Educational Data Literacy for School Teachers and Leaders

a key professional competence in the post COVID-19 era

Demetrios Sampson
Professor, Department of Digital Systems, University of Piraeus, Greece
Educational Data Literacy for School Teachers and Leaders: a key professional competence in the post COVID-19 era

Demetrios Sampson
PhD(ElectEng) (Essex), PgDip (Essex), BEng/MEng(Elec) (DUTH), CEng
Golden Core Member, IEEE Computer Society
Professor, Department of Digital Systems, University of Piraeus, Greece
Adjunct Professor, School of Education, Curtin University, Australia

EMINENT2022: Responsible & Smart: Use of Data in Education
European Schoolnet (EUN)
Aviva Stadium, Dublin, Ireland
6-7 December 2022
Emergency Remote Teaching during Covid-19
Lessons & Opportunities
The need for Digital Readiness: Schools & Teachers

Educational Data Literacy
Educational Data: The challenge and the opportunity
Educational Data Analytics: Methods & Tools
Barriers & Ethical Issues

Professional Development 4 Educational Data Literacy
EU Knowledge Allience Learn2Analyze MOOC
EdX MOOC: Analytics for the Classroom Teacher
(European) Microcredentials for Educational Data Literacy
Emergency Remote Teaching during Covid-19
Emergency Remote Teaching during Covid-19

During **Covid-19** almost all **Educational Institutions** (K12 Schools, Colleges & Universities, Professional Development Training Centers) around the world adopted **Emergency Remote Teaching** strategies to cope with the global public health crisis.

Covid-19 created an urgent need for **temporary online access to teaching** at **global scale**.

→ **lessons to be learnt & opportunities**
Lessons & Opportunities

• Curriculum
  – global problems - **internationalization** of the curriculum
  – a **smart citizenship** curriculum - **digital intelligence**
  – **effective thinkers** and ethical **global citizens**

• Pedagogy
  – more **flipped** and **blended** teaching & learning
  – need for more engaged **self-regulated** learners

• Means – Technology
  – unlock **existing technologies**: beyond access to digital content into orchestration of meaningful personalised learning experiences

• Assessment of/for Learning
  – integrate formative **e-assessment** strategies: enhance feedback & guidance
  – explore **educational data** and collection and analysis

• Leadership & Policies
  – **data-driven** decision-making and performance evaluation

Digital Readiness: Schools & Teachers
Educational Data
The Role of Digital Technologies in the Post Covid19 Education

- **enabler** for incremental or disruptive **transformations**
- **supports** educational institutions complexity **leadership**
- **allows** for **innovative** experiences, processes, products, services, *that would not be possible without the use of digital technologies*

→ Educational Data Collection & Analysis for Evidence-based Pedagogical Actions / move beyond the otherwise “black box” classrooms
Priority 2: Enhancing digital skills and competences for the digital transformation

**Action 7**: Common guidelines for teachers and educators to foster digital literacy and tackle disinformation through education and training

**Action 8**: Updating the European Digital Competence Framework to include AI and data-related skills

**Action 9**: European Digital Skills Certificate (EDSC)

**Action 10**: Proposal for a Council recommendation on improving the provision of digital skills in education and training
Educational Data Literacy
Educational Data: The challenge and the opportunity

Educational Organisations and Teachers are challenged to

**Personalise** Teaching and Learning:

- *Learning Experiences*
- *Guidance & Feedback*
- *Recognition of Achievements*

for **each** Individual Student.
Educational Data: The challenge and the opportunity

As teachers, how much do we know about our students?

• do they understand?
• are they bored?
• are they distracted?
Educational Data: The challenge and the opportunity

Educators have a good understanding of their students’ needs when they interact with them daily in the classroom or in the lab.

And yet, they would like to be able to discover more and personalise their teaching for each one of their students – “differentiate instruction”.

What happens when Teaching and Learning moves

• from the Physical Classroom to the Online Virtual Space (the Web)
• from the Small Groups of Students to the Massive Audiences of a MOOC
Online Teaching and Learning are typically supported by Course or Learning Management Systems (CMS or LMS) which are web-based systems that handle teaching and learning activities online, such as Moodle.

Effective online and blended teaching require updated professional competences compared to those assumed at the traditional face to face education and training programs.
Educational Data: The challenge and the opportunity

A recent advancement in online and blended teaching and learning is **Educational Data Analytics (EDA):** the use of educational data generated during teaching and learning (including assessment) to better support individual learners' in online and blended courses and beyond.

As a result, most Course Management Systems are now incorporating **Educational Data Analytics tools.**

However, **these tools are not widely used** mainly because of the low **Educational Data Literacy (EDL)** competences of the professionals that could be using them (educators, instructional designers and trainers, leaders).
Educational Data:
The challenge and the opportunity

Benefits

- **Students**: take control of their learning
- **Educators**: reflect & improve their practice
- **Institutions**: take evidence-based decisions
Educational Data Literacy

Educational Data Literacy is a core competence for all education professionals, including school teachers, instructional designers and tutors of online and blended learning course, as well as educational institutions' leaders.

Data Literacy for Educators

• is the ability to understand and use data effectively to inform educational and pedagogical decisions
• it requires a competence set to locate, collect, process & store, analyze & understand, visualize & interpret and act upon Educational Data from different sources so as to support improvement of the teaching, learning and assessment process
Educational Data

Collected and organised to represent all aspects of teaching and learning (and assessment), including

Profiling and Interaction Data

of & between

Students, Teachers, Learning Environment
derived from

both qualitative and quantitative methods
collected from multiple sources

through Logs and/or Real-Time
Sofia Mougiakou, Dimitra Vinatsella, Demetrios Sampson, Zacharoula Papamitsiou, Michail Giannakos, Dirk Ifenthaler, Educational Data Analytics for Teachers and School Leaders, Springer, 2022, Fig 1.14, pg 37 - adopted by Data Quality Campaign
1. **Student characteristics**, such as demographics, prior academic performance, transfer records, native language. **Instructor characteristics**, such as competences, academic qualifications or professional experience.

2. **Context Data**
   - the curriculum, school human resources, infrastructure and financial plans, school culture

3. **Data Process**
   - data generated during the teaching, learning and assessment processes, lesson plans, methods of assessments, classroom management

4. **Outcome Data**
   - achievements, formative assessments, standardised tests (inter-) national exams, students' wellbeing (safety, support, respect for diversity and special needs), graduate data

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Sofia Mougjakou, Dimitra Vinatsella, Demetrios Sampson, Zacharoula Papamitsiou, Michail Giannakos, Dirk Ifenthaler, Educational Data Analytics for Teachers and School Leaders, Springer, 2022, Fig 1.15, pg 38 -
Educational Data Analytics Methods & Tools

**Teaching Analytics**
methods and digital tools to visualize, analyze, and/or assess teaching practice

**Learning Analytics**
methods and digital tools to collect, analyze and report student-related educational data towards monitoring the learning process

**Teaching & Learning Analytics**
to support the process of reflective practice: facilitating teachers to reflect on their teaching design using evidence from the actual delivery to their students
Teaching Analytics: Analyse Teaching Design

**for self-reflection and improvement**
visualize the *elements* of a lesson plan
visualize the alignment of a lesson plan to *educational objectives / standards*
validate whether a lesson plan has potential *inconsistencies* in its design

**through sharing with peers or mentors to receive feedback**
support the process of *sharing* a lesson plan with *peers or mentors*,
allowing them to provide *feedback* through comments and annotations

**through co-designing and co-reflecting with peers**
allow *peers* to *jointly analyze* and *annotate* a common teaching design in
order to allow for co-reflection
Learning Analytics

Collection of learner data during the delivery of a teaching design (e.g., a lesson plan) to *build/update individual student profiles*.

**Types of learner data** typically are *“Dynamic Student Data”*:

- **Engagement in learning activities**. For example, the progress each learner is making in completing certain learning activities.
- **Performance in assessment activities**. For example, formative or summative assessment scores.
- **Course Activities & Engagement: Interaction with Educational Resources & Tools, Peers & Tutors**. For example which educational resources each learner is viewing/using.
- **Emotional Data**. For example stress, boredom, anxiety.
Educational Data Analytics Technologies

**Descriptive Analytics:** use data *aggregation* and data *mining* to provide insight into the past and answer: “*What has happened?*” (e.g., reports and descriptions).

**Diagnostic Analytics:** dissect the data with methods like data *discovery*, data *mining and correlations* to answer the question “*Why did it happen?*” (e.g., interactive visualizations).

**Predictive Analytics:** utilize a variety of data to make the prediction and apply sophisticated analysis techniques (such as *machine learning*) to answer the question “*What is likely to happen?*” (e.g., trends and predictions).

**Prescriptive Analytics:** utilize an understanding of “*what has happened*”, “*why it has happened*” and a variety of “*what-might-happen*” analysis to *recommend best next actions in context to take* and answer the question “*What do I need to do?*” (e.g., alerts, notifications, recommendations).
How Educational Data can help School Teachers?

<table>
<thead>
<tr>
<th>Teacher Inquiry Cycle Steps</th>
<th>How TLA can contribute</th>
</tr>
</thead>
</table>
| **Identify a Problem to Inquiry** | **Teaching Analytics:** capture and analyse the teaching design and help the teacher to:  
  • pinpoint the specific elements of their teaching design that relate to the problem they have identified;  
  • elaborate on their inquiry question by defining explicitly the teaching design elements they will monitor and investigate in their inquiry. |
| **Develop Inquiry Questions and Define Inquiry Method** |  |
| **Elaborate and Document Teaching Design** |  |
| **Implement Teaching Design and Collect Data** | **Learning Analytics:**  
  • collect the learner data relevant to inquiry question.  
  • analyse and report on the collected data to facilitate interpretation. |
| **Process and Analyse Data** |  |
| **Interpret Data and Take Actions** | The combined use of **Teaching and Learning Analytics** can be used to map the analysed data to the initial teaching design, answer the inquiry question and generate insights for teaching design revisions. |
How Educational Data can help School Teachers of Blended (Flipped Classroom) Courses?

Alice is a School Teacher using Flipped Classroom

Alice is an enthusiastic English teacher who has just been appointed in a High School in Athens, Greece. She will be responsible for the English Course of grade 9. She is very excited about her new role but the school is a bit worried by last year’s 8th graders’ relatively low performance compared to other district schools.

After talking to Mr. Adams...

TO-DO LIST

1. Create an account on the school's LMS and familiarize with it
2. Sign the required data protection consent form (by the student and by the district)
3. Conduct a needs assessment
4. Select students for data collection
5. Implement the blended learning management system and other data collection methods

After running the online courses for three weeks...

Helen is struggling.

David is struggling.

John avoids participation in the online discussions.

This learning activity has problem.

Peer is exciting. Maybe I should assign him something more challenging.

For sure I must improve this activity!

Implementation

Ann needs a little nudge.

Ann, 5th grade student.

Anne, the teacher.

Alex, the director.

Peter, 9th grade student.

Data Management

Using Learning Analytics, Alice collects and analyses data about her students and now she is self-reflexive to improve the design and the delivery of her course. She uses Learning Analytics tools to monitor their learning progress, to discover patterns, to identify problems early, to find indications for success and indicators for poor learners or dropouts.

Based on the results of her data analysis, Alice decides to revise the course’s online learning activities and educational resources. She uses a Learning Analytics tool that provides an easy-to-use way to analyse and visualise the metrics of the course. Alice decides to include additional discussion forums to enhance participation and to further support the students when they study at home.

Furthermore, Alice designs an evaluation plan for her course. She decides to use learning analytics indicators and criteria for success. She plans to use indicators to ensure that the flipped classroom initiative is on track to reach the long-term goal of improving students’ academic performance to reach the required standards. Her data literacy awareness and competencies, including the use of available tools, have helped her collect useful evidence based on data analysis for herself, her students and the parents.

It is the end of the school year and everyone is happy. Most of the students liked the flipped classroom experience and performed well. Ann overcome her learning gaps and is now having her confidence. Peter won a competition with his outstanding project. This year’s 8th graders exceeded the director’s expectations. Alice is proud of what she has achieved and she is already thinking of the revised version of her course, according to the results of the data-based evaluation.
Barriers to Educational Data

- **Access to Educational Data**
  - Lack of easy access to diverse data from different sources internal and external to the school system

- **Timely collection and analysis of Educational Data**
  - Delayed or late access to data and/or their analysis might affect the efficiency of the planned in response to data intervention

- **Quality of Educational Data**
  - Verification of the validity of collected data - do they accurately measure what they are supposed to?

- **Lack of time and support**
  - A very time- and resource-consuming process (infrastructure and human resources)

Sofia Mougiakou, Dimitra Vinatsella, Demetrios Sampson, Zacharoula Papamitsiou, Michail Giannakos, Dirk Ifenthaler, Educational Data Analytics for Teachers and School Leaders, Springer, 2022, Fig 1.18, pg 43
Principles and challenges to comply with GDPR

**Personal Data**
Personal Data is defined as any information about an identified or identifiable person, also known as the data subject.

**Anonymous Information**
Regulation does not concern the processing of properly anonymized data. Anonymisation is often seen as the "easy way out" of data protection obligations. However, experts around the world are adamant that 100% anonymisation is not possible.

**Lawfulness of processing**
GDPR allows processing of personal data where is necessary for the purposes of organization’s or a third party’s legitimate interests. This may be taken by institutions as justification for not obtaining proper consent from learners. However, it may be difficult to argue that the individual’s privacy is less important than the institution’s right to carry out learning analytics without consent.

**Sensitive Personal Data**
Processing of sensitive personal data, also defined as special categories of data, e.g. revealing racial or ethnic origin, political opinions, religious or philosophical beliefs shall be prohibited, unless the individual has given explicit consent to the processing of those personal data for one or more specified purposes.

**Automated decision-making and profiling**
Individuals have the right not to be subject to a decision that is based solely on automated processing. However, there are some exceptions to this rule, such as when they have given their explicit consent to the automated decision.

Sofia Mougakou, Dimitra Vinatsella, Demetrios Sampson, Zacharoula Papamitsiou, Michail Giannakos, Dirk Ifenthaler, Educational Data Analytics for Teachers and School Leaders, Springer, 2022, Fig 2.17, pg 96
Control over Personal Data under GDPR

- **Right to be informed**
  Right to **information** about the processing of your personal data;

- **Right to be forgotten**
  Right to request that personal data be erased when it’s no longer needed or if processing it is unlawful;

- **Right to data portability**
  Right to receive your personal data in a machine-readable format and send it to another controller;

- **Right to restrict processing**
  Right to request the restriction of the processing of your personal data in specific cases;

- **Right of access**
  Right to obtain access to the personal data held about you;

- **Right to rectification**
  Right to ask for incorrect, inaccurate or incomplete personal data to be corrected;

- **Right to object**
  Right to object to the processing of your personal data for marketing purposes or on grounds relating to your particular situation;

**Rights related to automated decision making including profiling**

Right to request that decisions based on automated processing concerning you or significantly affecting you and based on your personal data are made by natural persons, not only by computers. Right to express your point of view and to contest the decision.

Sofia Mougialakou, Dimitra Vinatsella, Demetrios Sampson, Zacharoula Papamitsiou, Michail Giannakos, Dirk Ifenthaler, Educational Data Analytics for Teachers and School Leaders, Springer, 2022, Fig 2.22, pg 105
Professional Development 4
Educational Data Literacy
EDU1x: Analytics for the Classroom Teacher

developed

the first Massive Online Open Course (MOOC) on the use of Educational Data Analytics by School Teachers (Analytics for the Classroom Teacher)

offered by the edX platform (a Harvard and MIT led global initiative)

which has attracted more than 25,000 participants from 180 countries around the world since October 2016.
edX MOOC, Curtin University

EDU1x Analytics for the Classroom Teacher

30,000 enrollments from 180 countries since October 2016
Learn2Analyze:
An Academia-Industry Knowledge Alliance for enhancing Online Training Professionals’ (Instructional Designers and e-Traines) Competences in Educational Data Analytics

European Commission
ERASMUS+ Key Action 2 “Cooperation for innovation and the exchange of good practices - Knowledge Alliances”
Academia – Industry - End User Communities

2018-2021
Educational Data Literacy Roadmap

1. COLLECT: Locate and Collect Relevant Educational Data
2. KNOW: Know about Educational Data beyond Grades
3. 01: ANALYSE: Synthesise and Analyse Educational Data from Diverse Sources
4. UNDERSTAND: How to Use Educational Data beyond Grades
5. ENGAGE: Engage in a Data-Driven Continuing Inquiry Process
6. CUSTOMISE: Use Data Analysis to Customise Teaching Plans to Diverse Groups
7. REFLECT: Use Own Data to Reflect on Practice
8. FACILITATE: Facilitate Students to Understand their Data
9. COMMUNICATE: Communicate Insights from Data Analysis
10. MONITOR: Monitor this process in a continuous manner
Learn2Analyze

Educational Data Literacy Competence Dimensions

DATA COLLECTION
Access & Gather Appropriate Educational Data

DATA ETHICS
Ensure Clear Ethical Policies & Codes of Practices that Govern the Use of Educational Data

DATA APPLICATION
Use Educational Data Analysis Results to Make Decisions to Revise Instruction

DATA COLLECTION

DATA MANAGEMENT
Organize, Clean, Curate & Preserve Educational Data

DATA ANALYSIS
Apply Educational Data Modelling & Presentation Methods

DATA COMPREHENSION & INTERPRETATION
Understand what the Educational Data Represent & Mean
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<tbody>
<tr>
<td>1.1 Know - understand - be able to obtain, access and gather the appropriate data and/or data sources</td>
<td>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)</td>
<td>3.1 Know - understand - be able to apply data analysis and modeling methods (e.g. application of descriptive statistics, exploratory data analysis, data mining).</td>
<td>4.1 Know - understand - be able to interpret data properties (e.g., measurement error, outliers, discrepancies within data, key take-away points, data dependencies)</td>
<td>5.1 Know - understand - be able to use data analysis results to make decisions to revise instruction</td>
<td>6.1 Know - understand - be able to use the informed consent</td>
</tr>
<tr>
<td>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)</td>
<td>2.2 Know - understand - be able to apply data description (i.e., metadata)</td>
<td>3.2 Know - understand - be able to apply data presentation methods (e.g., pictorial visualisation of the data by using graphs, charts, maps and other data forms like textual or tabular representations)</td>
<td>4.2 Know - understand - be able to interpret statistics commonly used with educational data (e.g., randomness, central tendencies, mean, standard deviation, significance)</td>
<td>5.2 Be able to evaluate the data-driven revision of instruction</td>
<td>6.2 Know - understand - be able to protect individuals' data privacy, confidentiality, integrity and security</td>
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<td></td>
<td>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)</td>
<td></td>
<td>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)</td>
<td></td>
<td>6.3 Know - understand - be able to apply authorship, ownership, data access (governance), re-negotiation and data-sharing</td>
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<td>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</td>
<td></td>
<td>4.4 Be able to elicit potential implications/links of the data analysis insights to instruction</td>
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Learn2Analyze  MOOC

Learn to Analyze Educational Data and Improve your Blended and Online Teaching

The course is combines

• **theory** on collecting, analysing, interpreting and using educational data (including issues related with ethics and privacy),
• with **practice** on applying educational data analytics in three different e-learning platforms, including Moodle.

Leads to a free **Certification of Achievement in Educational Data Literacy (Level A & B)** upon successful completion.
## Module 1 - Orientation

**Module 2 - Online and Blended Teaching and Learning supported by Educational Data**
- **Topic 1** – Educational Data as a key success factor for online and blended teaching and learning
- **Topic 2** – Data is Everywhere (Educational Data Collection)
- **Topic 3** – Adding value to educational datasets (Educational Data Management)

## Module 3 - Learning Analytics
- **Topic 1** – Using learner-generated data and learning context for extracting learning analytics
- **Topic 2** – Organizing and presenting learning analytics
- **Topic 3** – Interpreting and mapping learning analytics

## Module 4 - Teaching Analytics
- **Topic 1** – Data sources for supporting teaching analytics
- **Topic 2** – Data ethics and privacy principles for teaching analytics
- **Topic 3** – Applying and communicating educational data and analytics findings

## Module 5 - Applying Educational Data Analytics with Moodle
- **Topic 1** – Moodle Site Level
- **Topic 2** – Course Level
- **Topic 3** – User Level
- **Topic 4** – 3rd Party Tools in Moodle

## Module 6 - Applying Educational Data Analytics the eXact Suite
- **Topic 1** – Understanding and supporting course progress via learning reports
- **Topic 2** – Additional learning reports
- **Topic 3** – Beyond the LMS, monitoring and supporting informal learning via eXact Delivery Portal

## Module 7 - Applying Educational Data Analytics the Learning Suite
- **Topic 1** – How educational data is handled in Learning Suite (Overview of main principles and techniques)
- **Topic 2** – Possibilities of Teaching Analytics in the Learning Suite
- **Topic 3** – Tools of Learning Analytics in the Learning Suite
- **Topic 4** – Using Teaching and Learning Analytics tools of the Learning Suite to support Teacher Inquiry

## Module 8 – Concluding the MOOC
Educational Data Literacy

a monograph on educational data literacy (EDL), researching and presenting a competence profile for EDL together with exemplary learning outcomes and use-case examples for indicative target groups such as, instructional designers, e-trainers and K-12 teachers

Educational Data Analytics for Teachers and School Leaders

An Open Access textbook for building educational data literacy competences. It includes chapters on Online and Blended Teaching and Learning Supported by Educational Data, Adding Value and Ethical Principles to Educational Data, Learning Analytics, Teaching Analytics.
Microcredentials for Educational Data Literacy

Learning Outcomes
These learning outcomes will have been assessed against transparent and clearly defined criteria.

Portability
Microcredentials are owned by the learner, can be shared and are portable.

Learning experiences
Learning experiences leading to microcredentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs.

Quality Assurance
They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity.

Stackability
They may be stand-alone or combined into larger credentials.

https://www.presentationgo.com/
(European) Microcredentials for Educational Data Literacy
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https://www.presentationgo.com/
Microcredentials for Educational Data Literacy:
European Principles for the Design & Issuance of Micro-credentials

1. Quality
2. Transparency
3. Relevance
4. Valid assessment
5. Learning pathways
6. Recognition
7. Portable
8. Learner-centred
9. Authentic
10. Information and guidance

https://tinyppt.com/
Educational Data Literacy

Educational Data Analytics for Teachers and School Leaders
Thank you for your attention
Q&A
Thank you!

www.eun.org