Co-funded by the
Erasmus+ Programme
of the European Union

Learn2Analyze (L2A)

An Academia-Industry Knowledge Alliance for enhancing Online Training Professionals' (Instructional Designers and e-Trainers) Competences in Educational Data Analytics

Learn2Analyze

Erasmus+ Program

Knowledge Alliances (Key Action 2)

AGREEMENT NUMBER: 2017 - 2733 / 001 – 001

PROJECT NUMBER: 588067-EPP-1-2017-1-EL-EPPKA2-KA

R4. Competence Profiles for Instructional Designers and e-Trainers aligned with EQF

Disclaimer:

*The **Learn2Analyze project results** are developed with co-funding by the European Commission through the **Erasmus+ Program** of the European Union (Cooperation for innovation and the exchange of good practices - **Knowledge Alliances**, Agreement n. 2017-2733 / 001-001, Project No 588067-EPP-1-2017-1-EL-EPPKA2-KA). The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflects the views only of the authors, and the Commission will not be held responsible for any use which may be made of the information contained therein.*

Learn2Analyse Consortium

Contact

Professor Demetrios Sampson, Learn2Analyse Project Co-ordinator

Department of Digital Systems, University of Piraeus,
80, Karaoli and Dimitriou Street, Piraeus, 18534 / Greece
Phone: +30-210-4142766
E-mail: sampson@unipi.gr

Executive Summary

The scope of **Result 4** (Competence Profiles for Instructional Designers and e-Trainers aligned with EQF) is to present the alignment of the validated (R3@WP2) **Educational Data Literacy (EDL) Competence Profiles (CPs)** framework for Instructional Designers and e-Trainers (EQF EDL-CP) to the **European Qualifications Framework** (EQF), to develop **exemplary learning outcomes** based on the two-dimensional EDL-CP framework, and to create **use-case examples** for the target group, whose main stakeholders are instructional designers, e-Trainers and K-12 teachers.

The result was realised through a **semi-structured interview study** with **34 experts** from higher education institutions and eLearning enterprises which were conducted between 26-Nov-2018 and 18-Jan-2019.

This document presents the alignment of the EDL-CP dimensions/statements with the European Qualifications Framework, the design, the implementation and the analysis of the semi-structured interview study, suggests exemplary learning outcomes for the EDL-CP framework, and describes use-case examples for the target groups of the EDL-CP.

Table of Contents

1. Scope

The scope of **Result 4** (Competence Profiles for Instructional Designers and e-Trainers aligned with EQF) is to present the alignment of the validated (R3@WP2) **Educational Data Literacy (EDL) Competence Profiles (CPs)** framework for Instructional Designers and e-Trainers (EQF EDL-CP) to the **European Qualifications Framework** (EQF), to develop **exemplary learning outcomes** based on the two-dimensional EDL-CP framework, and to create **use-case examples** for the target group, whose main stakeholders are instructional designers, e-Trainers and K-12 teachers.

The result was realised through a **semi-structured interview study** with **34 experts** from higher education institutions and eLearning enterprises which were conducted between 26-Nov-2018 and 18-Jan-2019.

This document presents the alignment of the EDL-CP dimensions/statements with the European Qualifications Framework, the design, the implementation and the analysis of the semi-structured interview study, suggests exemplary learning outcomes for the EDL-CP framework, and describes use-case examples for the target groups of the EDL-CP.

2. Background

Educational Data Literacy (EDL) is the ethically responsible collection, management, analysis, comprehension, interpretation, and application of data from educational contexts.

In Result 2, a draft version of the EDL-CP framework for instructional designers and e-Trainers of online and blended courses was produced through an extensive literature review.

In Result 3 (report on the emerging competences for instructional designers and e-Trainers - expert-based survey), the draft version of the EDL-CP framework was validated through an online survey including 210 international experts from higher education institutions and eLearning industry enterprises.

The revised and final EDL-CP framework consists of six competence dimensions and 21 competence statements which aim to describe the dimensions (see Table 1 below).

3. Design and implementation of the semi-structured interview study

The purpose of the semi-structured interview study was to (a) map and transfer the EDL-CP framework to the European Qualifications Framework and to (b) develop exemplary learning outcomes for the dimensions/statements of the EDL-CP framework.

3.1. Participants

The interview study was conducted with a sample of *N* = 34 (23 male, 11 female) participants identified as experts with a strong background in data science and/or online learning and teaching. The mean age within the sample was 44.1 years (*SD* = 10.17). Twenty-eight experts were located in 10 different EU countries (Greece: 9; Germany: 6; Ireland: 4; Sweden: 2; UK: 2; Austria: 1; Estonia: 1; Norway: 1; Portugal: 1; Spain: 1), six experts came from Non-EU countries (Australia: 2; USA: 2; Azerbaijan: 1; Taiwan: 1). All experts had an academic background: with regard to their highest academic qualifications, 24 experts classified themselves on PhD-level, eight on MSc-level, and two on BSc-level. Twenty-four experts were employed in Higher Education, six in industry or for-profit organizations. Three experts were employed in public/non-profit organizations, and one expert worked as a teacher in K-12/secondary education.

3.2. Materials

The **invitation letter** (see Appendix 1) was based on the previous material used for Result 3. The letter was sent to the participants, mentioning the description of the project and its objectives, the reasons why they were selected to participate in the interview, a description of the methodology, guidelines for participating in the interview, as well as information about privacy and ethical issues.

The **consent form** (also based on Result 3; see Appendix 2) included all required information (purpose and procedure, potential benefits, potential risk or discomforts, storage of data, anonymity and confidentiality, right to withdraw, conflict of interest, compensation, participant concerns and reporting) for the participants to consent or not in the interview. The consent form follows the guidelines of the General Data Protection Regulation (EU) 679/2016 ('GDPR') [1] the main data protection legal framework in the EU directly applicable to all Member States, repealing the current Data Protection Directive 95/46/EC as of 25 May 2018.

The **semi-structured interview guide** (see Appendix 3) consisted of interviewer guidelines and two parts of interview questions:

- The interview guidelines provided information on how to conduct the semi-structured interview with the participants. This information was only available for the interviewer.
- The semi-structured interview consisted of two parts:
    - Part 1 including prompts for a) mapping the EDL-CP framework to EQF and b) transfer of the EDL-CP statements to EQF levels.
    - Part 2 including tasks for developing exemplary learning outcomes based on the EDL-CP framework's dimensions/statements.

3.3. Implementation

The semi-structured interview study was conducted between 15-Oct-2018 and 31-Jan-2019 based on the following timeframe:

15-Oct-2018 – 14-Nov-2018	Select and contact participants ; agree on dates and times for interviews; run a dummy pilot interview to confirm the proposed timeframe for the interviews
15-Nov-2018 – 31-Jan-2019	Conduct interviews with confirmed experts

[1] http://eur-lex.europa.eu/eli/reg/2016/679/oj

4. Data analysis and findings

4.1. Data analysis strategy

The interviews were transcribed using F4transkript[2] (a software for transcribing qualitative interviews) and analyzed using a framework-based approach with the help of F4analyse (a software for analyzing qualitative interviews). In addition, the learning outcomes were validated based on L2A EDL-CP framework and EQF.

4.2. Findings

4.2.1 Mapping of the EDL-CP framework to EQF

The European Qualifications Framework (EQF) is a common European reference framework whose purpose is to make qualifications more readable and understandable across different countries and systems. The core of the EQF is its eight reference levels defined in terms of learning outcomes, i.e. knowledge, skills and autonomy-responsibility (https://ec.europa.eu/ploteus/content/descriptors-page). Level 1 represents basic general knowledge, basic skills, or work under direct supervision. Level 8 represents knowledge at the most advanced frontier, most advanced and specialised skills, or working at the forefront of research and innovation.

Each L2A EDL competence statement was assigned to one of the eight EQF-levels in line with the common descriptors defining the levels. Experts were asked to comment on this mapping of the L2A EDL-CP framework to EQF.[3] Aggregated results are shown in Table 1. For detailed results see Appendix 4.

The literature-based mapping of the L2A EDL-CP to EQF was confirmed through the expert validation for the individual dimensions and statements. One exception has to be reported for statement 6.2 for which the experts did not agree with the theory-based mapping. The majority of the experts assigned a higher EQF level for this statement. The findings presented in Table 1 are limited with regard to minor changes of the EDL-CP statements (which were proposed in Result 3 (WP2) during the interview phase of Results 4 (WP2)).

Table 1

Alignment of the L2A EDL-CP with the European Qualifications Framework

	L2A EDL-CP V1 based on literature review	**L2A EQF mapping**	**L2A EQF mapping expert validation**		
L2A EDL competence dimension	***L2A EDL competence statements***	***Assigned level***	***Agree-ment (perc./ freq.)***	***Disagree-ment (perc./ freq.)***	***Alternative mappings and commentaries (frequencies)***
1. Data Collection	1.1 Know where to find the right data/data sources	5	76 % 26	24% 8	Level 2: 1 Level 3: 2 Level 4: 3 Level 6: 2
	1.2 Know how to obtain/access data	5	68% 23	32% 11	Level 3: 3 Level 4: 7 Level 6: 1
	1.3 Understand data quality and limitations (e.g., accuracy, completeness)	6	62% 21	38% 13	Level 4: 1 Level 5: 6 Level 6: 1

[2] https://www.audiotranskription.de/english

					Level 7: 5
2. Data Management	2.1 Identify the technologies to preserve data	4	68% 23	32% 11	Level 3: 3 Level 4: 1 Level 5: 5 Level 6: 2
	2.2 Know and apply data manipulation methods	5	56% 19	44% 15	Level 4: 3 Level 5: 3 Level 6: 9
	2.3 Know and apply data curation and data re-use methods	5	71% 24	29% 10	Level 4: 2 Level 6: 8
	2.4 Understand Data Description (Metadata)	6	62% 21	38% 13	Level 3: 1 Level 4: 1 Level 5: 5 Level 6: 4 Level 7: 2
3. Data Analysis	3.1 Know and apply the basic data analysis methods	4	59% 20	41% 14	Level 3: 1 Level 4: 2 Level 5: 8 Level 6: 2
	3.2 Understand and apply the basic data analysis process steps	5	68% 23	32% 11	Level 4: 4 Level 6: 7
	3.3 Understand and apply the basic data presentation methods	5	65% 22	35% 12	Level 4: 6 Level 5: 1 Level 6: 4 Level 7: 1
4. Data Comprehen-sion & Interpretation	4.1 Understand data (e.g., measurement error, discrepancies within data, key take-away points)	6	82% 28	18% 6	Level 5: 4 Level 6: 1 Level 7: 1
	4.2 Understand statistics	6	74% 25	26% 9	Level 5: 6 Level 6: 2 Level 7: 1
	4.3 Know how to interpret data (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations)	7	65% 22	35% 12	Level 6: 5 Level 7: 5 Level 8: 2
	4.4 Generate potential connections to instruction	7	65% 22	35% 12	Level 4: 1 Level 6: 9 Level 7: 1 Level 8: 1
	4.5 Make decisions based on data	7	59% 20	41% 14	Level 4: 1 Level 6: 6 Level 7: 5 Level 8: 2
5. Data Application	5.1 Use data to inform instruction	6	71% 24	29% 10	Level 4: 1 Level 5: 3 Level 6: 2 Level 7: 4
	5.2 Know how to share and cite data	5	68% 23	32% 11	Level 4: 6 Level 5: 1 Level 6: 3 Altern.: 1
	5.3 Evaluate the data-driven intervention	7	79% 27	21% 7	Level 6: 5 Level 7: 1 Level 8: 1

6. Data Ethics	6.1 Explain the use of informed consent	5	56% 19	44% 15	Level 1: 1 Level 2: 1 Level 4: 7 Level 6: 4 Level 7: 1 Altern.: 1
	6.2 Know how to protect individuals' data privacy, confidentiality, integrity and security	5	38% 13	62% 21	Level 3: 1 Level 4: 3 Level 5: 1 Level 6: 13 Level 7: 2 Altern.: 1
	6.3 Understand authorship, ownership, data access (governance), re-negotiation and data-sharing	6	82% 28	18% 6	Level 5: 3 Level 7: 2 Level 8: 1

4.2.2 Exemplary learning outcomes for the L2A EDL-CP framework

Learning outcomes are statements of what a successful learner is expected to be able to do at the end of the process of a learning experience (Gogus, 2012). Learning outcomes and learning objectives are often used synonymously since learning objectives can be written and used for the similar purpose that learning outcomes are used for. However, course aims and course objectives express the intention of the instructor behind the introduced content or the intention of the course from the instructor's point of view while learning outcomes are concerned with the achievements of the learner and expectations from the successful learner as an end product of the course.

Experts were asked to develop exemplary learning outcomes in support of the L2A EDL-CP framework. Each expert was asked to work on three EDL-CP statements and thus develop three exemplary learning outcomes. The results for Instructional Designers are presented in Table 2 and for e-Trainers in Table 3.

Table 2

Learning outcomes in support of the L2A EDL-CP framework for instructional designers

L2A EDL-CP dimension	**L2A EDL-CP statement**	**Suggested learning outcome** *The instructional designer…*
1. Data Collection	1.1 Know where to find the right data/data sources	• can understand and apply the data access and data evaluation methods • can assess potential data sources relevant to what you are searching for • knows how to find the right data/data sources; shows how to find the right data/data source
	1.2 Know how to obtain/access data	• can locate appropriate data sources depending on the question or problem she/he has to solve • is able to go the right place to find the correct data/data sources • can choose appropriate methods of collecting and accessing data to evaluate different aspects of teaching and learning (learners, tutor, instruction)
	1.3 Understand data quality and limitations (e.g., accuracy, completeness)	• can evaluate the quality of data, has a comprehensive range of cognitive skills to converse legacy face to face content into an online format • can explain the concepts relevant to data quality and limitations and provide examples of high quality or importance • is aware of the limitations of the captured data and the reasons for those (why is data limited/incomplete), understands what kind of data measurement points are used for which indicators
2. Data Management	2.1 Identify the technologies to	• if the technology is software: can distinguish or describe or contrast particular software applications for the usefulness to preserve the data

	preserve data	• knows which technologies to use to preserve data
	2.2 Know and apply data manipulation methods	• can identify and apply methods that are appropriate for a specific context • should be able to understand the different data manipulation methods and apply them in different domain contexts based on the specific requirements • is able to transform and format data appropriately in order to make it easier to read or at least to be better organized in order to continue with the rest of the process
	2.3 Know and apply data curation and data re-use methods	• will be able to verify the reuse of data sources and validate the integrity of the data's life cycle • be able to deal with data processing methods that allow you to deal with missing data, outliers; has an understanding in which cases data can be reused or what methods you need to know and understand in order to be able to reuse the data in another context than the original one
	2.4 Understand Data Description (Metadata)	• can present data in a numerical, descriptive, or visual way • can understand the type of data and the limitations of manipulation of this data • can describe what data description and meta data is; is able to identify the meta data; create meta data for a project • is able to construct a data model
3. Data Analysis	3.1 Know and apply the basic data analysis methods	• becomes familiar with the available technology to proceed with basic data analysis methods • applies basic data methods to the relevant field of study depending on the context • is able to show how to apply data analysis methods
	3.2 Understand and apply the basic data analysis process steps	• can follow specific steps in order to solve a specific problem • has the knowledge and skills to apply the data analysis methods (qualitative or quantitative methods) • can select and apply basic data analysis methodologies to appropriately process data for a given problem (depending on what the data is collected for)
	3.3 Understand and apply the basic data presentation methods	• can analyze, acquire and review various data presentation methods available to an online creator, ensure a comprehensive range of presentation methods, understand pitfalls of the problems to associate the different presentation methods that may not be in all environment and to differentiate (know what to use, identify, evaluate and utilize, be able to deploy and have a comprehensive knowledge of the methods) • can decide on a criterion based view which visualization type meets the data they collected and the audience, knows about biases due to visualization methods (what is the purpose of different visualization methods?), understands the different visualization types and their field of applications
4. Data Comprehen-sion & Interpretation	4.1 Understand data (e.g., measurement error, discrepancies within data, key take-away points)	• can modify, synthesize or transform the data in a manipulative way to make it suitable, understand the quality of the data (how pure is it and what do we want to do with it) • can make sense of the given data • is aware of the common/usual measurement errors that can occur and can check the given data against these specific measurement errors
	4.2 Understand statistics	• is able to comprehend and interpret the results of advanced statistic procedures • should be able to understand what type of statistical method is needed for a specific research question • can understand statistics and utilize in order to create meaningful e-learning experience
	4.3 Know how to	• is able to interpret and evaluate complex data to formulate and synthesize

	interpret data (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations)	utterance relationships and hypotheses • is able to understand standard scientific practices on the formulation of hypotheses and the identification of hypotheses or patterns connecting to trying to go backwards, knowing what the problem is that you are looking for; looking for the patterns will probably support the hypotheses; interpretation in longitudinal studies (different time series or observations at the same time) • is able to evaluate hypothesis based on the data obtained in the study
	4.4 Generate potential connections to instruction	• must know the original data and present information in multiple formats • can use the data-based findings in a teaching and learning process • is able to create evidence based instruction; is able to create a model/a unit of instruction based on data; is able to create instruction based on current data • is able to apply an appropriate theoretical framework to connect data to instruction
	4.5 Make decisions based on data	• make ethical data driven decisions • choose appropriate instructional design strategies based on data • is able to explain the genesis of decisions he made based on data
5. Data Application	5.1 Use data to inform instruction	• can select the appropriate data in order to get information about students' needs and knowledge • can choose the right learning path for students based on the data • can understand what aspects of the design need to be amended: can judge which aspects of the initial instructional plan/learning design need to be amended and how based on insights derived from data analysis; if making changes: can redesign aspects of the initial plan based on insights derived from data analysis
	5.2 Know how to share and cite data	• is able to evaluate which data you can share, identify the source of the data, copyright • is able to explain and comment on advantages and disadvantages of different methods observing the tools for saving the data, select an appropriate one, be competent in using at least three different types for citing and explain the main differences in the styles • is aware of the regulations related to sharing personal data especially for the country working in, differentiate between personal and non-personal data
	5.3 Evaluate the data-driven intervention	• has a look at the increase in skills and learning outcomes, e.g. change in proficiency level of multiple skills based on the intervention • can reflect on how data are applied
6. Data Ethics	6.1 Explain the use of informed consent	• is be able to clarify and engage the stakeholders about the importance of informed consent • should be able to explain to a participant why the consent form is important, how it should be filled, what the specific rights the participant has are and make it transparent what the participant is actually signing • must be able to present to the learners how the data are collected during the learning process and how they are utilized to improve their overall learning experience in order to get their informed consent
	6.2 Know how to protect individuals' data privacy, confidentiality, integrity and security	• will be able to select and apply the appropriate data security aligned with the EU regulations • can understand how to store data in a secure place, anonymize data that you cannot go back to the original identifiable data • can store personal data in a correct/ethical manner; know how to handle which kinds of data; can handle different kinds of data in line with the GDPA
	6.3 Understand authorship, ownership, data	• will be able to select and apply the appropriate data security aligned with the EU regulations • can understand how to store data in a secure place, anonymize data that

	access (governance), re-negotiation and data-sharing	you cannot go back to the original identifiable data • can store personal data in a correct/ethical manner; know how to handle which kinds of data; can handle different kinds of data in line with the GDPA • can identify, establish and implement policies on how stakeholders involved are allowed to share data privately and securely as well as who should be allowed to do so and should have access and who they need to consult when doing publications or sharing data

Table 3

Learning outcomes in support of the L2A EDL-CP framework for e-Trainer

L2A EDL-CP dimension	**L2A EDL-CP statement**	**Suggested learning outcome** *The e-Trainer…*
1. Data Collection	1.1 Know where to find the right data/data sources	• is able to identify the relevant sources • is able to identify which data sources are credible and non-credible • needs to know where to find the right data in the systems they are using
	1.2 Know how to obtain/access data	• is able to collect and view data scaled assessment of learning processes • is able to select the appropriate data analysis tool for the right context; or for a given context an e-Trainer is able to select the appropriate tool for data analysis
	1.3 Understand data quality and limitations (e.g., accuracy, completeness)	• is able to assess the different sources of data and exclude all data that are unsuitable for their purposes; is able to select the suitable sources of data and preprocess in order to create a meaningful data strain for later analysis • can identify the quality and limitations of data or can identify accurate and complete data; present summary of that data in some way and in a readable format; can explain it to other people
2. Data Management	2.1 Identify the technologies to preserve data	• is able to identify a technology to preserve data fitting their context and apply the technology for their current work • can utilize a variety of methods to protect the quality and integrity of the data
	2.2 Know and apply data manipulation methods	• 3 different levels: assess if the e-Trainer masters the basic skill (copy-paste, import/export data) and is familiar with different data formats, word processing (google doc, use basic skills), compile the corrected data in a more structured way, file manipulation and use relational data bases and different types of data bases to manipulate • is able to apply weightings and prioritization to a set of variables of data (different indicators, e.g. are students online/in the classroom)
	2.3 Know and apply data curation and data re-use methods	• knows how to reuse learning material (learning objects) through a LMS; is able to search and find learning materials in a LO repository; is able to assemble an online course through an LO repository
	2.4 Understand Data Description (Metadata)	• is able to interpret the data descriptions/meta-data provided with the data to understand the limitations and how they can be applied • can understand the data model
3. Data Analysis	3.1 Know and apply the basic data analysis methods	• can understand the different methods to analyze data • can identify different analysis methods • knows and is able to apply basic data analysis methods for some educational data (mapping of the concrete data they are confronted with)
	3.2 Understand and apply the basic data analysis process steps	• is able to identify and derive patterns of learning • for a given context the e-Trainer is able to find appropriate methods for data analysis
	3.3 Understand	• must be familiar with different presentation methods, must be able to

	and apply the basic data presentation methods	visualize by using the presentation methods • can apply basic data presentation methods and give examples, written report, visuals, charts and explain the important points/key messages; used a range of formats to apply and present their understanding of the data; can apply their knowledge of data presentation methods using a range of formats and explaining that data to other people
4. Data Comprehen-sion & Interpretation	4.1 Understand data (e.g., measurement error, discrepancies within data, key take-away points)	• can present the data effectively
	4.2 Understand statistics	• if basic statistics: use basics e.g. google spreadsheet, excel; intermediate: R or SPSS; advanced: data mining, learning analytics tool, text mining tool • understand where the outliers are, distinguish between mainstream data and the outliers, be able to identify outliers and reason for the circumstances of those outliers
	4.3 Know how to interpret data (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations)	• able to extract and explain patterns out of learning analytics data of their class; is able to identify research hypotheses out of data in learning objects; knows how to connect multiple observations from different sources, e.g. sensors
	4.4 Generate potential connections to instruction	• is capable of interpreting or deriving insights from educational data related to how they can change their instructional methods for the benefit of the class • is able to use the framework to make the connections
	4.5 Make decisions based on data	• can determine the actions that you may take once you have analyzed the data • is able to apply the results of the data analysis; can correctly identify correct the trigger points of the instructional process • should be able to make decisions based on learning analytics of educational data from the system that he is using for online or blended courses
5. Data Application	5.1 Use data to inform instruction	• is able to infer assessment from learning retention data • is able to analyze data for a given context and based on this data analysis make decisions to improve instructional design
	5.2 Know how to share and cite data	• is able to import and export packed educational data, using well-known interoperable standards, know communication standards and how to package the data to make it usable for others • knows appropriate ways to reference and cite educational data to different audiences/stakeholders/..
	5.3 Evaluate the data-driven intervention	• given a set of evaluation tools, the e-Trainer is able to decide on one tool and apply it on his intervention • can demonstrate the value from the intervention
6. Data Ethics	6.1 Explain the use of informed consent	• is able to identify the purpose and recipient of a data package (who has access and what is it used for, understands the longevity of data and its different lengths of storage
	6.2 Know how to protect individuals' data privacy,	• knows how to protect students' individual data (grades) • understands the different roles and respective privileges in current LMSs

	confidentiality, integrity and security	
	6.3 Understand authorship, ownership, data access (governance), re-negotiation and data-sharing	• is aware and understands their responsibilities associated with the data in terms of how they are allowed to share privately and securely as well as who should be allowed to do so and should have access and who they need to consult when doing publications or sharing data • designer: identify or establish policies for each of this; needs to follow and implement data access policies

5. Alignment of the EDL-CP dimensions/statements with the European Qualifications Framework

Table 5 shows the theory-based mapping of the EDL-CP statements with the EQF levels validated by the experts. Clearly, the EDL-CP requires at least comprehensive, specialised, factual and theoretical knowledge, a comprehensive range of cognitive and practical competences required to develop creative solutions to abstract problems, as well as reviewing and developing performance of self and others.

Table 5

Alignment of the L2A EDL-CP with the European Qualifications Framework

EDL-CP Dimension	EDL-CP Statement	EQF Level
1. Data collection	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	**5**
	1.2 Know - understand - be able to apply data limitations and quality measures (e.g., validity, reliability, biases in the data, difficulty in collection, accuracy, completeness)	**6**
2. Data management	2.1 Know - understand - be able to apply data processing and handling methods (i.e., methods for cleaning and changing data to make it more organized – e.g., duplication, data structuring)	**5**
	2.2 Know - understand - be able to apply data description (i.e., metadata)	**7**
	2.3 Know - understand - be able to apply data curation processes (i.e., to ensure that data is reliably retrievable for future reuse, and to determine what data is worth saving and for how long)	**5**
	2.4 Know - understand - be able to apply the technologies to preserve data (i.e., store, persist, maintain, backup data), e.g., storage mediums/services, tools, mechanisms	**5**
3. Data analysis	3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive statistics, exploratory data analysis, data mining).	**7**
	3.2 Know - understand - be able to apply data presentation methods (e.g., pictorial visualization of the data by using graphs, charts, maps and other data forms like textual or tabular representations)	**6**
4. Data comprehension and interpretation	4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)	**6**
	4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)	**6**
	4.3 Know - understand - be able to interpret insights from data analysis (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations, underlying trends)	**7**

	4.4 Be able to elicit potential implications/links of the data analysis insights to instruction	**7**
5. Data application	5.1 Know - understand - be able to use data analysis results to make decisions to revise instruction	**7**
	5.2 Be able to evaluate the data-driven revision of instruction	**7**
6. Data ethics	6.1 Know - understand - be able to use the informed consent	**5**
	6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security	**5**
	6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing	**6**

6. Exemplary learning outcomes

The exemplary learning outcomes express what individuals should know, understand and be able to do at the end of a learning process focussing on a specific dimension/statement of the EDL-CP framework. Hence, the exemplary learning outcomes need to be differentiated for different target groups of learners, i.e., instructional designers, e-Trainers, or teachers in K-12. Table 7 presents the exemplary learning outcomes for the EDL-CP framework for instructional designers and e-Trainers. Three levels of learning outcomes are differentiated (Anderson, Krathwohl, & Bloom, 2001): (a) know, (b) understand, (c) be able to.

Table 7

Exemplary learning outcomes for the L2A EDL-CP framework

EDL-CP Dimension	**EDL-CP Statement**	**Level of learning outcome**	**Exemplary learning outcome**	
			The instructional designer will ...	**The e-Trainer will …**
1. Data collection	1.1	Know	list one or more data sources that support building pedagogically sound online blended courses	list one or more ways to access educational process data for the use in online blended courses
		Understand	differentiate between different sources of educational data with regard to accessibility	same
		Be able to	apply methods and technologies to access educational data in an efficient and timely manner	same
	1.2	Know	name different indicators of data quality relevant to working with educational data	same
		Understand	explain different indicators of data quality and their meaning when working with educational data sets	same
		Be able to	review educational data on the basis of different quality indicators	same
2. Data management	2.1	Know	describe methods for cleaning and organizing educational data sets	same
		Understand	outline an organized structure for educational datasets suitable	same

			for further analysis	
		Be able to	apply data cleaning and organizing methods to a given set of raw educational product data	apply data cleaning and organizing methods to a given set of raw educational process data
	2.2	Know	list appropriate metadata descriptors for educational data sets	same
		Understand	describe the differences and commonalities of two or more sets of educational data on the basis of their metadata	same
		Be able to	develop metadata descriptions for raw educational data	same
	2.3	Know	name the steps of a generic data curation process for educational data sets	same
		Understand	determine what educational data has to be saved for future reuse	same
		Be able to	apply methods to organize and integrate educational data collected from various sources	same
	2.4	Know	list different tools and mechanisms to preserve educational data	same
		Understand	evaluate different tools and mechanisms to preserve educational data and explain their (dis-)advantages	same
		Be able to	develop and execute a reliable data backup plan for persistent storage of educational data	same
3. Data analysis	3.1	Know	name the basic data modelling methods and their outcomes with respect to educational data analysis	same
		Understand	explain the process of educational data mining	same
		Be able to	apply the basic data analysis and modelling methods to a given set of educational product data	apply the basic data analysis and modelling methods to a given set of educational process data
	3.2	Know	name various approaches for the (re)presentation of educational data	same
		Understand	differentiate between the various forms of vizualisation and representation of educational data with respect to scope, strengths and weaknesses	same
		Be able to	illustrate the process of data presentation by applying one presentation method to a given data analytics problem involving educational product data	illustrate the process of data presentation by applying one presentation method to a given data analytics problem involving educational process data
4. Data comprehension and	4.1	Know	name the most important data properties within educational data sets	same
		Understand	explain the influence of data	same

interpretation			properties like outliers and missing values on the statistical analysis of educational data	
		Be able to	characterize a given set of educational product data with respect to data properties	characterize a given set of educational process data with respect to data properties
	4.2	Know	name and differentiate the most commonly used statistics for educational data analysis	same
		Understand	explain the concept of significance in the context of educational data analysis	same
		Be able to	interpret the basic measures of central tendency and variation for a given set of educational product data	interpret the basic measures of central tendency and variation for a given set of educational process data
	4.3	Know	sketch possible insights from the analysis of a set of educational product data	sketch possible insights from the analysis of a set of educational process data
		Understand	identify trends and hypotheses from a given set of educational data	same
		Be able to	evaluate the scope and appropriateness of interpretations based on educational data analysis	same
	4.4	Know	clearly communicate the links from data analysis insights to instructional design	clearly communicate the links from data analysis insights to instructional processes
		Understand	develop possible instructional design alternatives based on findings	develop possible tutorial interventions based on findings
		Be able to	infer general design principles for blended and online courses from data	infer general tutoring principles for blended and online courses from data
5. Data application	5.1	Know	name the areas to be improved based on the findings from educational data analysis	same
		Understand	design automatic prompts based on findings from data analysis	give individual process feedback based on findings from data analysis
		Be able to	revise course tasks and contents based on findings from data analysis	revise the current tutoring strategy based on findings from data analysis.
	5.2	Know	construct adequate criteria and indicators for evaluating the impact of a data-driven intervention	same
		Understand	conduct a methodologically sound evaluation of a data-driven intervention	same
		Be able to	communicate the evaluation results of the data-driven revision of instruction	same
6. Data ethics	6.1	Know	explain the concept of informed consent in the context of educational data analysis	same
		Understand	name one or more arguments for	same

			the importance of informed consent in educational data analysis	
		Be able to	link the use of informed consent in educational data analysis to data protection regulations and legal foundations	same
	6.2	Know	explain the notion of data privacy in the context of educational data analysis	same
		Understand	distinguish between different levels of data protection in educational data analysis	same
		Be able to	take adequate actions to protect individuals' data privacy and integrity in educational data analysis	same
	6.3	Know	name different concepts of data access (governance) in educational data analysis	same
		Understand	explain the differences between authorship and ownership when dealing with educational data	same
		Be able to	apply those concepts to a given educational data analysis problem correctly	same

7. Use-case examples for selected target groups

In general, a use-case is defined as a specific situation in which a service or product could potentially be used. The L2A use-case examples focussing on each dimension/statement of the EDL-CP framework provide insights about how the competence may be demonstrated in a specific context. In particular, three use-case examples have been developed: (a) instructional designer in industry context, (b) e-Trainer in higher education context and (c) teacher in K-12 context. Each use-case example includes a background story and exemplary activities in correspondence with the L2A EDL-CP dimensions, statements as well as specific learning outcomes.

7.1. Use-case example for instructional designer in industry context

7.1.1 Background story for instructional designer use-case

David works as an instructional designer for a training consulting company. The company provides a wide range of services, from tailor-made course offerings (face2face classroom based, blended learning, and online, including Massive Open Online Courses - MOOCs) to educational technology consulting. Karen, his manager, has put David in charge of a new innovative project: an important client - a global IT company – aims to implement a learning analytics solution for their internal and external online course programs. While the client company has strong expertise in data mining and analytics, they need to have some external support from pedagogical experts on using educational data for re-designing their online courses. So David is hired to lead the 'Data Driven Course Design' initiative at the client's site. As a pilot project within this initiative, David coordinates the redesign of a MOOC on IT management. This course primarily serves as a

marketing tool for the IT company, and it has had a large participant base with high enrollment numbers over recent years. However, participant engagement and completion rates were not satisfactory overall. Thus, the client wants to implement a number of pedagogical innovations in a redesigned version of the course, with the overarching goal of increasing learner satisfaction. It is part of David's mission to develop a strategy which based on educational data and analytics.

7.1.2 Use-case activities for instructional designer in industry context

Table 8 shows the L2A EDL-CP use-case example for instructional designer in industry context linked to the dimensions/statements of the L2A EDL-CP framework.

Table 8

Use-case examples for instructional designer in industry context linked to L2A EDL-CP framework

Dimension	Statement	Use-case instructional designer in industry context
1. Data Collection	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	David sets up a project team on site together with some employees of the client company. As a first step in the MOOC redesign project, he tries to get an overview of the different data and data sources that could help to get an idea of learner satisfaction. Therefore, he talks to different people from the IT and the training department, and compiles a list of available data and the respective systems (evaluation data, LMS performance data, HR system data, …). Having compiled a list of data sources, David contacts people responsible for those sources to get permission to access and use the data. The IT manager shows him how to access the LMS to get a snapshot of learner data, and he provides additional data in a transferable file format (.csv). David imports the datasets into his spreadsheet program.
	1.2 Know - understand - be able to apply data limitations and quality measures (e.g., validity, reliability, biases in the data, difficulty in collection, accuracy, completeness)	For a status meeting with the project team, David seeks to elucidate the scope of possible inferences and insights with respect to learner satisfaction from the available educational data. Therefore, he assesses the strengths and weaknesses of the data sets at hand with the help of different indicators of data quality. For his presentation, he researches and lists different indicators (validity, reliability, objectivity, accuracy, completeness, ease of use, …). In the following, David applies a number of criteria to the data sets at hand, comparing them against each other. He lists opportunities and shortcomings of the different data sets for his presentation during the meeting.
2. Data Management	2.1 Know - understand - be able to apply data processing and handling methods (i.e., methods for cleaning and changing data to make it more organized – e.g., duplication, data	David takes a closer look at the available data sets. Spotting a number of duplicates as well as incomplete sets, he soon realizes that the data needs to be cleaned and processed before further analysis can take place. He researches the standard procedures for data processing and outlines a desirable structure for the data sets at hand. He then applies some data cleaning and organizing methods to implement this structure.

	structuring)	
	2.2 Know - understand - be able to apply data description (i.e., metadata)	With the whole 'Data Driven Course Design'-initiative in mind, David thinks about how educational datasets for the analysis of learner satisfaction can be described and compared on an abstract level. Therefore, he researches some common metadata approaches and selects appropriate data descriptors (e.g., course title, education level). He then applies those descriptors to the datasets in the MOOC redesign project. As a result, he develops a complete metadata description for educational datasets that can be used throughout the whole 'Data Driven Course Design'-initiative.
	2.3 Know - understand - be able to apply data curation processes (i.e., to ensure that data is reliably retrievable for future reuse, and to determine what data is worth saving and for how long)	Having categorized and characterized the data sets at hand, David needs to determine how to proceed with the collected data. For an analysis of learner satisfaction, it seems to be crucial that automatically generated system data and evaluation data can be combined. After discussing this with the project team, he makes some suggestions to the client on what data need to be saved for future reuse, and for how long. He then sets up a data curation process, which involves a fixed number of steps from data collection and storage to future retrieval.
	2.4 Know - understand - be able to apply the technologies to preserve data (i.e., store, persist, maintain, backup data), e.g., storage mediums/services, tools, mechanisms	For the technical aspects of data curation, David collaborates with a member of the client's IT department who is responsible for storage and database management. They discuss the pros and cons of different technologies and services for storing educational data, and then develop a reliable backup plan for building up a persistent educational data repository.
3. Data Analysis	3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive statistics, exploratory data analysis, data mining).	Having prepared and organized the different sets of educational data, David has a go at data analytics. As a first step, David conducts some basic exploratory data analysis on the evaluation data and applies the basic descriptive procedures to the items and scales dealing with motivational and emotional aspects from past MOOC evaluations. With a member of the client's data science team, he discusses the pros and cons of educational data mining. Together, they try to unveil some notable patterns in the system generated data at hand, seeking to identify possible critical incidents for learner satisfaction.
	3.2 Know - understand - be able to apply data presentation methods (e.g., pictorial visualization of the data by using graphs, charts, maps and other data forms like textual or tabular representations)	For a joint steering meeting involving the client's management, as well as Karen, David needs to prepare a presentation of his results so far. He researches a number of data visualization approaches and decides on different graphs and tables for the descriptive statistics and exploratory data analysis on learner satisfaction

4. Data Comprehension & Interpretation	4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)	Within the steering meeting presentation, David explains the basic properties of the analyzed datasets. By the example of the items on learners' initial motivation, he explains outliers, dependencies and the like, and he explains to his audience what these properties could mean for further data analysis, understanding and interpretation.
	4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)	In the course of the steering meeting presentation, David explains the common statistics (such as means and standard deviation) used with educational data with the help of tables and graphs. Having conducted some correlation and regression analyses to illustraterelationships between input (i.e. initial motivation) and outcome (i.e. overall satisfaction, overall performance) variables, David further explains the concept of significance testing.
	4.3 Know - understand - be able to interpret insights from data analysis (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations, underlying trends)	Within the steering meeting presentation, David shows and interprets some further insights from data analysis and educational data mining. He illustrates possible patterns and trends of learner satisfaction, identifying hypotheses for further research.
	4.4 Be able to elicit potential implications/links of the data analysis insights to instruction	In the discussion section of the steering meeting presentation, David links the results to the existing instructional design and design variables mapping out some possible implications from the intended changes. He identifies a number of starting points within the course from which learner satisfaction could be increased. Later, within his project team, he works on possible design alternatives based on those insights. These alternative designs include a specific focus on learners' satisfaction and include a number of possible pedagogical interventions to improve it.
5. Data Application	5.1 Know - understand - be able to use data analysis results to make decisions to revise	As a result of their team effort, David writes up a report on how to redesign the MOOC on IT management based on educational data at hand. He identifies the areas to be improved and makes clear and concrete suggestions for revised course tasks and content based on the findings from data analysis. In the outlook section of his report, he

	instruction	discusses the potential of automatic prompting based on learner data for increasing learner satisfaction. These adaptive interventions could be implemented if the data analysis was carried out in real-time and automatically as it is obligatory in a full-fledged learning analytics setting.
	5.2 Be able to evaluate the data-driven revision of instruction	Together with his project team, David develops a strategy on how to evaluate the impact of the data-driven course redesign. They define indicators and criteria for measuring developments in learner satisfaction (i.e., learner activity, time-on-task, motivational and emotional items in a formative evaluation), and they sketch a methodologically sound A/B-design (i.e., a comparison of two different design cases with different 'conditions' for supporting learner satisfaction) for a quasi-experimental evaluation setting.
6. Data Ethics	6.1 Know - understand - be able to use the informed consent	In the context of the 'Data Driven Course Design'-initiative, David seeks to establish legal and ethics procedures. Thus, he collaborates intensively with the client's legal department and discusses the various legal topics involved. As a first result, they develop a legally compliant participant form for informed consent to be presented to and signed by each person taking part in one of the client company's online courses.
	6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security	In the course of the discussion on legal aspects, the client company's legal experts explain to and teach David how to protect the learners' data privacy, data confidentiality, data integrity and data security.
	6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing	Likewise, legal concepts like authorship, ownership, data access and governance, re-negotiation and data-sharing are discussed. Well-equipped with this specific knowledge, David writes a quick legal analysis for the 'Data Driven Course Design'-initiative.

7.2. Use-case example for e-Trainer in higher education context

7.2.1 Background story for e-Trainer use-case

Laura works as a fulltime teaching assistant in the School of Education of an international University. One of her responsibilities is to coordinate the online support in the Massive Open Online Course "Introduction to Educational Technology". The course is offered on a major international MOOC platform, and it serves both as a marketing tool for the school and as an entry point to the School's certificate and degree programs in educational technology. Enrollment

numbers were consistently high over recent semesters. However, drop-out rates were notable as well, leaving ample space for improvement. Professor Chang, the course leader and main instructor, has decided to redesign the course and to implement some recent pedagogical innovations with the goal of increasing the course completion rate. Hence, data driven instruction and learning analytics will be an important future topic area, and the course will be re-built on these approaches at the same time. Professor Chang sets up a project team with people involved in course design and implementation. Laura's task is to develop a tutoring and student support strategy that incorporates a data-driven approach to increase course completion. She is also responsible for implementing this strategy with her online tutoring team of three student teaching assistants.

7.2.2 Use-case activities for e-Trainer in higher education context

Table 9 shows the L2A EDL-CP use-case example for e-Trainer in higher education context linked to the dimensions/statements of the L2A EDL-CP framework.

Table 9

Use-case examples for e-Trainer in higher education context linked to L2A EDL-CP framework

Dimension	Statement	Use-case e-Trainer in higher education context
1. Data Collection	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	Laura has only a vague idea of the different sets of educational data linked to course completion that are being generated and processed through the MOOC and its participants. So she tries to get a thouroughoverview of the data sources at hand. She gathers the relevant information from the faculty, the student service department, the MOOC provider and the IT-department (e.g., evaluation data, MOOC performance data, enrollment data, …). Having compiled a list of data sources, Laura contacts the people responsible for those sources to get permission to access and use the data. The MOOC provider lets her sign a data protection consent form and grants her access to system data. She also receives a set of historical performance data in a transferable file format (.csv) providing her initial insights into the data structure. Laura imports the datasets into her spreadsheet program.
	1.2 Know - understand - be able to apply data limitations and quality measures (e.g., validity, reliability, biases in the data, difficulty in collection, accuracy, completeness)	For a project team meeting, Laura aims to clarify how educational data might be useful for online tutoring and increasing the completion rate. Therefore, she assesses the strengths and weaknesses of the data sets at hand with the help of different indicators of data quality. For her presentation, she researches and lists different indicators (validity, reliability, objectivity, accuracy, completeness, ease of use, …). Next, Laura applies a number of criteria to the data sets at hand, comparing them against each other. She lists opportunities and shortcomings of the different data sets for her presentation.

2. Data Management	2.1 Know - understand - be able to apply data processing and handling methods (i.e., methods for cleaning and changing data to make it more organized – e.g., duplication, data structuring)	Laura takes a closer look at the available data sets. Discovering a number of inconsistencies (e.g., cases related to different time zones) as well as incomplete sets, she soon realizes that the data needs to be cleaned and processed before further analysis can take place. She researches the standard procedures for data processing and outlines a desirable structure for the data sets at hand. She then applies some data cleaning and organizing methods to implement this structure.
	2.2 Know - understand - be able to apply data description (i.e., metadata)	Considering the wide range of courses also challenged by completion rate issues, Laura thinks about how educational datasets can be described and compared on a general level. Therefore, she researches some common metadata approaches and selects appropriate data descriptors (e.g., course title, student id, timestamp). She then applies those descriptors to the datasets in the MOOC redesign project. As a result, she develops a complete metadata description for educational datasets that can be used for various types of online courses.
	2.3 Know - understand - be able to apply data curation processes (i.e., to ensure that data is reliably retrievable for future reuse, and to determine what data is worth saving and for how long)	Having categorized and characterized the data sets at hand, Laura needs to determine how to proceed with the collected data. She realizes that plain data on learner drop-outs has to be combined with a number of direct (i.e. formative evaluation data) and indirect (i.e. time-on-task, progress) indicators to get a bigger picture of course completion. After discussing the issue within the project team, she makes some suggestions to the IT department and the MOOC provider on what data need to be saved for future reuse, how frequent, and for how long. She then sets up a data curation process, which involves a fixed number of steps from data collection and storage to future retrieval.
	2.4 Know - understand - be able to apply the technologies to preserve data (i.e., store, persist, maintain, backup data), e.g., storage mediums/services, tools, mechanisms	For the technical aspects of data curation, Laura collaborates with a member of the university's IT department who is responsible for storage and database management. They discuss the pros and cons of different technologies and services for storing educational data, and then develop a reliable backup plan for building up a persistent educational data repository.
3. Data Analysis	3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive statistics, exploratory data analysis, data mining).	Having prepared and organized the different sets of educational data, Laura has a go at data analytics. As a first step, Laura conducts some basic exploratory data analysis with the more straightforward data sets from the MOOC provider. She generates some descriptive statistics on drop-out numbers related to different course chapters. An additional member of the project team who is an expert in learning analytics tells her about the pros and cons of educational data mining. Together, they try to identify some emergent patterns in the more complex sets of system data with regard to course completion (e.g., clusters of possible early drop-outs).
	3.2 Know - understand - be able	For a larger steering meeting involving Prof. Chang as well as the head of the department, Laura has to prepare a presentation of her results so

	to apply data presentation methods (e.g., pictorial visualization of the data by using graphs, charts, maps and other data forms like textual or tabular representations)	far. She researches a number of data visualization approaches and decides on different graphs and tables for the descriptive statistics and the results of the exploratory data analysis on drop outs and completion.
4. Data Comprehension & Interpretation	4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)	Within the steering meeting presentation, Laura explains the basic properties of the analyzed datasets. Using the example of drop-outs per course chapter, she explains outliers, dependencies and the like, and she explains to her audience what these properties could imply for further data analysis, understanding and interpretation.
	4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)	Shortly after the steering meeting presentation, Laura meets her tutoring team to discuss the results of her research and possible implications for increasing the course completion rate. Laura shows her presentation, and she explains the common statistics (such as means and standard deviation) used with educational data with the help of tables and graphs. Having conducted some correlation and regression analyses to model the relationships between possible early indicators and actual drop-outs, Laura further explains the ideas of significance testing to her team of student teaching assistants.
	4.3 Know - understand - be able to interpret insights from data analysis (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations, underlying trends)	Laura explains some further insights from data analysis and educational data mining to her team. She illustrates trends in course participation and emergent patterns that differentiate succesful learners from drop-out learners. She discusses some possible interpretations with her team.
	4.4 Be able to elicit potential implications/links of the data analysis insights to instruction	In the following step, Laura relates the results and insights to the existing online tutoring strategy and maps out possible implications of a redesign. She identifies some crucial points in the course where special actions to prevent drop-outs could be necessary. Together with her team, she then discusses possible tutoring strategies based on those insights. These alternative strategies focus on keeping the learners actively involved and include a number of tutorial interventions to achieve this.

5. Data Application	5.1 Know - understand - be able to use data analysis results to make decisions to revise instruction	As a result of their team effort, Laura writes up a report on how to change the tutoring in the MOOC based on the educational data at hand. She identifies the areas to be improved to prevent drop-outs and makes clear and concrete suggestions for revised tutorial interventions and a support strategy based on the findings from data analysis. In the outlook section of her report, she discusses the potential of individualized process feedback based on learner data for keeping learners involved. These adaptive interventions could be implemented if the data analysis was carried out real-time and automatically as it is obligatory in a full-fledged learning analytics setting.
	5.2 Be able to evaluate the data-driven revision of instruction	Together with some experienced researchers from the project team, Laura develops a strategy on how to evaluate the impact of the data-driven tutoring strategy. In addition to plain completion rates, they define a set of indicators and criteria for measuring developments (i.e. use of learning objects, time-on-task, level of activity), and they sketch a methodologically sound A/B-design (i.e., a comparison of two different design cases with different tutoring 'conditions' for preventing drop-outs) for a quasi-experimental evaluation setting.
6. Data Ethics	6.1 Know - understand - be able to use the informed consent	A major goal of the data-driven instruction project is to establish legal and ethics procedures. Thus, the project team collaborates intensively with the university's legal department, and they heavily discuss the various legal topics involved. As a first result, the project team develops a legally compliant participant form for informed consent to be presented to and signed by each person taking part in the MOOC on educational technology.
	6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security	In the course of the discussion on legal aspects, the project team develops institutional guidelines to protect the learners' data privacy, confidentiality, integrity and security.
	6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing	Likewise, legal concepts like authorship, ownership, data access and governance, re-negotiation and data-sharing are discussed. Well-equipped with this specific knowledge, Laura writes a quick legal analysis for her data-driven online tutoring strategy.

7.3. Use-case example for the school teacher of blended learning courses in the K-12 education context

7.3.1 Background story for the school teacher use-case

Alice is an enthusiastic English Language teacher who has just been appointed in an Experimental High School, in Athens, Greece.

She will be responsible for the English Language Course of class1 and class2 of the 9th Grade (14 to 15 years students). Alice is very excited about her new role. Nevertheless, the school's principle, Alex, is concerned about the relatively low performance of last year's 8th graders compared to other experimental schools in the region. Alex encourages Alice to use student data to gain insights and plan her teaching activities accordingly, so as to improve this year's Grade 9 students' academic performance. The principal also informs Alice about the Learning Management System (Moodle) used by the school to facilitate teaching and learning, pointing out that the previous teacher has already created some online activities there.

Alice decides to apply the flipped classroom strategy to her new students using the school's LMS. For this purpose, she designs and develops online teaching resources for Class1 and Class2. Students of these classes enrol in the respective group and study the lecture material at home (prior to classroom meeting). The material is in the form of video, text, small activities with automatic feedback (such as online quizzes), and forum discussions. During the classroom sessions, students are performing more complex activities, typically in small groups, with the benefit of Alice's scaffolding, guidance and feedback. Then, they can undertake some additional homework online to further check their understanding and extend their learning through appropriately designed individual and group assignments. Alice is confident with the flipped classroom approach, as she has used it before with great results. However, she is lacking data literacy competences. The principle encourages her to enrol in the Learn2Analyse MOOC before the school year starts - it is only an 8 week course and it is free.

7.3.2 Use-case activities for school teacher in K-12 (primary and secondary) blended teaching and learning courses

Table 10 shows the L2A EDL-CP use-case example for School Teacher in K-12 (primary and secondary) education context linked to the dimensions/statements of the L2A EDL-CP framework.

Table 10. Use-case examples for School Teacher in K12 Blended Courses linked to L2A EDL-CP framework

Use-case School Teacher in K12 Blended Courses	**Statement**	**Dimension**
Alice starts posing questions to identify and **collect** the appropriate educational data. She asks herself "*Why do I need the data*?", "*What data are needed?*" "*Where are data located*?" "*How will data be collected*?" Alice decides to gather a variety of students' data, including demographics, perception data, past academic performance, last year's academic performance and summative assessments for English Language course and other relevant courses, as well as the regional performance data over the past 5 years. To retrieve the needed data she has to access diverse sources: school's internal data sources like the student information system as well as external data sources, like the district's databases.	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	**1. Data Collection**
To this end, she contacts the colleague, appointed as school's Data Protection Officer (DPO), to secure all necessary approvals for the sources handled by her school or by the corresponding district. As soon as Alice signs the required data protection consent form, she gets permission and downloads the datasets from the several sources. Alice also requests to grant her access to the LMS used by the school (a	6.1 Know - understand - be able to use the informed consent	**6. Data Ethics**

new teacher account is created by the LMS administrator). Before implementing her flipped classroom strategy, she contacts the school's DPO again to discuss any legal and ethical issues she needs to pay attention to. As advised by the DPO, she accesses the LMS and via the "*User agreements page*" she reviews the existing user agreements and confirms that **signed informed consent** has been given for all participating students (either parental consent on behalf of minors or directly by the students, as defined by National Data Protection Authority). Alice imports all retrieved datasets into her spreadsheet software to further process them.		
Alice gets informed by the DPO on school's policy and guidelines to protect students' **data privacy**, **confidentiality**, **integrity** and **security**. She becomes aware of the appropriate technical and organisational measures taken by the school, so as to secure data protection. Such measures include use of anonymisation and pseudonymisation to remove personally identifiable information, encryption, limited accessibility as well as short storage period. Alice needs to pay extra attention to **sensitive** data, a special category of personal data, e.g. Ethnic Origin and Health-related data, since the school can only process this data under specific conditions. Alice also gets informed about the school's **LMS GDPR compliance** functionality, which is designed to assist in ensuring that the online course is fully compliant with the General Data Protection Regulation (GDPR) requirements. Some key features include an age check for the new LMS users, management of the user agreements to privacy policies, data export and deletion requests, definition and maintenance of a data registry, as well as the ability to give consent on behalf of minors.	6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security	**6. Data Ethics**
Alice gets familiar with key legal concepts including authorship, **ownership**, **data access** and **governance**, **re-negotiation** and **data-sharing**. Alice realizes that though the presumption is often that data collected is owned by the school, nevertheless the school does not own the student data that it holds, but has temporary stewardship according to GDPR. Alice is now ready to cope with any ethical issue that may arise and she is confident that she can proceed further with her flipped classroom strategy, making it a success story for her students.	6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing	**6. Data Ethics**
After running the online course for three weeks, Alice checks the data about students' activity which have been tracked by the online learning environment so far. Thus, she also **collects** data related to students'` engagement, behavior and performance within the LMS, e.g. time spent in the platform, the videos her students watched, their progress in the online elements of the course, the downloaded files, their online quiz scores, their participation in the forum as well as interaction between peers.	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	**1. Data Collection**
Before proceeding further, Alice confirms that the collected data meets basic quality characteristics. Thus, she examines and verifies the educational data against different **quality measures,** such as **relevancy** (the data must directly relate to the questions she posed), **reliability** (the data must be measured, trustworthy and consistent) and **validity** (the data must measure what she intends to measure). Alice pays attention to avoid biases e.g. **Availability bias** by collecting the data that are easier to obtain, rather than collecting more relevant data.	1.2 Know - understand - be able to apply data limitations and quality measures (e.g., validity, reliability, biases in the data, difficulty in collection, accuracy, completeness)	**1. Data Collection**
Alice studies the performance of her students based on data collected so far.	2.1 Know - understand - be	**2. Data Management**

She wants to create a table that merges data from both sources: the school's central students' information system as well as the LMS. Alice soon realizes that since the data comes from various sources in diverse formats, are quite messy, containing missing values, outliers and duplicate instances. To obtain a consistent database, free from any sort of discrepancies, **data cleaning** is required so as to detect erroneous or irrelevant data and discard it. She notices that many problems arise: ● Inconsistent formats for input fields, such as the mixed use of American (MM/DD/YYYY) and European (DD/MM/YYYY) date format. ● To be able to correctly merge the data of the two sources it is necessary to use a unique identifier for each student that exists in both tables (e.g. registration number). ● There are students who changed school and do not appear in this year's data. ● There is no direct connection between the groups because a number of students changed class from last year. Thus, Alice applies data cleaning and **organizing** so as to get a concrete dataset. For this task, Alice is supported by the school's technical team in using open source tools for data cleaning, like openrefine.	able to apply data processing and handling methods (i.e., methods for cleaning and changing data to make it more organized – e.g., duplication, data structuring)	
In order to better describe and characterize the produced structured dataset, Alice decides to look for the appropriate **metadata** schema to ensure that each data element is defined the same way throughout the school's organization. Following this schema, Alice, with the support of her school's technical team, applies *descriptive metadata* (such as subject, grade level, timestamp, and related skills), *administrative metadata* (such as rights and licensing) and *structural metadata* (such as parts, prerequisites) to describe the respective data elements.	2.2 Know - understand - be able to apply data description (i.e., metadata)	**2. Data Management**
It's now the time for Alice to apply the needed **curation** processes to the integrated data, always with the support of her school's technical team. Through the curation process, the resulting composite data set is well organized, enhanced, and reliably retrievable for future reuse. The goal is to maintain the value of the unified data set and ensure its long term availability. To this end, Alice determines what data is worth saving and for how long, especially considering the high volume of the resulting data set. She addresses the DPO to define a data **preservation plan** according to which the performance data are transferred every semester to the corresponding school database for permanent storage, while the tracking data remains at the LMS until students' graduation.	2.3 Know - understand - be able to apply data curation processes (i.e., to ensure that data is reliably retrievable for future reuse, and to determine what data is worth saving and for how long)	**2. Data Management**
Having prepared the data, Alice needs to ensure its **preservation**. Alice gets informed about the hybrid storage solution used by the school. It's a combination of local infrastructure/data center and cloud-based storage. Moreover, as per her school guidelines for data storage good practice strategy, she needs to create multiple independent copies to stabilize her files. The copies are geographically separated in different locations, using different storage technologies and are actively monitored to ensure any problems are detected and corrected	2.4 Know - understand - be able to apply the technologies to preserve data (i.e., store, persist, maintain, backup data), e.g., storage mediums/services, tools, mechanisms	**2. Data Management**
Now that the data is ready to yield powerful insights, Alice proceeds with analysis and modeling methods. Initially, she applies **descriptive statistics** for the last year's Class1 and Class2 8th graders. Alice calculates the **total mean, median** and **standard deviation** of her students' last year's final scores, so as to get a measure of their general performance.	3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive	**3. Data Analysis**

She is also interested in learning whether there is a correlation between time spent in the LMS and student's performance on quizzes (**inferential statistics**).	statistics, exploratory data analysis, data mining)	
To gain a better understanding of the data on hand, Alice proceeds with its **pictorial visualization**. This will also assist her for the upcoming meeting with the school's principal in order to present her findings. Firstly, Alice decides to graphically present the last year's overall students' academic performance. Thus, she plots a *histogram* to visualize the underlying *frequency distribution*. This helps her ascertain the number of students who are performing to a particular standard. To further enhance her understanding of spread, Alice also utilises a *boxplot*, which includes minimum, maximum, median, first and third quartile. Based on the gathered LMS access data, Alice also produces a *scatter plot* that shows the relationship between students' activity time in the LMS and their performance on quizzes.	3.2 Know - understand - be able to apply data presentation methods (e.g., pictorial visualization of the data by using graphs, charts, maps and other data forms like textual or tabular representations)	**3. Data Analysis**
Following data analysis, Alice is keen to comprehend the story that the collected data reveals. She starts by interpreting **data properties**, including measurement errors, outliers, discrepancies and data dependencies. For last year's academic performance, Alice notices that total class mean may be more or less significant depending on the number and extent of outliers in the distribution of grades. She **appreciates the impact of extreme scores on the mean.**	4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)	**4. Data Comprehension & Interpretation**
Alice realises that she can't rely on the total class **mean** value. The **median** may be more helpful than the mean depending on outliers. With regards to **standard deviation**, the larger the standard deviation, the larger the spread of student performance within the class. With regards to the scatter plot, at first glance, it does not suggest strong relationship between course activity time and quizzes' performance. Most students do not seem to fit into the 'ideal' or 'predictable' model: If students spend time and study hard, they will perform well. Following a closer look, it seems that it also reveals four 'unique' data points: Two students Ann and David appeared to be quite active in the course (49 and 60 hours, respectively), but did not do as well as the rest of the students did. One student, John, was not so active (20 hours) but did reasonably well, whereas Peter spent the least amount time (about 2 hours) in the course compared to rest of the class, however he excelled on quiz assignments. Alice understands that further analysis is needed. She needs to drill into the LMS activities for these students.	4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)	**4. Data Comprehension & Interpretation**
Alice learns that her school's LMS (Moodle) provides a number of useful Learning Analytics tools. She decides to leverage them and implement more complex analyses and statistical models. To this end, Alice implements *Descriptive Learning Analytics* by using the "**Learning Analytics Enriched Rubric**" tool**,** an advanced grading method used for criteria-based assessment. Grading levels are associated to data from the analysis of learners' interaction and learning behaviour within the online elements of her course, such as the number of post messages, times of accessing learning material, assignments' grades and so on. She also decides to use "**Inspire Analytics**", a tool for *Predictive Learning Analytics*, which provides feedback about student's progress against a range of indicators and activities identified to have an impact on student success in the online course. In order for Alice to examine further the quizzes' results, she generates a	4.3 Know - understand - be able to interpret insights from data analysis (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations, underlying trends)	**4. Data Comprehension & Interpretation**

respective "**Quiz Statistics Report**" for each one including details of the attempts of the enrolled students (how long the student's attempt took, the student's grade for each individual question). She focuses on two of her students, Ann and David, who do not perform well. For these 2 students, she also retrieves a "**Complete Report**" that displays a very detailed view of the progress of the individual learner throughout the online elements of her course (a list of the course activities and resources and how often and when the user has accessed them). Using this report, Alice can obtain more accurate information on students' progress and engagement. She confirms that Ann and David struggle with content comprehension.		
Using learning analytics, Alice is self-reflecting to improve the design and the delivery of her course. She uses Learning Analytics to monitor their learning process, to discover patterns, to identify problems early, to find indicators for success and indicators for poor marks or drop-out. Using Prescriptive Learning Analytics, Alice applies the "**Analytics and Recommendations**" tool, so as to get a visual color-coded presentation of the student's participation in each online course activity, as well as some initial recommendations about what activities students could work to improve their final grade. She realizes that some students like John do not participate in the forums at all. This behavior reflects his low interaction in class activities, as well. And then, there is Peter whose performance is remarkable though he does not seem interested in the online activities, as he goes right from the homepage of the online course to assignments/quizzes without additional navigation.	4.4 Be able to elicit potential implications/links of the data analysis insights to instruction	**4. Data Comprehension & Interpretation**
Based on the results of her data analysis, Alice decides to revise the course's online learning activities and educational resources. Thus, she uses the course level "**Activity report**" to investigate how her students engaged with the different elements of the course and which activities were the most appealing. The Activity report provides aggregate reports highlighting which elements of the course have more or less student activity. To support students who are struggling, like Ann and David, Alice decides to include "**Lesson Activities**" to incorporate conditional branching and create differentiated learning paths by sequencing learning activities throughout a series of web pages. In the event that a student answers a question incorrectly, conditional branching makes it possible to direct the student to additional content pages to help them reach the correct answer. Each question response could "jump" the student to various areas of content within the same lesson activity. Moreover, she includes additional **graded discussion forums** to facilitate a higher participation and support further the students when they study on their own, allowing them to ask questions and receive support. To drive motivation for students like Peter, she also assigns optional challenging activities. To further increase students' engagement and participation, she also decides to add **Level up! - Gamification**, an easy way to gamify students' learning experience by motivating them to progress towards the next level of the course.	5.1 Know - understand - be able to use data analysis results to make decisions to revise instruction	**5. Data Application**
Furthermore, Alice designs an evaluation plan for her course. She plans to use indicators to ensure that the flipped classroom initiative is on track for reaching the long term goal of improving students' academic performance to reach the regional standards. Her data literacy awareness and competences, including the use of available tools, have helped her collect useful evidence (based on data analysis) for herself, her principle and the parents.	5.2 Be able to evaluate the data-driven revision of instruction	**5. Data Application**

A short version of use-case example for school teacher in K-12 (primary and secondary) is represented via the infographic in Appendix 5.

7.4. Short version of use-case examples linked to L2A EDL-CP

The short version of the use-case examples for instructional designer and e-Trainer are presented in Table 10.

Table 11

Short version of the use-case examples linked to L2A EDL-CP framework

Dimension	Statement	Use Case Instructional Designer (short)	Use Case e-Trainer (short)
1. Data Collection	1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources	David compiles a list of available data and the respective systems that could help to get an idea of learner satisfaction such as evaluation data, LMS performance data, HR system data. He gets access the LMS to get a snapshot of learner data, and is provided additional data in a transferable file format (.csv). David imports the datasets into his spreadheet program.	Laura tries to get an overview over the different data and data sources linked to course completion. She gathers the relevant information from the faculty, the student service department, the MOOC provider and the IT-department such as evaluation data, MOOC performance data, enrollment data. The MOOC provider grants her access to system data. She further receives a set of historical performance data in a transferable file format (.csv) that gives her an idea of how the data looks like. Laura imports the datasets into her spreadsheet program.
	1.2 Know - understand - be able to apply data limitations and quality measures (e.g., validity, reliability, biases in the data, difficulty in collection, accuracy, completeness)	David seeks to elucidate the scope of possible inferences and insights with respect to learner satisfaction from the available educational data. He assesses the strengths and weaknesses of the data sets at hand with the help of different indicators of data quality. He researches and lists different indicators (validity, reliability, objectivity, accuracy, completeness, ease of use, …). David applies a number of criteria to the data sets at hand, comparing them against each othis. He lists opportunities and shortcomings of the different data sets.	Laura aims to clarify how educational data might be useful for online tutoring and increasing the completion rate. Therefore, she assesses the strengths and weaknesses of the data sets at hand with the help of different indicators of data quality. For her presentation, she researches and lists different indicators (validity, reliability, objectivity, accuracy, completeness, ease of use, …). Laura applies a number of criteria to the data sets at hand, comparing them against each other. She lists opportunities and shortcomings of the different data sets.

2. Data Management	2.1 Know - understand - be able to apply data processing and handling methods (i.e., methods for cleaning and changing data to make it more organized – e.g., duplication, data structuring)	David realizes that the data needs to be cleaned and processed before further analyses can take place. He researches the standard procedures for data processing and outlines a desirable structure for the data sets at hand. He then applies some data cleaning and organizing methods to implement this structure.	Laura realizes that the data needs to be cleaned and processed before further analyses can take place. She researches the standard procedures for data processing and outlines a desirable structure for the data sets at hand. She then applies some data cleaning and organizing methods to implement this structure.
	2.2 Know - understand - be able to apply data description (i.e., metadata)	David thinks about how educational datasets for the analysis of learner satisfaction can be described and compared on an abstract level. Therefore, he researches some common metadata approaches and selects appropriate data descriptors. He then applies those descriptors to the datasets in the MOOC redesign project. As a result, he develops a complete metadata description for educational datasets.	Laura thinks about how educational datasets for the analysis of drop-out and completion can be described and compared on a general level. Therefore, she researches some common metadata approaches and selects appropriate data descriptors. She then applies those descriptors to the datasets in the MOOC redesign project. As a result, she develops a complete metadata description for educational datasets that can be used for various types of online courses.
	2.3 Know - understand - be able to apply data curation processes (i.e., to ensure that data is reliably retrievable for future reuse, and to determine what data is worth saving and for how long)	Having categorized and characterized the data sets at hand, David has to determine how to proceed with the collected data. For an analysis of learner satisfaction, it seems to be crucial that automatically generated system data and evaluation data can be combined. He makes some suggestions on what data has to be saved for future reuse, and for how long. He then sets up a data curation process, which involves a fixed number of steps from data collection to future retrieval.	Having categorized and characterized the data sets at hand, Laura has to determine how to proceed with the collected data. She realizes that simple data on learner drop-outs has to be combined with a number of direct and indirect indicators in order to get a bigger picture of course completion. She makes some suggestions on what data has to be saved for future reuse, and for how long. She then sets up a data curation process, which involves a fixed number of steps from data collection to future retrieval.
	2.4 Know - understand - be able to apply the technologies to preserve data (i.e., store, persist, maintain, backup data), e.g., storage mediums/services, tools, mechanisms	David discusses the pros and cons of different technologies and services for storing educational data, and then develops a reliable backup plan for building up a persistent educational data repository.	Laura collaborates with a member of the university's IT department who is responsible for storage and database management. They discuss the pros and cons of different technologies and services for storing educational data, and then develop a reliable backup plan for building up a persistent educational data repository.

3. Data Analysis	3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive statistics, exploratory data analysis, data mining).	As a first step in data analytics, David conducts some basic exploratory data analyses and applies the basic descriptive procedures to some motivational data from the MOOC redesign project. Furthermore, he discusses the pros and cons of educational data mining. He tries to unveil some notable patterns in the data at hand, seeking to identify possible critical incidents for learner satisfaction.	As a first step in data analytics, Laura conducts some basic exploratory data analysis with the data sets from the MOOC provider. She generates some descriptive statistics on drop-out numbers related to different course chapters. Furthermore, she discusses the pros and cons of educational data mining. She tries to identify some emergent patterns with regard to course completion in the data at hand.
	3.2 Know - understand - be able to apply data presentation methods (e.g., pictorial visualization of the data by using graphs, charts, maps and other data forms like textual or tabular representations)	David prepares a presentation of his results. He researches a number of data visualization approaches and decides on different graphs and tables for the descriptive statistics and exploratory data analysis on learner satisfaction.	Laura has to prepare a presentation of her results so far. She researches a number of data visualization approaches and decides on different graphs and tables for the descriptive statistics and the results of the exploratory data analysis on drop outs and course completion.
4. Data Comprehension & Interpretation	4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)	David explains the basic properties of the analyzed datasets. He explains outliers, dependencies and the like, and he explains to his audience what these could properties mean for further data analysis.	Laura explains the basic properties of the analyzed datasets. She explains outliers, dependencies and the like, and she explains to her audience what these properties could imply for further data analysis.
	4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)	In the course of a presentation, David explains the common statistics (like means and standard deviation) used with educational data with the help of tables and graphs. Having conducted some correlation and regression analyses to illustrate relationships between input (i.e. initial motivation) and outcome (i.e. overall satisfaction, overall performance) variables, David further explains the concept of	Laura meets her tutoring team to discuss the results of her research and possible implications for increasing the completion rate. Laura shows her presentation, and she explains the common statistics (like means and standard deviation) used with educational data with the help of tables and graphs. Having conducted some correlation and regression analyses to model the relationships between early indicators and drop-outs, Laura further explains the

		significance testing.	idea of significance testing.
	4.3 Know - understand - be able to interpret insights from data analysis (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations, underlying trends)	David shows and interprets some further insights from data analysis and educational data mining. He illustrates possible patterns and trends of learner satisfaction, identifying hypotheses for further research	Laura explains some further insights from data analysis and educational data mining to her team. She illustrates trends in course participation, and emergent patterns for drop-out learners. She discusses some possible interpretations with her team.
	4.4 Be able to elicit potential implications/links of the data analysis insights to instruction	David links the results to the existing instructional design and design variables and maps out some possible implications from possible changes. He identifies a number of starting points within the course from which the learner satisfaction could be increased. He later works on possible design alternatives based on those insights.	Next, Laura relates the results and insights to the existing online tutoring strategy and maps out possible implications for a redesign. She identifies some crucial points in the course where special actions to prevent drop-outs seem necessary. Together with her team, she then discusses possible tutoring strategies based on those insights.
5. Data Application	5.1 Know - understand - be able to use data analysis results to make decisions to revise instruction	David writes up a report on how to redesign a MOOC based on educational data at hand. He names the areas to be improved and makes clear and concrete suggestions for revised course tasks and contents based on the findings from data analysis. He discusses the potential of automatic prompting based on learner data for increasing learner satisfaction.	Laura writes up a report on how to change the tutoring in the MOOC based on the educational data at hand. She names the areas to be improved to prevent drop-outs and makes clear and concrete suggestions for revised tutorial interventions and a support strategy based on the findings from data analysis. She discusses the potential of individualized process feedback based on learner data for keeping learners involved.
	5.2 Be able to evaluate the data-driven revision of instruction	David develops a strategy on how to evaluate the impact of the data-driven course redesign. He defines indicators and criteria for measuring developments in learner satisfaction (i.e. the use of learning objects, time-on-task, motivational and emotional items in a formative evaluation), and sketches a methodologically sound A/B-design for a quasi-experimental evaluation setting.	Together with some experienced researchers from the project team, Laura develops a strategy on how to evaluate the impact of the data-driven tutoring strategy. In addition to plain completion rates, they define a set of indicators and criteria for measuring developments in learner participation, and they sketch a methodologically sound A/B-design for a quasi-experimental evaluation setting.

6. Data Ethics	6.1 Know - understand - be able to use the informed consent	David seeks to establish legal and correct procedures. Thus, he collaborates intensively with the client's legal department and discusses the various legal topics involved. As a first result, they develop a legally compliant participant form for informed consent to be presented to and signed by each person taking part in one of the client company's online courses.	A major goal of the project is to establish legal and correct procedures. Thus, the project team collaborates intensively with the university's legal department, and they heavily discuss the various legal topics involved. As a first result, the project team develops a legally compliant participant form for informed consent to be presented to and signed by each person taking part in the MOOC on educational technology.
	6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security	The client company's legal experts explain to David how to protect the learners' data privacy, data confidentiality, data integrity and data security.	In the course of the discussion on legal aspects, the project team develops standards to protect the learners' data privacy, confidentiality, integrity and security.
	6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing	Likewise, legal concepts like authorship, ownership, data access and governance, re-negotiation and data-sharing are discussed. David writes a quick legal analysis based on this information.	Likewise, legal concepts like authorship, ownership, data access and governance, re-negotiation and data-sharing are discussed. Laura writes a quick legal analysis for her data-driven online tutoring strategy.

Appendix 1: Invitation letter

Topic of Interviews: Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutore-Trainers of Online and Blended Courses aligned with the European Qualifications Framework (EQF)

Dear prospective participant,

I am writing on behalf of the Learn2Analyze Consortium to invite you to participate in a remote interview on: "**Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with the European Qualifications Framework (EQF)**".

Learn2Analyze (L2A): *An Academia-Industry Knowledge Alliance for enhancing Online Training Professionals' (Instructional Designers and e-Trainers) Competences in Educational Data Analytics*, is an action co-funded by the European Commission through the Erasmus+ Program of the European Union (Cooperation for innovation and the exchange of good practices - Knowledge Alliances, Agreement n. 2017-2733 / 001-001, Project No 588067-EPP-1-2017-1-EL-EPPKA2-KA). More information about the project is available at www.learn2analyze.eu.

The interviews aim to endorse and adjust the proposed framework on **"***Educational Data Literacy (EDL) Competence Profile (CP) for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses***"**. We are inviting participants with expertise and impact on the field of Digital Learning from different organizations and geographic regions to participate in this study. Based on your professional profile and expertise we would like to ask you to participate in our interview study involving 35 experts from around the world.

Participating in this interview is an opportunity to reflect upon the proposed EQF-compatible *Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with EQF.* We do not perceive of any risk or discomfort in the completion of the interview.

1. The remote interviews will be carried out via telephone or Skype from 15/10/2018 to 23/11/2018.
2. Before the interview takes place, you will be asked to state your consent or not for including you in the list of experts that participate in the interview study.
3. You will receive some background material in advance that helps you to prepare the interview.
4. The interview consists of 4 sections and lasts approximately 60 minutes.
5. The first section covers background information on the interview partner and includes an additional statement of consent for the recording.
6. The second section focuses on the validation of the mapping of the Learn2Analyze Educational Data Literacy (EDL) Competence Profiles (CP) to the European Qualification Framework (EQF).
7. The third section aims at developing exemplary learning outcomes based on the L2A EDL CP framework.
8. The forth section focusses on closing comments and open questions.

9. The remote interview will be recorded and transcribed, the data then stored on an internal server at the University of Mannheim, Germany. The persons that have access to this server are Prof. Dirk Ifenthaler and Mr. Marc Egloffstein, both researchers in the Learn2Analyze consortium.

This interview study has been approved by the Learn2Analyze Leadership Board and the final report will be made publicly available through the official website of the project www.learn2analyze.eu. If you have any questions concerning the interview or experience any discomfort related to the interview study, please contact the responsible Learn2Analyze researcher for this interview study: Marc Egloffstein at egloffstein@uni-mannheim.de

On behalf of the Learn2Analyze Consortium, we express our sincere thanks for your participation in our interview study acknowledging that your insights on the questions in this interview will prove invaluable.

Demetrios Sampson, Learn2Analyze Project Coordinator
PhD(ElectEng) (Essex), PgDip (Essex), BEng/MEng(Elec) (DUTH), CEng
Golden Core Member, IEEE Computer Society
Professor, Digital Systems for Learning and Education | Department of Digital Systems, University of Piraeus, 80, Karaoli and Dimitriou Street, Piraeus, 18534, Greece
E-mail:sampson@unipi.gr

Appendix 2: Consent form

Topic of Interviews: Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with the European Qualifications Framework (EQF)

Dear prospective participant,

I am writing on behalf of the Learn2Analyze Consortium to invite you to participate in a remote interview on: "**Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with the European Qualifications Framework (EQF)**".

Purpose and Procedure:

Learn2Analyze (L2A): *An Academia-Industry Knowledge Alliance for enhancing Online Training Professionals' (Instructional Designers and e-Trainers) Competences in Educational Data Analytics*, is an action co-funded by the European Commission through the Erasmus+ Program of the European Union (Cooperation for innovation and the exchange of good practices - Knowledge Alliances, Agreement n. 2017-2733 / 001-001, Project No 588067-EPP-1-2017-1-EL-EPPKA2-KA). More information about the project is available at www.learn2analyze.eu.

The interviews aim to endorse and adjust the proposed framework on **"***Educational Data Literacy (EDL) Competence Profile (CP) for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses***"**. We are inviting participants with expertise and impact on the field of Digital Learning from different organizations and geographic regions to participate in this study. Based on your professional profile and expertise we would like to ask you to participate in our interview study involving 35 experts from around the world.

Please note:

1. The remote interviews will be carried out via telephone or Skype from 15/10/2018 to 23/11/2018.
2. Before the interview takes place, you will be asked to state your consent or not for including you in the list of experts that participate in the interview study.
3. You will receive some background material in advance that helps you to prepare the interview.
4. Within the interview, you may stop and leave at any time, should you decide you do not wish to further participate.
5. In this interview study we collect the opinions of at least 35 experts from around the world.
6. The interview consists of 4 sections and lasts approximately 60 minutes.
7. The first section covers background information on the interview partner and includes an additional statement of consent for the recording.
8. The second section focuses on the validation of the mapping of the Learn2Analyze Educational Data Literacy (EDL) Competence Profiles (CP) to the European Qualification Framework (EQF).
9. The third section aims at developing exemplary learning outcomes based on the L2A EDL CP framework.
10. The forth section focusses on closing comments and open questions.

Potential Benefits:
Participating in this interview is an opportunity to reflect upon the proposed *Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with EQF.*

Potential Risk or Discomforts:
We do not perceive of any risk or discomfort in the completion of the interview.

Storage of Data:
The remote interview will be recorded and transcribed, the data then stored on an internal server at the University of Mannheim, Germany. The persons that have access to this server are Prof. Dirk Ifenthaler and Mr. Marc Egloffstein, both researchers in the Learn2Analyze consortium.

By indicating consent to participate in this interview you indicate consent for the possible secondary use of this data at a later date if we decide to undertake a further longitudinal study for the enhancement of the proposed Learn2Analyze EDL-CP framework.

Anonymity and Confidentiality:
The interview is not anonymous, meaning that we will ask you to provide your name. Furthermore, you will be asked about personal background information. However, there will never be a publication of interview data or results based on interview data that might reveal your identity.

The only people processing your input will be the researcher(s) involved in the Learn2Analyze project. The researcher(s) undertake to keep any information provided herein confidential, not to let it out of our possession and to report on the findings from the perspective of the entire participating group (35 experts) and not from the perspective of an individual. Please note that confidentiality cannot be guaranteed while data are in transit over the Internet.

Right to Withdraw:
You are under no obligation to complete the interview and you can withdraw from the interview at any time. If you do not want to participate further simply stop by telling the interviewer.

Conflict of Interest:
We do not perceive any conflicts of interest in the development of this interview study.

Compensation:
There is no compensation for participants in this interview study.

Participant Concerns and Reporting:
If you have any questions concerning the interview or experience any misgivings related to the interview study, please contact the responsible Learn2Analyze researcher responsible for this interview study: Marc Egloffstein at egloffstein@uni-mannheim.de

Debriefing and Dissemination of Results:

This interview study has been approved by the Learn2Analyze Leadership Board and the final report will be made publicly available through the official website of the project www.learn2analyze.eu. No personal data will be made available in any project related publication.

On behalf of the Learn2Analyze Consortium, we express our sincere thanks for your participation in our interview study acknowledging that your insights on the questions in this interview will prove invaluable.

Demetrios Sampson, Learn2Analyze Project Coordinator
PhD(ElectEng) (Essex), PgDip (Essex), BEng/MEng(Elec) (DUTH), CEng
Golden Core Member, IEEE Computer Society
Professor, Digital Systems for Learning and Education, Department of Digital Systems, University of Piraeus, 80 Karaoli and Dimitriou Street, Piraeus, 18534, Greece
E-mail: sampson@unipi.gr

Please indicate the form of your consent by ticking one of the boxes:

☐ I have read the consent form and I consent to participate in this interview study and in the use of my personal data in a public version of the report to be produced.

☐ I have read the consent form and I consent to participate in this interview study and in the use of my personal data in a confidential version to be shared only among Learn2Analyze Consortium partners and the European Commission of the report to be produced

☐ I have read the consent form and I consent to participate in this interview study but I do not consent in the use of my personal data in neither a confidential nor a public version of the report to be produced.

_____

Date, Signed

Appendix 3: Semi-structured interview guide

Section 1: Background information and statement of consent

[goal: warm-up, getting used to the interview situation, gather background information about interview partner]

"Welcome to our interview on the Educational Data Literacy Competence Profile framework for (a) Instructional Designers and (b) e-Tutors of Online and Blended Courses aligned with the European Qualifications Framework (EQF). The interview will consist of four parts in which we will discuss your expertise, the proposed EDL-CP framework in relation to EQF, and where you will have the opportunity to contribute exemplary learning outcomes for the EDL-CP framework. Overall, the interview will last approximately 60 minutes. Thank you very much for your cooperation and your willingness to participate. You already stated your consent to participate in the interview study."

"Before we get started: could you please express that you consent with the recording of the interview? If so, simply state: 'Yes, I agree with the recording of this interview'. Otherwise, we will stop the session right away."
-- "Thank you."
"*The first part of the interview is all about you and your expertise in the field. Could you please introduce yourself, that is: state your name and give some personal information, describe your current affiliation and give a sketch of your professional biography, with a special emphasis on your previous roles in and links to online learning?"*
[required information: age, gender, highest academic qualification, experience in digital learning and data analytics, current work affiliation (years working in the field/in the current position), current focus of work]

Section 2: Mapping of the L2A EDL-CP framework to EQF and transfer of EDL competence statements to EQF levels

[goal: develop and validate the EQF compatible L2A EDL-CP framework]

"As you maybe also recall from our online survey, Educational Data Literacy is the ability to collect, manage, analyze, comprehend, interpret and apply educational data in an ethical, meaningful and critical manner. The Learn2Analyze Educational Data Literacy Competence Profile framework consists of six competence dimensions specified by 21 competence statements. Your background document **Mapping of L2A EDL competence statements to EQF levels** gives an overview on this competence framework.

"Could you please name the most important and least important EDL competences you would expect from Instructional Designers and e-Tutors"
[required information: most important EDL competence (ID/e-Tutor); least important EDL competence (ID/e-Tutor)]

"The European Qualifications Framework – in short: EQF – is a common European reference framework which purpose is to make qualifications more readable and understandable across different countries and systems. Covering qualifications at all levels and in all sub-systems of education and training, the EQF provides a comprehensive overview over qualifications in the 39 European countries currently involved in its implementation. The core of the EQF is its eight reference levels defined in terms of learning outcomes, i.e., knowledge, skills and autonomy-responsibility. *Learning outcomes* express what individuals know, understand and are able to do at the end of a learning process. *Level 1* equals basic knowledge and basic skills that are sufficient for work or study under direct supervision in a structured context. At the other end of the spectrum, competences on *Level 6* equal those of a bachelor's degree, competences on *Level 7* those of a master's degree, and those on the highest *Level 8* those of a Ph.D. degree. Your background document **Mapping of L2A EDL competence statements to EQF levels** shows the proposed EQF levels for the L2A EDL CP framework.

"The first goal of our interview series is to reflect and endorse a mapping of the L2A EDL CP framework to the EQF levels. This is where your expertise comes in. In the following, we ask you for a critical review of our proposed mapping that you can find in the document **Mapping of L2A EDL competence statements to EQF levels**."

"The **first competence dimension** is **data collection**. Pertaining knowledge and skills are…

1.1 Know where to find the right data/data sources

1.2 Know how to obtain/access data

1.3 Understand data quality and limitations (e.g., accuracy, completeness)

In our mapping, we see '**1.1 Know where to find the right data/data sources**' on **EQF level 5**, as level 5 represents 'comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Then, we have '**1.2 Know how to obtain/access data**' also on **EQF level 5**. This, again, represents 'comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Furthermore, we have '**1.3 Understand data quality and limitations (e.g., accuracy, completeness)**' on **EQF level 6** which stands for 'advanced knowledge of a field of work or study, involving a critical understanding of theories and principles'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The **second competence dimension** is **data management**. Pertaining knowledge and skills are:

2.1 Identify the technologies to preserve data

2.2 Know and apply data manipulation methods

2.3 Know and apply data curation and data re-use methods

2.4 Understand Data Description (Metadata)

In our mapping, we see '**2.1 Identify the technologies to preserve data**' on **EQF level 4**, as level 4 represents 'a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Then, we have '**2.2 Know and apply data manipulation methods**' on **EQF level 5**. This represents 'a comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Moreover, there is '**2.3 Know and apply data curation and data re-use methods**', also on **EQF level 5.**

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

As the last competence statement in dimension 2, we have '**2.4 Understand Data Description (Metadata)**' on **EQF level 6.** This level describes 'advanced knowledge of a field of work or study, involving a critical understanding of theories and principles'. With regard to academic competences, this equals knowledge on the level of a bachelor's degree.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The **third competence dimension** in the L2A EDL CP framework is **data analysis**. The knowledge and skills associated with that dimension are:

3.1 Know and apply the basic data analysis methods

3.2 Understand and apply the basic data analysis process steps

3.3 Understand and apply the basic data presentation methods

We see '**3.1 Know and apply the basic data analysis methods**' on **EQF level 4**, as level 4 represents 'factual and theoretical knowledge in broad contexts within a field of work or study'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Then, '**3.2 Understand and apply the basic data analysis process steps**' is located on **EQF level 5**, as this represents 'a comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Likewise, '**3.3 Understand and apply the basic data presentation methods**' is mapped on **EQF level 5**.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Data Comprehension & Interpretation is the **fourth competence dimension** of the L2A EDL CP framework. It is made up of five competence statements, namely:

4.1 Understand data (e.g., measurement error, discrepancies within data, key take-away points)

4.2 Understand statistics

4.3 Know how to interpret data (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations)

4.4 Generate potential connections to instruction

4.5 Make decisions based on data

We see '**4.1 Understand data (e.g., measurement error, discrepancies within data, key take-away points)**' on **EQF level 6**, which describes 'advanced knowledge of a field of work or study, involving a critical understanding of theories and principles'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Correspondingly, we map '**4.2 Understand statistics**' on **EQF level 6**.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

'4.3 Know how to interpret data (e.g., explanations of patterns, identification of hypotheses, connection of multiple observations)', in our view, describes a more advanced set of knowledge, and is thus mapped on **EQF level 7**. This EQF level describes 'highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research' as well as 'critical awareness of knowledge issues in a field and at the interface between different fields'. With regard to academic competences, this equals knowledge on the level of a master's degree.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The same applies to the skills necessary for '**4.4 Generate potential connections to instruction'**, which is also mapped on **EQF level 7**. With regard to skills, EQF level 7 addresses 'specialized problem-solving skills

required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The last competence statement in competence dimension 4 is '**4.5 Make decisions based on data'.** We equally see this on **EQF level 7**.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The fifth competence dimension of the L2A EDL competence framework is **Data Application.** The three pertaining competence statements are…

5.1 Use data to inform instruction

5.2 Know how to share and cite data

5.3 Evaluate the data-driven intervention

'**5.1 Use data to inform instruction**' is mapped on **EQF level 6**, which entails 'advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialized field of work or study`.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

'5.2 Know how to share and cite data' is mapped on **EQF level 5,** which describes 'comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge'.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

‘5.3 Evaluate the data-driven intervention’, then, is mapped on **EQF level 7**, as it addresses ‘specialized problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields’.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

The **sixth and final competence dimension** of the L2A EDL CP framework is **Data Ethics**. It consists of 3 competence statements:

6.1 Explain the use of informed consent

6.2 Know how to protect individuals' data privacy, confidentiality, integrity and security

6.3 Understand authorship, ownership, data access (governance), re-negotiation and data-sharing

‘**6.1 Explain the use of informed consent**’ is mapped on **EQF level 5**, as this level describes ‘a comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems’.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Likewise, we map ‘**5.2 Know how to share and cite data**’ on **EQF level 5**, as this level addresses ‘comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge’.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?

Finally, we have ‘**6.3 Understand authorship, ownership, data access (governance), re-negotiation and data-sharing’**. This competence statement is mapped on **EQF level 6**, as it addresses ‘advanced knowledge of a field of work or study, involving a critical understanding of theories and principles’.

Do you agree with that? / Do you think this is correct? / Do you see this the same way?

If not: would you see this knowledge / skill on a lower or a higher level? Can you specify the level?

Can you explain why?"

"Thank you very much for your valuable ratings and comments. Now let's move on to the third part of this interview."

Section 3: Developing exemplary learning outcomes based on the L2A EDL-CP framework

[goal: sketch 3 exemplary learning outcomes with the expert which can be converted into learning objects in the L2A EDL MOOC]

"With our L2A EDL CP framework, we address two different groups of online learning professionals, namely Instructional Designers (those who build online courses) and e-Tutors (those who run and support online courses). Now that we have gone through the L2A EDL CP framework and have had a closer look at the different dimensions and statements, we would like to find out how those competence statements really emerge in the practice of online learning. Here again, your expertise and experience is needed."

"With your help, we would like to develop ***three learning outcomes*** for either Instructional Designers or e-Tutors in line with our competence framework. *Learning outcomes* are concrete and measurable manifestations of the competence statements we discussed in the previous part of this interview."

"Here are two examples."

"We stick to the group of **Instructional Designers** first. If we look at competence dimension #5 'Data Application', we have three competence statements. We try to transform statement 5.3 into a learning outcome. Statement 5.3 is 'Evaluate the data-driven intervention'. Here, an exemplary learning outcome could be:
'The Instructional Designer can assess the impact of data-driven instructional decisions.'"

"Second, we look at competence dimension #1 'Data Collection' for the group of **e-Tutors**. Statement 1.2 is 'Know how to obtain/access data'. Here, an exemplary learning outcome could be:
'The e-Tutor knows one or more ways to access educational data from the systems that he is using for online or blended courses.'"

"Please note the different quality of the verbs describing the learning outcomes, according to the level of knowledge or skills to be applied."

"So here is your first task. Let's look at the EDL competence dimension #6: **Data ethics** with the competence statement 6.2 'Know how to protect individuals' data privacy, confidentiality, integrity and security'.
*Can you think of a learning outcome from the working context of an **e-Tutor** in which this competence statement comes into action? Please take your time and think… and then develop and elaborate one example.*

[to be elaborated for two more competence statements; see separate table for the assignment]

[In total, 35*3 learning outcomes will be developed. With 21*2 competence statements at hand, this means that each competence statement for either Instructional Designers or e-Tutors will be operationalized by at least 2 experts.]

Section 4: Closing

"This is the final part of our interview. Is there any other competence you see as relevant for the EDL competence framework?"
[information: additional EDL competence]
"Do you like to suggest any other information, material, tools, or reports which can be linked to EDL?"
[information: suggestions]
"Would you like to stay connected with the project? How? – Please provide your contact details."
[information: contact details]
"Is there something else you would like to share with regard to the project and EDL?"
[information: additional information]

Estimated time [to be checked in a dummy pilot interview]

Section 1: 5 minutes

Section 2: 20 minutes

Section 3: 3 * 10 minutes

Section 4: 5 minutes

Documents to be sent in advance

invitation letter

consent form [to be signed and returned?]

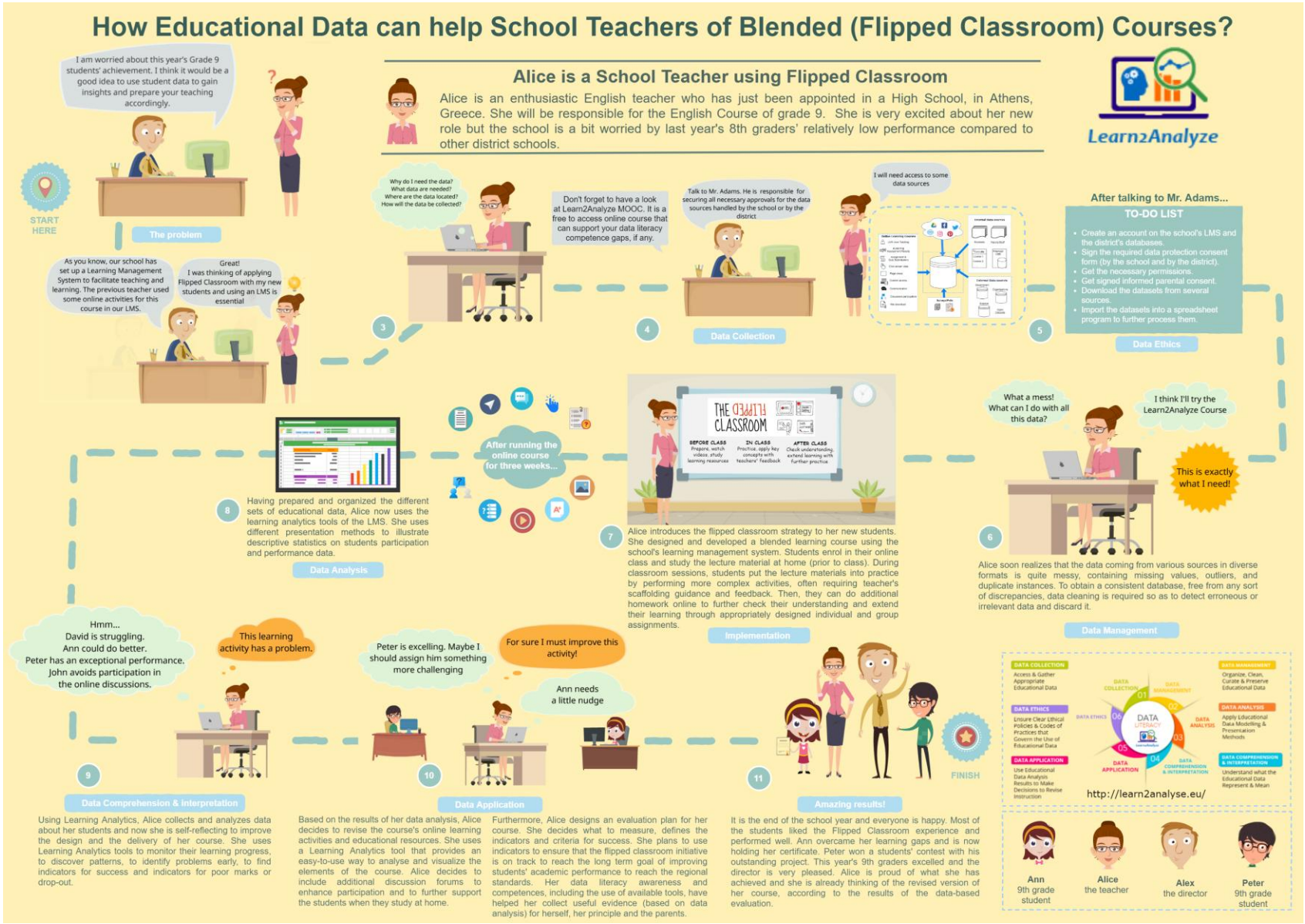
background information:

- L2A EDL CP framework (competence dimensions and statements)
- Descriptors defining levels in the European Qualifications Framework (EQF)
- Guidelines for describing learning outcomes

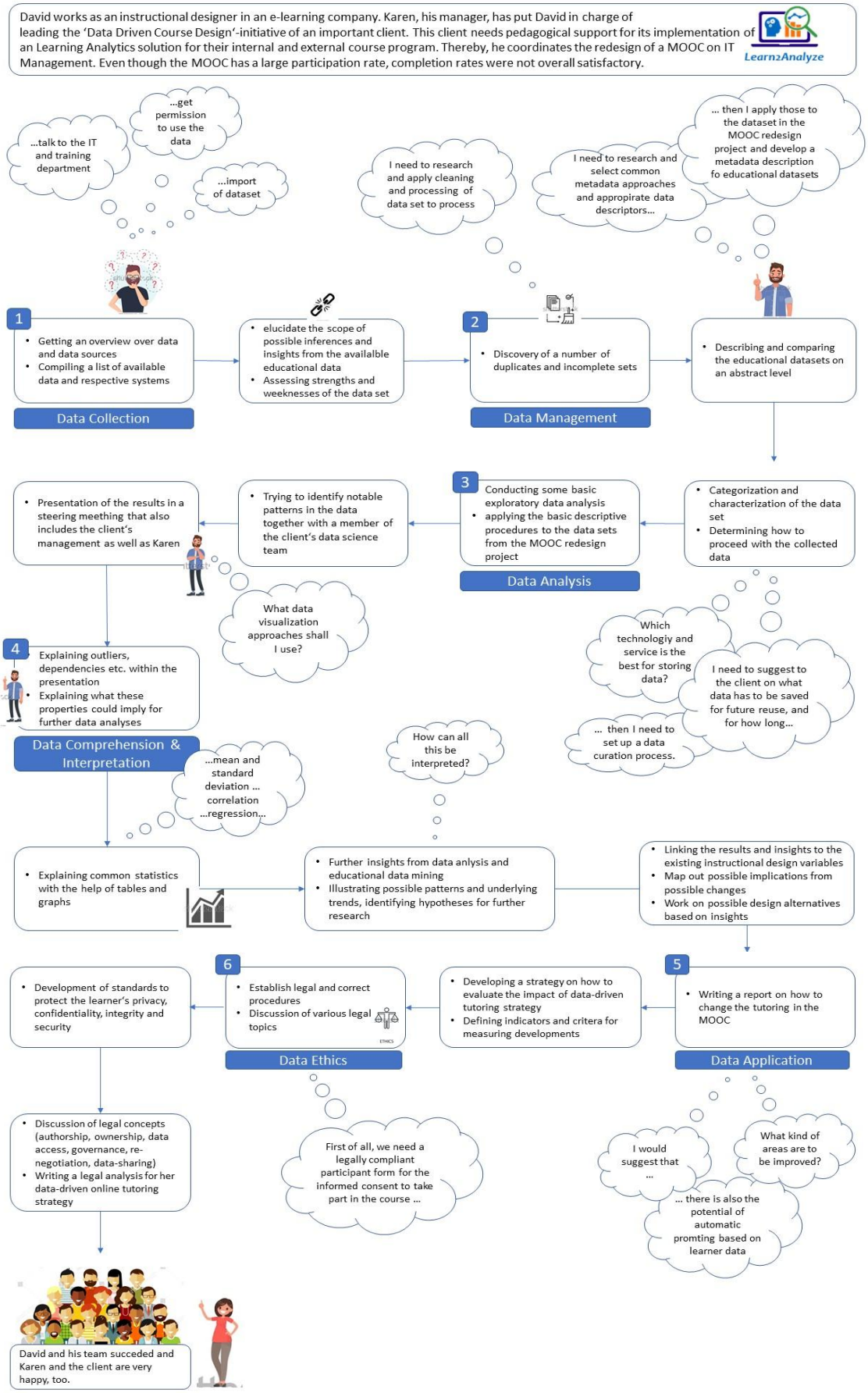
Appendix 4: Mapping of the EDL-CP framework to EQF

	Statements and Mapping																				
	1,1	**1,2**	**1,3**	**2,1**	**2,2**	**2,3**	**2,4**	**3,1**	**3,2**	**3,3**	**4,1**	**4,2**	**4,3**	**4,4**	**4,5**	**5,1**	**5,2**	**5,3**	**6,1**	**6,2**	**6,3**
Interviewee	5	5	6	4	5	5	6	4	5	5	6	6	7	7	7	6	5	7	5	5	6
e01	6 because it	6 because it's not	7 because	6 because there	6	-	7 because	6 because of	6 because of	6 because	-	-	-	-	-	5 because it is	-	6 because if you	7 because not	7 should be in	8
e02	4 or 5 because it	4 because if I	7 in some cases	-	5 or 6, because	5 or 6, because	-	4 is okay, but	4 or 5 depending	4 or 5	-	-	7 or 8,	6 "plus", for eT it	7 "plus"	-	-	7 "plus"	4 because	could be also 6	-
e03	-	-	-	could be also 5,	could be also 4,	-	7 because	-	or 6 because its	7 because it	7 or 8, because	7 because	8 because the	8 because the	7 is okay, could	-	could be 6	-	-	6 because it	6 or 7 depending
e04	3 because of	3 because of	-	3 because of	4	4	3 or 4 bc	3 or 4 bc it can	4 bc according to	4 bc according to	-	-	agreed, but could	agreed, but could	-	7 if the purpose	-	-	6 bc it requires	6 bc it requires	7 bc ethical
e05	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	could also be 4	-	-
e06	4 bc it is lower	4 bc it is lower	-	-	-	6 bc of life cycle	-	3 bc of the	-	-	-	-	8 bc of very	-	-	-	could be also	-	4 bc in the world	6 bc of the	-
e07	-	-	-	-	-	-	-	-	-	-	5	5	not such a high	-	-	most complicated	-	-	-	very important	-
e08	-	-	-	-	-	-	-	-	6 because it is	6 because it is	-	-	mix between 7	-	-	-	-	-	-	could be 4	-
e09	-	-	-	could be also 3	-	6 bc data	-	-	6 bc of	4 bc of basic	-	6 is okay if it is	-	-	-	could be also 5	-	-	4 bc it does not	6 bc measuring	-
e10	-	-	-	could be also 5,	-	-	depends on what	-	-	-	-	-	-	-	6 bc making	-	-	-	-	-	-
e11	4 bc it does not	4 bc it does not	5 bc this is not	-	-	-	-	-	4 bc there is no	4 bc of	5 bc	5 bc of	-	6 bc it should be	6 bc it should be	-	4 bc it shouldn't	-	4 bc it's not	5 is okay, but it	5 bc there is no
e12	-	-	-	5 bc many	-	6 bc the purpose	-	5 bc ID und eT	-	5 is okay, but	-	-	-	-	-	-	5 is okay, but	-	-	6 or 7 bc privacy	-
e13	-	-	-	-	-	-	-	-	-	-	-	-	could be also 6,	-	-	-	-	-	-	-	-
e14	-	-	-	5 bc it is not any	6 bc data	-	6 is okay, but	5 bc it should be	6 bc of bachelor's	-	-	-	-	-	7 is okay, but it	7 bc it is related	6 bc of bachelor's	-	-	6 bc it can get	-
e15	-	-	5 or 6 depending	-	-	-	5 or 6 depending	5 bc it depends	-	-	-	-	6 bc it depends	6 bc it doesn't	6 bc it doesn't	-	-	-	-	5 is okay, but	-
e16	-	-	-	5 or 6 bc it	-	-	-	-	-	-	-	-	-	6 or 7 bc maybe	6 bc it doesn't	5 bc it doesn't	-	-	-	-	-
e17	-	5 is okay but	6 is okay but	-	-	-	5 or 6 bc of the	-	-	-	5 or 6 bc	5 or 6 bc	-	-	-	6 or 7	-	-	4 bc it is very	-	-
e18	3 no	4 no	-	-	-	6 bc more	-	-	-	-	-	could be 5	-	-	-	-	-	-	basic skill	-	-
e19	-	3 or 4 bc it	-	3 bc it is a simple	5 is okay if the	6 bc it is more	6 is okay when it	-	5 or 6 bc of the	if it is only basic 5	-	-	depends on the	-	8 bc you need to	-	4 bc it is not a	-	4 bc it is a	7 bc it is a very	-
e20	6 bc it is not only required to find data, but the "right" data	-	6 or 7 bc it requires understanding of the theories, more specific	-	could be also a 4, but 5 bc it is about methods	-	-	-	-	could be also 4, depending on what is basic	5 or 6, depends on experience and the data analysis	5 if it is only statistics, 6 if it is deeper understanding, also depends on	-	6 bc it requires mainly experience and innovation	7 or higher, depends on wether 4.4 is a 6 or 7; 4.5 must be higher than 4.4	6 or 7, depending on the mapping of 4.4 and 4.5	5 or 6	6 or 7 depending on experience, requires a lot of understanding of the context	could be 6 bc to do it in a very precise way is very difficult	6 bc it is a quite complex problem	-
e21	-	-	depending on	-	-	-	5 bc	-	-	-	-	-	-	-	could be 8	-	-	-	6 bc different	-	-
e22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e23	-	-	-	higher level bc of	-	-	5 bc it is	-	-	-	**could** also be a	-	at least 7, from day-to-day business it could also be 8			-	4 bc it is not that	at least 7, from	-	at least 6 bc	-
e24	-	-	-	-	could be higher	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e25	-	-	5 because of the	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-
e26	2 or 3 bc it is very	3 or 4 bc it is very	4 or 5 bc 1.1 and	-	5 or 6 bc it	-	5 or 6 bc	2 and 3 bc of the	4 or 5 bc 3.1 was	-	-	could be 1 to 8	could be also 6	4 to provide more	4 bc it should not	4 as a minimum	-	6 or 7 bc it is very	2 bc it is a key	3 bc it is not	-
~~e27~~																					-
e28	-	if procedure has	-	-	if procedure has	if procedure has	between 4 and 6	-	-	-	-	-	-	-	-	7	4 more basic	-	can get lower	can get lower	5 because it is
e29	-	4 is enough	-	-	5-6 bc can be	-	-	5 bc of 'apply'	-	-	-	-	-	6 bc of descriptor	6 bc everyone	-	-	-	-	6 bc higher	5 no innovation
e30	-	-	-	-	6 bc it requires extensive knowledge	-	-	6 bc it requires extensive knowledge	-	-	-	-	-	-	-	-	4 bc it is just about processes to follow	6 bc research skills are not necessarily needed	-	4 bc ID and eT should follow the existing rules and that shouldn't be too complex	-
e31	-	-	could be also 7 bc data quality and limitations is quite tough and multifaceted	5 bc an identification process is needed	6 bc of bachelor's degree	6 bc of bachelor's degree and bc of the terms knowing and applying	-	4 or 5 depending on what basic means	6 bc process steps really need to be understood and it requires a bachelor's level	5 or 6 depending on what basic means	-	-	-	-	-	-	-	-	could be also 6 if it is not just replicating the informed consent	6 bc it's really difficult to protect individuals data privacy	-
~~e32~~																					
e33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e34	-	-	5	-	6 data manipulation is not basic	-	-	5 because it is about applying	-	-	-	depending what kind of statistics is meant should be 5	-	-	-	-	4	-	-	-	-
e35	-	-	5 bc not sure whether someone needs advanced knowledge	-	-	-	4 bc not sure whether someone needs advanced knowledge; more like reading the first page of a book and understand it -> make sense of it	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e36	-	-	-	-	could be higher for an instructional designer because of use of data manipulation -> level 6; eTutor more with analytics toll that already prestents analysis ->stay with 5	6 because frequent task	-	5 for instructional designer because of more work with data for specific goal	-	eTutor 4 because it is not as importatn for him and should have system that does the presentation for him	-	-	-	level 6 for Tutor because not as important for him/not what he would do all the time	-	-	-	ID on level 6 because it's more on eTutors side	-	6 or 7 for eTutor bc he needs to know a lot about it 5 is fine when it is more standardized	-
Agreed	**26**	**23**	**21**	**23**	**19**	**24**	**21**	**20**	**23**	**22**	**27**	**25**	**22**	**22**	**20**	**24**	**23**	**27**	**19**	**13**	**28**

Appendix 5: Infographic for School Teacher in K12 Blended Courses



Appendix 6: Infographic for Instructional Designer in corporate context



Appendix 7: Infographic for e-Trainer in Higher Education context