITEv6p001-021Skulmoski212.pdf>
- Slade, S., & Prinsloo, P. (2013). Learning Analytics, Ethical Issues and Dilemmas. *American Behavioral Scientist*, 57(10), 1510–1529. <https://doi.org/10.1177/0002764213479366>
- Stewart, B. E. (2015). In abundance: Networked participatory practices as scholarship. *The International Review of Research in Open and Distributed Learning*, 16(3). Retrieved from <http://www.irrodl.org/index.php/irrodl/article/view/2158/3350>
- Thelwall, M., & Kousha, K. (2015). ResearchGate: Disseminating, communicating, and measuring Scholarship? *Journal of the Association for Information Science and Technology*, 66(5), 876–889. <https://doi.org/10.1002/asi.23236>
- Tim van der Zee. (2018). Open Educational Science. SocArXiv. <https://doi.org/10.17605/OSF.IO/D9BME>
- van der Zee, T., & Reich, J. (2018). Open Education Science. *AERA Open*, 4(3), 233285841878746. <https://doi.org/10.1177/2332858418787466>
- Veletsianos, G. (2013). Open practices and identity: Evidence from researchers and educators' social media participation. *British Journal of Educational Technology*, 44(4), 639–651. <https://doi.org/10.1111/bjet.12052>
- Veletsianos, G., & Kimmons, R. (2012). Networked Participatory Scholarship: Emergent techno-cultural pressures toward open and digital scholarship in online networks. *Computers & Education*, 58(2), 766–774. <https://doi.org/10.1016/j.compedu.2011.10.001>
- Veletsianos, G., & Stewart, B. E. (2016). Discreet Openness: Scholars Selective and Intentional Self-Disclosures Online. *Social Media + Society*, 2(3), 2056305116664222. <https://doi.org/10.1177/2056305116664222>
- Vuorikari, R., Ferguson, R., Brasher, A., Clow, D., Cooper, A., Hillaire, G., ... Rienties, B. (2016). *Research Evidence on the Use of Learning Analytics*. Brussels. <https://doi.org/10.2791/955210>
- Walker, A., & Selfe, J. (1996). The Delphi method: a useful tool for the allied health researcher. *British Journal of Therapy and Rehabilitation*, 3(12), 677–681. <https://doi.org/10.12968/bjtr.1996.3.12.14731>
- Wasson, B., Hansen, C., & Netteland, G. (2016). Data Literacy and Use for Learning when using Learning Analytics for Learners. In S. Bull, B. M. Ginon, J. Kay, M. D. Kickmeier-Rust, & M. D. Johnson (Eds.), *Learning Analytics for Learners, 2016 workshops at LAK* (pp. 38–41). Edimburg: CEUR. Retrieved from <http://ceur-ws.org/Vol-1596/paper6.pdf>

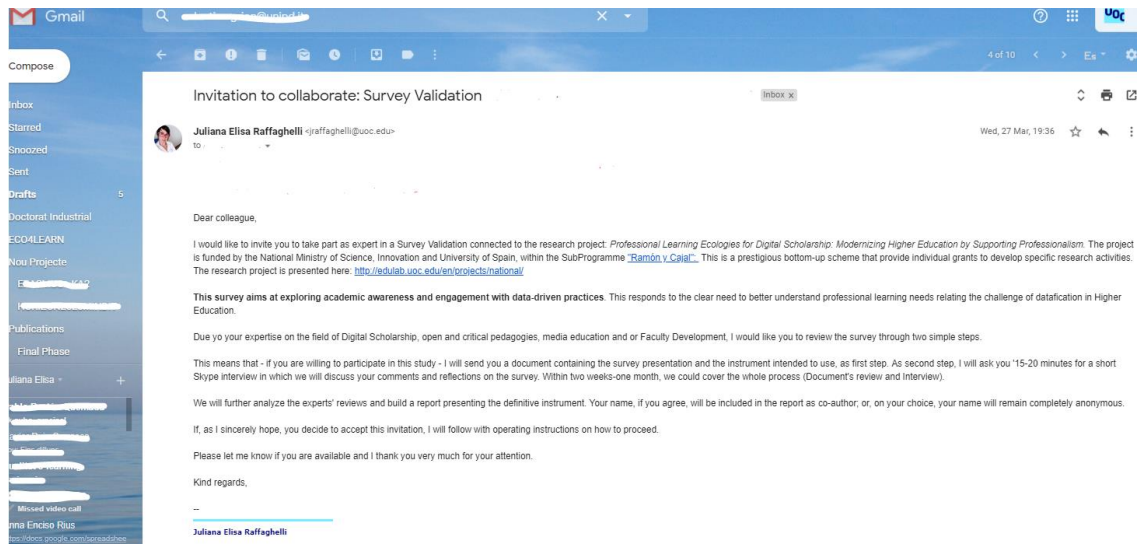
Williamson, B. (2018). The hidden architecture of higher education: building a big data infrastructure for the 'smarter university.' *International Journal of Educational Technology in Higher Education*, 15(1), 12. <https://doi.org/10.1186/s41239-018-0094-1>



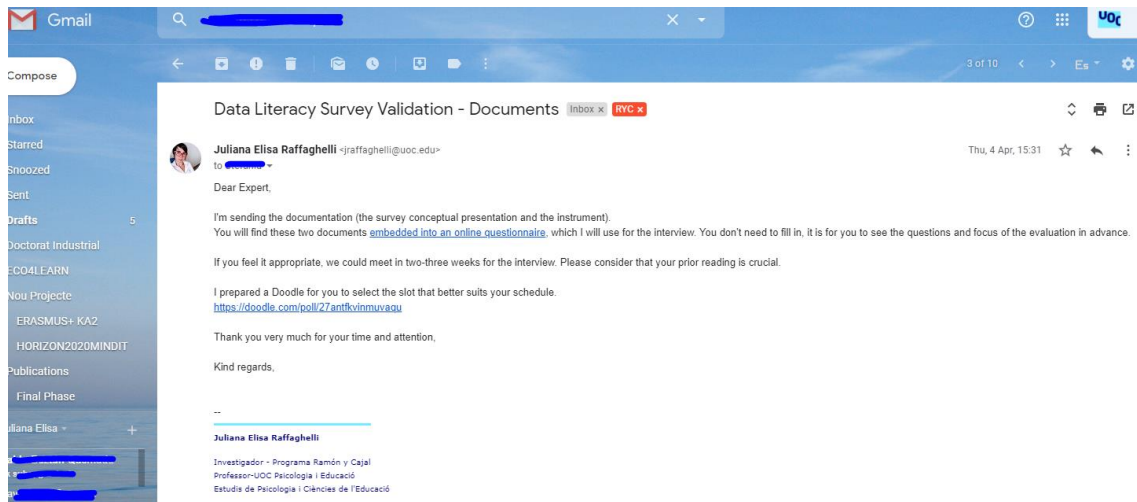
# Annex I


## 7. Experts invitation and response system

### First Communication: Invitation



### Second Communication: Instruments and Procedure





## RYC-UOC\_Data-Literacy\_Experts\_2.0

Before answer this form, please make sure you have analyzed the following two documents:

1- Survey Presentation - <http://bit.do/eMUcu>

2- Instrument - <http://bit.do/ePKWY>

Beyond replying to this form, please feel free to make any comment to the documents above.

Many thanks for your precious contribution.

**\*Required**

**Email address \***

Your email address \_\_\_\_\_

**:: Disclaimer ::**

Your information will be processed in accordance with EU Data Protection laws. The UOC system will be used to keep your information safe and retrievable upon your query. The results of this survey will be processed and anonymized to produce an Open Dataset, responding to the EU Open Data policies.

The responsible researcher for the data treatment is: Dr. Juliana Raffaghelli, [jraffaghelli@uoc.edu](mailto:jraffaghelli@uoc.edu)

**Survey's conceptual Introduction \***

	Completely Disagree	Rather Disagree	Neither disagree or agree	Rather agree	Completely agree
The contracts in the research cover appropriately the research topic (academics' critical data literacy)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The research questions are aligned with the research	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Annex II

### Material under evaluation

RYC Project – PI: Juliana E. Raffaghelli

Project approved by the National Ministry of Science, Innovation and University of Spain

Bid Number: RYC-2016-19589

Project Presentation: <http://edulab.uoc.edu/en/projects/national/>

## Professional Learning Ecologies for Digital Scholarship: Modernizing Higher Education by Supporting Professionalism

Survey to explore academic awareness and engagement with data-driven practices.

### 1. Introduction

Digitalized data has entered into our lives in a massive way in the last ten years. Beyond the Internet of the information society, we are now witnessing a datafied society, where large amounts of digital data, the DNA of information, are leading new social practices. The most enthusiastic discourses on data abundance have emphasized the opportunity to generate new business models, new professional landscapes connected to data science and open practices in science and in the public space (EMC Education Services, 2015; Scott, 2014). More recently, the rather naïve logic of data capture and articulation through several algorithms as drivers of more objectionable economic and social has been an object of criticism and deconstruction (Kitchin, 2015). The university as institution has appeared in this paradigm somehow abruptly, while it has strived to survive a crisis of credibility through forms of innovation that go hand in hand with the digitalization of processes and services (Daniel, 2015). Initially fervent discourses embraced data-driven practices as an opportunity to improve efficiency, objectivity, transparency and innovation (Daniel, 2017). The two main missions in higher education (HE) – teaching and research – have experienced several digitalization processes encompassing data-intensive practices.

On the teaching side, data has been collected about learning and learners on an unprecedented scale, giving rise to educational data mining and particularly to learning analytics and techno-determinist visions of educational quality. While there is no doubt regarding the value of learning analytics in supporting teachers' pedagogical practices and learners' self-regulation (Ferguson, 2012), assumptions regarding the power of algorithms to predict, support or address learning may prevent agentic and transformational practices if unsupervised (Perrotta & Williamson, 2018). Studies have pointed to the poor links between models of learning analytics and pedagogical theories (Knight, Buckingham Shum, & Littleton, 2014; Nunn, Avella, Kanai, & Kebritchi, 2016), the lack of evaluation in authentic contexts, the poor uptake by teachers and learners (Vuorikari et al., 2016), not to mention social and ethical issues (Prinsloo & Slade, 2017; Slade & Prinsloo, 2013). Moreover, the massive adoption of social media at the crossroads with learning management systems implies new forms of data of which both teachers and students may be completely unaware (Manca, Caviglione & Raffaghelli, 2016).

On the research side, the digital, open and networked context has led to an abundance of opportunities for professional development, but also has encompassed criticalities (Stewart,

2015). The open science paradigm is based on participatory schemes in which citizens are invited to explore and to contribute more tightly to the whole cycle of data gathering. Moreover, the fact that research data is expected to be open and reused by researchers accelerates scientific collaboration and discovery in unprecedented ways.

Scholarly practice could potentially address new connections between research and teaching through the use of educational data as content and for the advancement of teaching as part of educational science. The first case is based on the concept of open data as an open educational resource (Atenas, Havemann, & Priego, 2015) in a widely scientific culture. The second case is linked to the overall movement of open science applied to educational research (van der Zee & Reich, 2018). In spite of such promising scenarios for data-driven practices, implementing these innovations in research and teaching involves both professional reflection and the need for a critical approach (Raffaghelli, 2018; van der Zee & Reich, 2018).

It has already been pointed out that the appropriation of data in relevant ways requires data literacy among both students and academics (Wasson et al., 2016), and not only technical literacy, but also critical literacy, in the sense of social and political contextualization of the data produced, handled and used with social and political purposes. Particularly in the case of academics, data literacy may be connected to new forms of professionalism guiding research, teaching and learning in digital contexts. According to Boyer's well-known DIAT (discovery, integration, application and teaching) model of scholarship, we can observe two types of developments related to critical data literacy.

In research, becoming a scholar in a digital, data-driven context implies data practices and activism that take into consideration ethical and social justice concerns while doing research. Responsible research and innovation (RRI) (Owen et al., 2012), which embeds open data practices, is a European Union (EU) policy that addresses practical concerns on how research is conducted. Moreover, the emerging literature on digital, open and networked scholarship (Goodfellow, 2014; Raffaghelli, 2017b; Veletsianos & Stewart, 2016; Veletsianos, 2013; Veletsianos & Kimmons, 2012) aligns with concerns to support new forms of professionalism in the digital environment. However, much needs to be done in terms of what data-driven science means for scholars and their professional identities (Hey, 2009).

In teaching, data literacy in the context of Boyer's SOTL (scholarship of teaching and learning) model could lead to more agentic forms of analysing, evaluating and sharing effective pedagogical practices. Moreover, it could project a strategic vision of open education science (Tim van der Zee, 2018), while datasets from educational design-based research could be critically commented on and shared in the broad educational community. In this case we are also at the beginning of practices and engagement that need to be further explored (Raffaghelli & Manca, 2019).

Beyond a dystopian vision of data in academic practices that emphasizes control, surveillance and a lack of ethical concerns regarding collection (Williamson, 2018), data could enter the academic profession creatively and fairly as a professional activity, dealing with civic engagement and student participation in the final use of data generated in research, teaching and learning processes. In this case the dialogue between academics and society would not only be fruitful, but a springboard for a common endeavour regarding social justice scenarios.

Such more constructive and critical data practices within academia are configuring a complex concept of data literacy. Data literacy should also be embedded in the overall concept of digital scholarship (DS), which covers professional practices, working conditions and identities of academics in the digitalized HE context (Raffaghelli, 2017b). DS specifically implies public and

open sharing of scholarly knowledge and active appropriation by students and society in general. DS, as a set of skills for working in digital, networked and open research and teaching contexts, is also expected to have an impact on digital literacy, critical thinking and civic engagement in students through the use of open science outputs. Data literacy supports digital practices whereby data is tracked, collected and used in a context of academic endeavour.

However, while data literacy (encompassing a critical, open and networked vision of data) is becoming a central component in lifelong learning and civic education (Pangrazio & Selwyn, 2019; Raffaghelli, 2017a), it seems that there is a dearth of first-hand conceptual and empirical research on faculty development. This might be due to the fact that the problems related to data are diversified, given that academics operate in the two complex fields of research and teaching, as explained above. In relation to research, data is connected with the discourses of open science and open data in research. In relation to teaching, data comes from pedagogical practices and teachers' and students' activities and interactions in online and blended learning. These are two different universes with different research specificities. But data-driven practices imply forms of awareness that are potentially transversal and connected to DS, in a context of HE modernization and with digital and derived data-driven practices at the core.

*How should the professional development of academic staff be designed and developed so as to introduce transformative and critical use of digitalized data and ensure a positive impact on DS as an essential component in HE modernization?*

This research question is addressed within this project by analysing, designing, developing, deploying and testing a professional learning ecology supporting data literacy among academics and relating it to short-term impacts (on some 70 engaged academics across the national context) and mid/long-term impacts (on students and researched communities linked to at least 30% of the engaged academics). The chosen methodological approach encompasses mixed methods research developed in three phases: an initial desk research phase and two phases of design-based research. In the desk research phase the constructs are defined, and in this phase, a survey will collect the necessary information to elaborate the scenarios and framework of competences for data literacy among academics. While the two areas of research and teaching will be taken into account, the instrument will provide the opportunity to select one or other as the main area of activity. This is particularly important considering that many professional roles at the beginning of a career in academia exclusively cover either research or teaching.

## 2. Survey research goals

- To analyse existing academics' awareness and use of data-driven practices embedded in research, teaching and learning in HE.
- To explore professional learning ecologies (PLEcs) for the achievement of data literacy among academics (PLEcs-DL) in the broader context of DS,
- To further elaborate on the EU DigCompEdu applied to data literacy as a competence framework operationalizing data literacy skills and levels within academic teaching.

## 3. Constructs and their operationalization

As initially defined in the project, the main underlying construct is DS, linked to the digital, networked and open practices developed by scholars in their professional activities. This concept also relies on Boyer's DIAT scholarship model (Boyer, Moser, Ream, & Braxton, 2015), long adopted in discussions on DS (Li, Greenhow, & Askari, 2016; Pearce, Weller, Scanlon, & Kinsley,

2010; Stewart, 2015). The research endeavour has been also characterized in other disciplinary fields, such as Information Science, through the concept of the cycle of scientific information (Raffaghelli, 2017b; Thelwall & Kousha, 2015).

The complexity of the research endeavour in Boyer’s model (corresponding to the DIA components) will be packaged through the more functional model of the scientific information cycle that includes the three dimensions of the scholarship of our age: digital, open, networked. As for the T component in the DIAT model, the scholarship of teaching and learning (SOTL), coined by Boyer in 1991, has been widely used to characterize teaching not only in terms of its basic functions but also from a perspective of continuing innovation based on educational research. However, the SOTL requires an update to incorporate new digital and data-driven concepts that, in time, will determine its further operationalization. The concept of data literacy has been embedded in the EU DigCompEdu framework (Redecker & Punie, 2017) and the vision of data literacy supported here is a part of digital competences, as was argued in previous works (Raffaghelli, 2017a, 2018). In spite of the fact that the application of this framework to the professionalism of academics could be controversial – since the framework was developed to address the professionalism of educators – we argue that the teaching endeavour renders academics to be a specific category of educators. However, our framework does not exclude the fact that the academics are sometimes the producers of the knowledge they teach. The “silos” of research and teaching in academia can be connected and research can be partially included in the framework. This is the case of research data used as educational content (Atenas et al., 2015).

The survey will aim to analyse ongoing data-driven practices associated with university teaching and learning in a complex cycle that starts with searching for and using data as educational content, generating and analysing educational data, using it for several purposes and sharing it to improve teaching. Moreover, the SOTL framework will be linked to the main constructs of open and networked scholarship in the digital age (George Veletsianos & Kimmons, 2012). The Figure 1 shows the above-described relationship between concepts, and Table 1 shows the constructs associated with research questions. Appendix A includes an adapted version of DigCompEdu used to define several areas of data literacy among academics.

Figure 1. Constructs used in the survey.

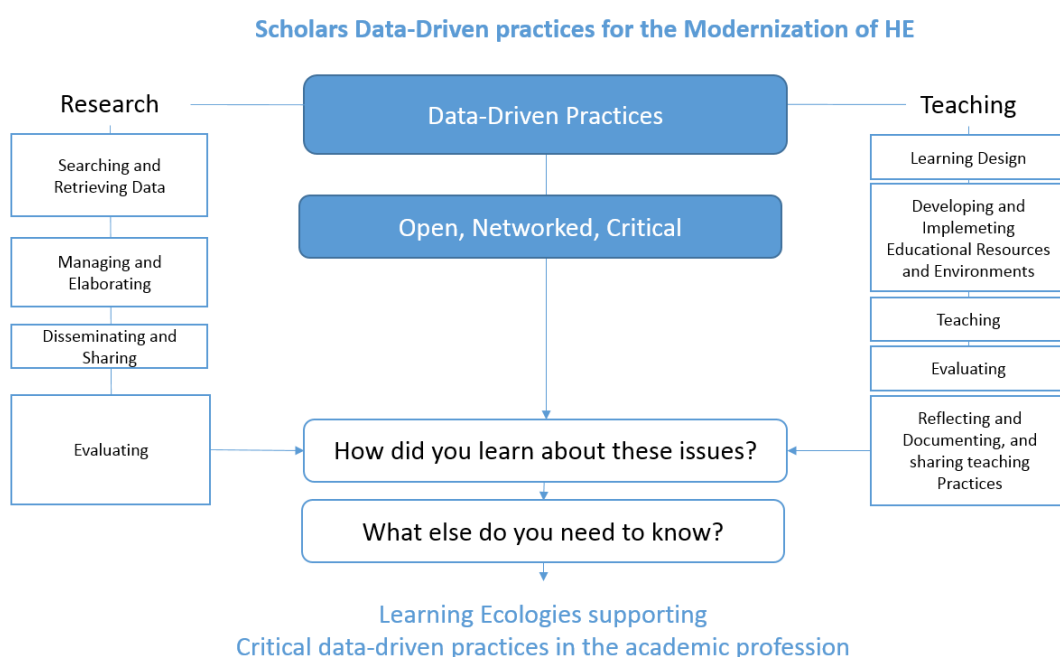


Table 2. Research constructs and related research questions.

Construct	Research question
<p>Data within research practices (seeking, retrieving, managing, processing, disseminating, sharing and evaluating data)</p> <p>Data within academic teaching practices (professional engagement, digital resource elaboration, teaching and learning, assessment, empowerment, facilitating learners' data literacy)</p>	<p>What data practices do we find in academia if any?</p> <p>What are the differences across researchers by age and subject area?</p> <p>Is there any synergy between the silos of research and teaching data practices?</p>
<p>Digital, open, networked and critical approaches to data within academic practices</p>	<p>Do academics adopt digital, open, networked and critical approaches to available and produced research data?</p> <p>Do academics adopt open, networked and critical approaches to available and produced educational data?</p>
<p>Professional learning ecologies supporting data literacy</p>	<p>How are the professional learning ecologies configured that support practices related to data in teaching?</p>
<p>Professional learning opportunities to develop data literacy.</p>	<p>Which professional learning opportunities are available as perceived by academics in own practice context?</p>

## General questionnaire structure

### COMPONENT 0. INTRODUCTION TO THE SURVEY

- C0.1. Research goals
- C0.2. Privacy

### COMPONENT 1. PERSONAL INFORMATION

- C1.1 Sex
- C1.2. Age
- C1.3. Experience
- C1.4. Research/area - sector  
(according to the ERC: [https://en.wikipedia.org/wiki/European\\_Research\\_Council](https://en.wikipedia.org/wiki/European_Research_Council))

### COMPONENT 2. EXPLORING DATA LITERACY IN RESEARCH

#### Subcomponent 1. Data practices in research workflows

- C2S1.1 Frequency of activity: seeking and retrieving research data
- C2S1.2 Frequency of activity: managing and processing research data
- C2S1.3 Frequency of activity: disseminating and sharing research data
- C2S1.4 Frequency of activity: evaluating data

#### Subcomponent 2. Learning ecologies supporting data practices in research workflows

- C2S2.1 Perceived learning needs and opportunities in the institutional context
- C2S2.2 Overall engagement in relationships, with resources or activities by the participant to update professional practices related to the search for, management, sharing and evaluation of data as well as perceived learning needs.
- C2S2.3 Activities undertaken by the participant to update professional practices related to the search for, management, sharing and evaluation of data.
- C2S2.4 Resources searched, collected or consulted by the participant to update professional practices related to the search for, management, sharing and evaluation of data.
- C2S2.5 Relationships generated, maintained or cultivated by the participant to update professional practices related to the search for, management, sharing and evaluation of data.
- C2S2.6 Motivations to learn on the topic.

### COMPONENT 3. EXPLORING DATA LITERACY IN TEACHING AND LEARNING

#### Subcomponent 1. Data practices within teaching and learning

- C3S1.1 Frequency of activity: professional engagement with data practices
- C3S1.2 Frequency of activity: data as a resource for learning
- C3S1.3 Frequency of activity: data in teaching and learning
- C3S1.4 Frequency of activity: data in assessment
- C3S1.5 Frequency of activity: empowering learners to develop data practices in their discipline



C3S1.6 Frequency of activity: facilitating learners' data literacy.

## Subcomponent 2. Learning ecologies supporting data practices within teaching and learning

C3S2.1 Perceived learning needs and opportunities to learn in the institutional context

C3S2.2 Overall engagement in relationships with resources or activities by the participant, to update professional practices related to: data embedded in professional engagement, the elaboration of educational resources, teaching and learning processes, assessment, empowering learners, and facilitating learners' data literacy.

C3S2.3 Activities undertaken by the participant, to update professional practices related to: data embedded in professional engagement, the elaboration of educational resources, teaching and learning processes, assessment, empowering learners, and facilitating learners' data literacy.

C3S2.4 Resources searched, collected or consulted by the participant, to update professional practices related to: data embedded in professional engagement, the elaboration of educational resources, teaching and learning processes, assessment, empowering learners, and facilitating learners' data literacy.

C3S2.5 Relationships generated, maintained or cultivated by the participant, to update professional practices related to: data embedded in professional engagement, the elaboration of educational resources, teaching and learning processes, assessment, empowering learners, and facilitating learners' data literacy.

C3S2.6 Motivations to learn on the topic.

## APPENDIX A. DATA LITERACY FOR EDUCATORS

Competence dimension	Descriptor	Description
PROFESSIONAL ENGAGEMENT	Research data practices	Over the full cycle of scientific information, to be actively engaged in open science and advanced critical data practices that are transferrable to teaching.
	Organizational communication	To use available data to enhance organizational communication with colleagues, students and third parties. To contribute to collaboratively developing and improving organizational communication strategies and policies driven by data (learning and academic analytics, statistical reports, social media data, etc.).
	Professional collaboration	To use open data approaches in science and educational activities to engage with other scholars, sharing and exchanging knowledge and experience, and collaboratively innovating pedagogic practices.
	Reflective practice	To individually and collectively reflect on, critically assess and actively develop one's own data-driven practices within teaching.  To reflect on the connections between the advancement of one's own research discipline and data procedures and those of data procedures and activities embedded into teaching.
	Continuous professional development	To cultivate learning ecologies supporting data literacy in academic practice.
DATA AS A RESOURCE FOR LEARNING	Selecting data as a resource for learning	To identify, assess and select data or data approaches as resources for teaching and learning.  To consider specific learning objectives, contexts, pedagogical approaches and learner groups when designing data approaches and planning their use.
	Generating, collecting, extracting data as a resource for learning	To modify and build on existing openly-licensed data or data extraction approaches where this is permitted. To collect new data as a resource for learning. To consider the specific learning objectives, contexts, pedagogical approaches and learner groups when designing data approaches and planning their use.
	Managing, protecting and sharing data	To organize data as educational content and make it available to learners and eventually to other stakeholders. To effectively protect sensitive data. To respect and correctly apply privacy and copyright rules to open data. To understand the use and creation of open licences and open

		data as open educational resources, including their proper attribution.
TEACHING AND LEARNING	Teaching	To plan for and implement data-driven activities and visualizations in the teaching and learning process, so as to enhance the effectiveness of teaching interventions.
	Guidance	To integrate data-driven guidance (based on students' logs, assessments, course evaluations, monitoring processes, dashboards) to offer timely and targeted guidance and assistance. To experiment with and develop new forms and formats for offering data-driven guidance and support.
	Collaborative learning	To use data-driven approaches to foster and enhance learner collaboration. To enable learners to use their own data as part of collaborative assignments and as a means of enhancing communication and collaboration and collaborative knowledge creation.
	Self-regulated learning	To use data-driven approaches (based on students' logs, assessments, course evaluations, monitoring processes, dashboards) to support learners' self-regulated learning, i.e., to enable learners to plan, monitor and reflect on their own learning, provide evidence of progress, share insights and come up with creative solutions.
ASSESSMENT	Assessment strategies	To integrate the data produced throughout the learning process for formative and summative assessment purposes.
	Analysing evidence	To generate, select, critically analyse and interpret data as evidence of learner activity, performance and progress, in order to inform teaching and learning.
	Feedback and planning	To use the data produced throughout the learning process to provide targeted and timely feedback to learners. To adapt teaching strategies and to provide targeted support based on the evidence generated by the digital technologies used. To enable learners and other stakeholders to understand the data as a form of evidence provided by digital technologies.
EMPOWERING LEARNERS	Accessibility and inclusion	To ensure accessibility to the data generated and used during learning activities, of all learners, including those with special needs. To consider and respond to learners' expectations, abilities, uses and misconceptions on data.
	Differentiation and personalization	To use digital technologies to address learners' diverse learning needs, allowing learners to advance at different levels and speeds and to follow individual learning pathways and objectives.
	Actively engaging learners	To use digital technologies (like data storytelling and the generation of infographics) to foster learners' active creative and critical engagement with data as learning content.

		To open up learning with data to new, real-world contexts of data usage, involving learners themselves, in hands-on activities, scientific investigation or complex problem solving.
FACILITATING LEARNERS' DATA LITERACY	Learners' data literacy	To incorporate learning activities, assignments and assessments that require learners to articulate the need for data; to support students in finding and extracting raw data in digital environments; to support learners in their organization, processing, analysis and interpretation of data and to compare and critically evaluate the credibility and reliability of available data in the context of their sources.
	Learners' use of data in communication and collaboration	To incorporate learning activities, assignments and assessments which require learners to effectively and responsibly use digital tools to share data.
	Learners abilities of data storytelling	To incorporate learning activities, assignments and assessments which promote learners in the generation of visualizations, representations and stories using data. To teach learners how copyright and licences apply to data as digital content and how to reference sources and attribute licenses.
	Learners' responsible use of data	To empower learners to acknowledge and manage the risks of using personal, social and generally open data safely and responsibly.
	Learners' use of data in problem solving	To incorporate learning activities, assignments and assessments that help learners identify and solve technical problems and data extraction, elaboration and presentation

The same framework and the logic of statements in support of self-evaluation were adopted in the survey in relating the levels of proficiency for each of the above dimensions with areas of competence.

DigCompEdu levels of proficiency.

Level / Description	PROFESSIONAL ENGAGEMENT	DIGITAL RESOURCES	TEACHING AND LEARNING	ASSESSMENT	EMPOWERING LEARNERS	FACILITATING LEARNERS' DATA LITERACY
C2 Pioneer	Innovating towards a critical perspective of data-driven professional practices	Promoting innovative ways of exploring and using data	Innovating in ways of understanding and using data in teaching and learning	Innovating in ways of understanding and using data assessment	Innovating learner involvement in data-driven practices	Using innovative formats to foster learners' personal, professional and social data literacy

<b>C1 Leader</b>	Discussing and renewing data-driven professional practices	Comprehensively using advanced strategies and resources for exploring and using data	Strategically and purposefully renewing teaching practice by understanding and using data	Critically reflecting on ways of understanding and using data in assessment and evaluation	Holistically empowering learners in data-driven practices	Comprehensively and critically fostering learners' data literacy
<b>B2 Expert</b>	Enhancing data within professional practices	Strategically using interactive strategies and resources	Enhancing teaching and learning activities through data	Strategic and effective use of data-driven assessment and evaluation	Strategically using a range of tools to empower learners in data-driven practices	Strategically fostering learners' data literacy
<b>B1 Integrator</b>	Expanding professional practice through the use of data	Fitting data as a resource to the learning context	Meaningfully integrating data into teaching	Enhancing traditional assessment on the basis of available data	Addressing learner empowerment in data-driven practices	Implementing activities to foster learners' data literacy
<b>A2 Explorer</b>	Exploring data-driven professional practices	Exploring data as a resource for learning	Exploring teaching and learning activities using data	Exploring the meaning of data on traditional assessment	Exploring learner-centred strategies to promote data-driven practices	Encouraging learners to understand data in the taught discipline
<b>A1 Newcomer</b>	Awareness of data-driven practices, uncertainty, basic use	Awareness of data as a possible resource, uncertainty, basic use	Awareness of the problem of data within teaching and learning, uncertainty, basic use	Awareness of the problem of data in assessment, uncertainty, basic use	Awareness on the need to empower learners to understand and use data beyond the discipline, uncertainty, basic use	Awareness of the need to understand data in the taught discipline, uncertainty, basic use

Source. Adapted from Table 8 (DigCompEdu proficiency progression by area), European Framework for the Digital Competence of Educators, 31 (Redecker & Punie, 2017).

## Questionnaire – English Version

Electronic version @.....

### 4. Survey: Digital Scholarship and the Modernization of Higher Education

\*Required

#### Introduction

The digital environment and tools progressively being adopted in higher education (HE) are generating massive amounts of data and require critical awareness and engagement. This survey proposes a number of questions that explore how data is perceived and used in research and teaching, the two main activities in academic life. The questionnaire is hence divided in two main parts: 1) Research and 2) Teaching. In each part, you will find the following type of questions: the frequency of professional activities and tasks connected to research or/and teaching; how did you learn about the skills and knowledge required to undertake such activities; your opportunities and motivations to learn.

\*\*\*\*\*Along this questionnaire, we will use the concept of “data”, which indeed could enclose many meanings. In this survey, we will define data as “all the molecular pieces compounding the flows of information in your activity, such as numbers, text, images, etc. which can be processed by either quantifying or aggregating for the purposes of interpretation, visualization and communication”. Moreover, we will mostly refer to digitalized data\*\*\*\*\*

You can also see: <https://en.wikipedia.org/wiki/Data>

Thank you very much for your valuable time!

### 5. CO. INFORMED CONSENT FOR PERSONAL DATA PROCESSING

In this form we will collect your opinions and transform them into data to be used for the purposes of this research. Your identity will be protected by archiving the original answers in encrypted files located with <<name of partner>> at the **Universitat Oberta de Catalunya**.

The data will be processed, aggregated and used for scientific communication and dissemination purposes. Data which is not sensitive and cannot reveal your identity will be anonymized for future research. **By giving your consent you agree to this processing.**

In accordance with the [General Data Processing Regulation](#), you may request further information on how your personal data is used by writing to: [jraffaghelli@uoc.edu](mailto:jraffaghelli@uoc.edu)

### 6. C1. PERSONAL INFORMATION

#### C1.1 Sex \*

Mark only one **option**.

- F

- M

**C1.2. Age (years) \***

Mark only one option.

- Less than 25
- 25-34
- 35-44
- 45-54
- 54-65
- More than 65

**C1.3. Research domain and topic \***

Mark only one option.

PE=Physical Sciences & Engineering; SH=Social Sciences & Humanities; LS=Life Sciences

- PE1 - Mathematical foundations
- PE2 - Fundamental constituents of matter
- PE3 - Condensed matter physics
- PE4 - Physical and analytical chemical sciences
- PE5 - Materials and synthesis
- PE6 - Computer science and informatics
- PE7 - Systems and communication engineering
- PE8 - Products and processes engineering
- PE9 - Universe sciences
- PE10 - Earth system science
- SH1 - Individuals, institutions and markets
- SH2 - Institutions, values and beliefs and behaviour
- SH3 - Environment and society
- SH4 - The human mind and its complexity
- SH5 - Cultures and cultural production
- SH6 - The study of the human past
- LS1 - Molecular and structural biology and biochemistry
- LS2 - Genetics, genomics, bioinformatics and systems biology
- LS3 - Cellular and developmental biology
- LS4 - Physiology, pathophysiology and endocrinology
- LS5 - Neurosciences and neural disorders
- LS6 - Immunity and infection
- LS7 - Diagnostic tools, therapies and public health
- LS8 - Evolutionary, population and environmental biology
- LS9 - Applied life sciences and biotechnology

**C1.4 Research and teaching experience (years) \***

Mark only one option per column

Experience	Research	Teaching
<ul style="list-style-type: none"> <li>• None</li> </ul>	<i>If none, go to "Professional activity: teaching"</i>	<i>If none, go to "Professional activity: research"</i>
<ul style="list-style-type: none"> <li>• Less than 3</li> </ul>		

• 3		
• 3-5		
• 5-10		
• 10-15		
• More than 15		

## C2. PROFESSIONAL ACTIVITY: RESEARCH

The questions below refer to research as part of your professional activity at your university.  
First answer the following question:

My professional activity relates only to teaching -> YES/NO

[If the answer is YES -> go to "Professional activity: teaching"]

### C2S1. Data practices in research workflows

In the last year, how frequently have you engaged in one of the following research-related activities?

\*

Mark only one option per row.

C2S1.1 Seeking and retrieving research data	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I extracted (with automated procedures) massive amounts of digitalized data from the WWW, digital platforms, social networks, apps or via IoT (Internet of Things) devices/sensors.</li> <li>• I sought in Open Data portals (OpenAire, Eudat, Open Data Research Network, Zenodo, etc.)</li> </ul>				
C2S1.2 Managing and processing research data	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I adopted closed research data</li> </ul>				



<p>processing tools (Excel, SPSS, MatLab, NVIVO, etc.)</p> <ul style="list-style-type: none"> <li>• I adopted open research data processing tools (R, Python)</li> <li>• I generated “traditional” graphics and representations over the basis of my research data (like histograms, pie charts, dispersion graphs, etc.)</li> <li>• I generated open and dynamic visualizations (where the user can interact with research notes, labels, zooming into particular categories of data) with my research data</li> <li>• I collaborated in data processing activities adopting specific/closed instruments</li> <li>• I collaborated in data processing activities adopting open source instruments</li> </ul>				
<p>C2S1.3 Sharing research data</p>	<p>Never</p>	<p>1-2 times</p>	<p>3-5 times</p>	<p>More than 5 time</p>
<ul style="list-style-type: none"> <li>• I published the data of my ongoing, unpublished research on an open data repository (Figshare, Zenodo, Mendeley Data, etc.) or my University Institutional Repository</li> <li>• I published the data of my ongoing, unpublished research on</li> </ul>				

<p>my personal or institutional blog</p> <ul style="list-style-type: none"> <li>• I shared the data of my ongoing, unpublished research through academic social networks (Research Gate, Academia.edu, LinkedIn, etc.)</li> <li>• I shared the data of my published research through non-open digital environments for teaching (eLearning platforms)</li> <li>• I shared the data of my published research through open digital environments for teaching (open eLearning platforms, social networks, videos)</li> <li>• I shared my ongoing/final research through social media (social networks, video), explaining data procedures</li> <li>• I shared my ongoing/final research through collaboration and activities with schools or civil society organizations, explaining data procedures</li> </ul>				
<p>C2S1.4 Evaluating research quality through data</p>	<p>Never</p>	<p>1-2 times</p>	<p>3-5 times</p>	<p>More than 5 times</p>
<ul style="list-style-type: none"> <li>• I analysed the quality of research data by using standard principles (e.g.,</li> </ul>				

<p>the “FAIR DATA PRINCIPLES”)</p> <ul style="list-style-type: none"> <li>• I reflected on ethical aspects of data extraction, treatment and presentation in own research field</li> <li>• I analysed own or colleagues’ scientific production using traditional indicators (h-index, impact factor, number of publications)</li> <li>• I analysed own or colleagues’ scientific production using emerging indicators (altmetrics, social network scores, followers, etc.)</li> <li>• I criticized/advocated for new forms of research evaluation beyond traditional metrics.</li> </ul>				
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C2S2. Learning ecologies supporting data practices in research workflows

C2S2.1a Considering your current situation and only according your personal learning needs, what relevance would you give to learning/skills acquisition in the following areas of data literacy in RESEARCH?

	Relevant	Somewhat relevant	Neither relevant or irrelevant	Somewhat irrelevant	Irrelevant
Seeking and retrieving data					
Managing data					
Sharing data					

Evaluation of research quality through data					
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**C2S2.1b** What is the relevance/attention paid (in terms of policies, instruments and support) in your institution to learning/skills acquisition in the following areas of data literacy in research?

	Relevant	Somewhat relevant	Neither relevant or irrelevant	Somewhat irrelevant	Irrelevant
Seeking and retrieving data					
Managing data					
Sharing data					
Evaluation of research quality through data					

**C2S2.2** Have you undertaken activities, sought resources and/or developed relationships aimed at updating your professional research practices?

*Please consider related activities that you do, resources that you collect, read, see and consult, and the persons you contact and communicate with to further your understanding (and hence your learning) of specific matters or to resolve professional problems.*

- Yes
- No
- Not sure

[if the answer is NO, go to “Professional activity: teaching”]

**C2S2.3a** What kind of activities have you undertaken in the last three years in order to update your professional practices related to the search for scientific information?

*Select all that apply*

ACTIVITIES	Never	Seldom	Often	Daily
A1. I participated in face-to-face courses, seminars, conferences offered by the institution				
A2. I participated in online courses, seminars, conferences offered by the institution				
A3. I participated in face-to-face courses, seminars, conferences on my own initiative				
A4. I participated in online courses, seminars, conferences on my own initiative				

A5. I participated in study groups promoted by my institution				
A6. I participated in study groups outside my institution				
A7. I used social network sites to find information or resources				
A8. I participated in social network sites to share information and/or discuss techniques, topics and problems				

C2S2.3b. Give at least two examples of those activities.

C2S2.4a What kind of resources have you sought, collected or consulted in the last three years in order to update your professional practices related to your RESEARCH activity?

RESOURCES	Never	Seldom	Often	Daily
R1. I sought/collected/consulted books or scientific articles suggested by my institution				
R2. I sought/collected/consulted magazine articles or social media suggested by my institution				
R3. I sought/collected/consulted books or scientific articles I find myself				
R4. I sought/collected/consulted magazine articles or social media I find myself				
R5. I sought/collected/consulted videos and tutorials suggested by my institution				
R6. I I sought/collected/consulted videos and tutorials I find myself				

C2S2.4b. Give at least two examples of those resources.

C2S2.5a What kind of relationships have you generated, maintained or cultivated in the last three years in order to update your professional practices related to your RESEARCH activity.

RELATIONSHIPS	Never	Seldom	Often	Daily
RS1. I engaged with my co-workers to ask for information				
RS2. I engaged with co-workers to discuss and think about problems				

RS3. I engaged with other experts in my field to ask for information				
RS4. I engaged with other experts in my field to discuss and think about problems				
RS3. I engaged with other persons (including family and friends) to ask for information that can be connected to my ongoing professional activities				
RS4. I engaged with other persons (including family and friends) to discuss and think about problems				

C2S2.5b. Give at least two examples of those relationships.

C2S2.6. Indicate the motivations that led you to want to improve your professional knowledge and skills in data practices in RESEARCH.

Select all that apply, considering the more frequent options in your case for the last three years.

<i>Motivations</i>	
Mostly personal interest	
Personal interest stimulated by my colleagues/team	
Neither personal interest nor institutional interest	
Institutional suggestion based on a specific project	
Institutional suggestion based on established institutional and national policies	
Institutional/national or transnational compulsory regulations	

### C3. PROFESSIONAL ACTIVITY: TEACHING AND LEARNING

The questions below refer to teaching as part of your professional activity at your university.

First answer the following question:

My professional activity relates only to research -> YES/NO

[If the answer is YES -> go to the end of the questionnaire]

#### C3S1. Data practices within teaching and learning

In the last year, how frequently have you been engaged in one of the following teaching-related activities?

*\*Mark only one option per row.*

C3S1.1 Professional engagement with data practices	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I used processed data (national or institutional reports) to address institutional development and planning</li> <li>• I used data yielded from institutional evaluation to support institutional development and planning</li> <li>• I used data yielded from assessment and evaluation of my own course to engage in institutional development and planning</li> <li>• I used data yielded from institutional assessment and evaluation for curriculum design</li> <li>• I used data obtained from learning analytics for my own courses for learning design</li> <li>• I used data obtained from learning analytics for my own courses to reflect on my own teaching effectiveness</li> <li>• I used data obtained from social media integrated in my teaching activity to improve teaching effectiveness</li> <li>• I used data obtained from social media where my students freely engage to address teaching effectiveness</li> <li>• I reflected on connections between the advancement of data in my own research discipline and data procedures (analysis, elaboration and visualization) embedded in teaching</li> </ul>				
C3S1.2 Data as educational resource	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I adopted processed data (national or institutional reports) as a educational resource</li> <li>• I re-used digitally accessible data (Open Data) from external research or public or government research as an educational resource</li> </ul>				

<ul style="list-style-type: none"> <li>• I re-used digitally accessible data (Open Data) from my own research as an educational resource</li> <li>• I reflected on the ethical issues connected with integrating data as an educational resource</li> </ul>				
C3S1.3 Teaching and learning	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I introduced traditional data collection techniques as part of students' assignments</li> <li>• I introduced massive digital data extraction techniques as part of students' assignments.</li> <li>• I taught specific techniques to elaborate and represent/visualize data</li> <li>• I used advanced tools to generate interactive visualization of data</li> <li>• I reflected on ethical issues in data collection when extracted automatically (e.g., from social media)</li> <li>• I used students' logs to the eLearning system to support students' monitoring and evaluation of their own learning</li> </ul>				
C3S1.4 Assessment	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I used data from assessment activities to monitor learning</li> <li>• I used data from assessment activities to monitor teaching effectiveness</li> <li>• I used data from assessment activities to give feedback</li> <li>• I used from the overall course' assessment to give formative feedback</li> <li>• I used data from the overall course' assessment to reflect on course effectiveness with students</li> <li>• I reflected with the students on yield from final assessment and evaluation</li> <li>• I used data students' logs to monitor/evaluate teaching</li> </ul>				



<ul style="list-style-type: none"> <li>• I used data teacher dashboards to monitor/evaluate teaching</li> <li>• I used data simple automated digital systems to analyse and score students' work (online quizzes)</li> <li>• I used simple automated digital systems to analyse students' opinions (online final surveys)</li> <li>• I used complex automated digital systems to analyse and score students' work (AI - Artificial Intelligence- tutors, text mining for open written assignments)</li> <li>• I used complex automated digital systems to analyse students' opinion (e.g., sentiment analysis, social network analysis)</li> <li>• I selected and opened data from assessment and evaluation to inform future students on my course</li> </ul>				
C3S1.5 Empowerment	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I shared and discuss data produced by institutional reports with students so they can make interpretations on the dimensions and progress of their own learning in the institutional and social context</li> <li>• I shared and discuss data produced by learning analytics with students so they can make interpretations on the dimensions and progress of their own learning in the institutional and social context</li> <li>• I shared and discussed analytics on social media integrated in the course with students so they can make interpretations on the dimensions and progress of their own learning in the institutional and social context</li> </ul>				
C3S1.6 Learners' data literacy	Never	1-2 times	3-5 times	More than 5 times
<ul style="list-style-type: none"> <li>• I analysed students' ability to critically appraise the credibility and reliability of</li> </ul>				

<p>available data in the context of their sources</p> <ul style="list-style-type: none"> <li>• I analysed students' ability to integrate data into narrative or visual presentations and make sense of them.</li> <li>• I discussed and reflected with students on the social constraints on data and digital applications in AI as a socio-technical process.</li> <li>• I discussed the ethical concerns with students on collecting and using their data as part of the learning and evaluation process</li> <li>• I discussed the overall ethical concerns of collecting data in education and research with my students.</li> </ul>				
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C3S2. Learning ecologies supporting data practices within teaching and learning

C3S2.1a If you had to make a choice right now, what relevance would you give to learning/skills acquisition in the following areas of data literacy in TEACHING AND LEARNING?

	Relevant	Somewhat relevant	Neither relevant or irrelevant	Somewhat irrelevant	Irrelevant
Professional engagement with data practices					
Data as resource for learning					
Data in teaching and learning					
Data within assessment					
Empowering learners to develop data practices in the disciplinary field.					
Facilitating learners' data literacy					

**C3S2.1b** Which is the relevance/attention paid (in terms of policies, instruments and support) in your institution to learning/skills acquisition in the following areas of data literacy in TEACHING?

	Relevant	Somewhat relevant	Neither relevant or irrelevant	Somewhat irrelevant	Irrelevant
Professional engagement with data practices					
Data as resource for learning					
Data in teaching and learning					
Data within assessment					
Empowering learners to develop data practices in the disciplinary field.					
Facilitating learners' data literacy					

**C3S2.2** Have you undertaken activities, sought resources and/or developed relationships aimed at updating your professional TEACHING activities?

*Please consider related activities that you do, resources that you collect, read, see and consult, and the persons you contact and communicate with to further your understanding (and hence your learning) of specific matters or to resolve professional problems.*

- Yes
- No
- Not sure

[If the answer is NO -> go to the end of the questionnaire]

**C3S2.3a** What kind of activities have you undertaken in the last three years in order to update your professional practices related to TEACHING?

*Select all that apply*

ACTIVITIES	Never	Seldom	Often	Daily
A1. I participated in face-to-face courses, seminars, conferences offered by the institution				
A2. I participated in online courses, seminars, conferences offered by the institution				

A3. I participated in face-to-face courses, seminars, conferences on my own initiative				
A4. I participated in online courses, seminars, conferences on my own initiative				
A5. I participated in study groups promoted by my institution				
A6. I participated in study groups outside my institution				
A7. I used social network sites to find information or resources				
A8. I participated in social network sites to share information and/or discuss techniques, topics and problems				

C3S2.3b. Give at least two examples of the activities.

C3S2.4a What kind of resources have you sought, collected or consulted in the last three years in order to update your professional practices related to teaching (from professional engagement to facilitating learners’ data literacy)?

RESOURCES	Never	Seldom	Often	Daily
R1. I sought/collected/consulted books or scientific articles suggested by my institution				
R2. I sought/collected/consulted magazine articles or social media suggested by my institution				
R3. I sought/collected/consulted books or scientific articles I find myself				
R4. I sought/collected/consulted magazine articles or social media I find myself				
R5. I sought/collected/consulted videos and tutorials suggested by my institution				
R6. I sought/collected/consulted videos and tutorials I find myself				

C3S2.4b. Give at least two examples of the resources.

C3S2.5a What kind of relationships have you generated, maintained or cultivated in the last three years in order to update your professional practices related to TEACHING?

RELATIONSHIPS	Never	Seldom	Often	Daily

RS1. I engaged with my co-workers to ask for information				
RS2. I engaged with my coworkers to discuss and think about problems				
RS3. I engaged with other experts in my field to ask for information				
RS4. I engaged with other experts in my field to discuss and think about problems				
RS3. I engaged with other persons (including family and friends) to ask for information that can be connected to my ongoing professional activities				
RS4. I engaged with other persons (including family and friends) to discuss and think about problems				

C3S2.5b. Give at least two examples of the relationships.

C3S2.6. Indicate the motivations that lead you to want to improve your professional knowledge and skills in data practices for TEACHING?

*Select all that apply, considering the more frequent options in your case for the last three years.*

Mostly personal interest	
Personal interest stimulated by my colleagues/team	
Neither personal interest nor institutional interest	
Institutional suggestion based on a specific project	
Institutional suggestion based on established institutional and national policies	
Institutional, national or transnational compulsory indication based on regulations.	