

# Creating Space for Data Science in K-12 Mathematics Education: Instructional and Professional Learning Perspectives from Türkiye

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The Role of Computational Thinking, Data Science, and AI

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# National context: K-12 Mathematics Education in Türkiye

## The Century of Türkiye Education Model (since 2024-2025 academic year)

→ Emphasis on **competencies**

- **Mathematical Domain Skills**

(Statistics included within mathematics strand)

- Mathematical Reasoning
- Mathematical Problem Solving
- Mathematical Representation
- **Working with Data and Making Data-Driven Decision**
- Working with Mathematical Tools and Technology

- **Literacy Skills** (Intercurricular components)

- **Information Literacy**
- **Digital Literacy**
- **Financial Literacy**
- Visual Literacy
- Cultural Literacy
- **Civic Literacy**
- **Data Literacy**
- **Sustainability Literacy**
- Art Literacy

Millî Eğitim Bakanlığı [Ministry of National Education] (2024). *Türkiye yüzyılı maarif modeli öğretim programları ortak metni* [The Century of Türkiye Education Model Teaching Programs Common Text]. [https://tymm.meb.gov.tr/upload/brosur/ortak\\_metin.pdf](https://tymm.meb.gov.tr/upload/brosur/ortak_metin.pdf)

# National context: K-12 Mathematics Education in Türkiye

The Century of Türkiye Education Model (since 2024-2025 academic year)

- Explicit encouragement for **interdisciplinary** connections
- Strong focus on **digital literacy** and **technology** integration
- **Inquiry-based** and **real-life problem solving** highlighted
- Grade 12 Theme: **Working with existing data**
  - Students design and carry out the statistical investigation process, and share the results

✗ **Data science** (DS) is not an explicit curricular strand

✗ **AI** is not systematically integrated into mathematics, but **computational thinking** appears as “algorithm and computing” theme

# Shift from statistics content to DS-oriented practices

Not new topics, but new classroom practices

- Tidy, ready-made datasets → Messy, unstructured data
- Predefined variables → Variable identification and generation (i.e., image-based data\*)
- Procedural calculations → Inquiry and modeling
- Static representations, e.g., textbook charts → Digital data visualization tools
- Focus on answer → Focus on interpretation, prediction, and decision-making

\* Kazak, S. (2025). Data-ing process with image-based data: variable identification and generation. *ZDM Mathematics Education*, 57(1), 61–74. <https://doi.org/10.1007/s11858-025-01656-5>

# A professional learning study in preparing teachers for DS-oriented instruction

## Promoting Data Science Education for Teacher Education at the University Level (<https://datasetup.euc.ac.cy/>)

- Erasmus+ Cooperation Partnership project in higher education, funded by EU (2023-2026): 6 institutions from Cyprus, Germany, Greece, Ireland, and Türkiye
- **Aim:** Develop data science education modules with the integration of digital tools (e.g., CODAP, Teachable Machine) to be used with pre-service teachers (PSTs) in STEAM subjects



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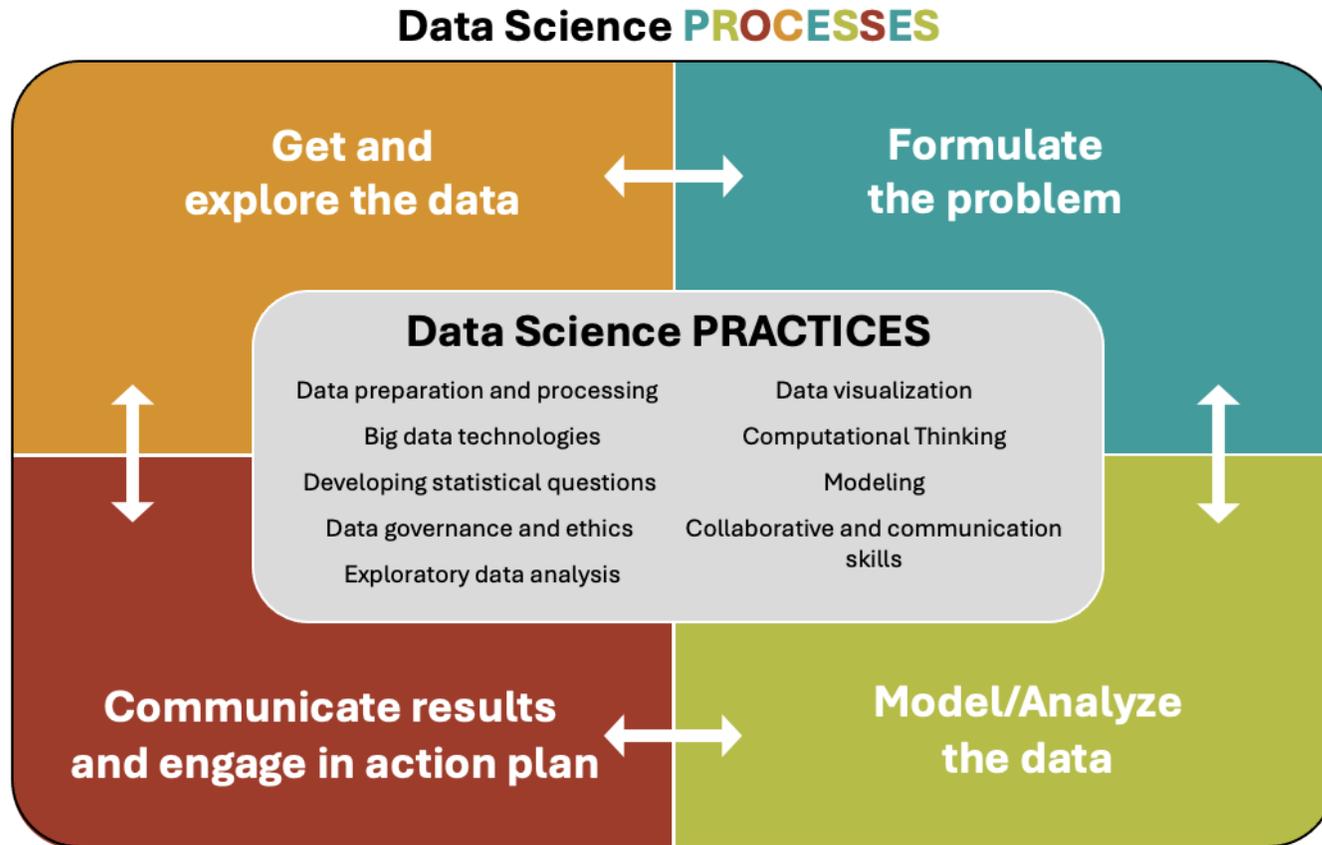
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DATASETUP

# The **EDUCATE** (Empowering Data Science Understanding for Teacher Education) Conceptual Framework



Target audience:

- Pre-service teachers (*doing* DS)
- Instructors of PSTs (*teaching and doing* DS)

Leavy, A., Kazak, S., Podworny, S., & Frischemeier, D. (2026). Designing Data Science Learning in Initial Teacher Education: The EDUCATE Conceptual Framework. *Education Sciences*, 16(2), 307.

<https://doi.org/10.3390/educscil6020307>

# Instructional Practices in DataSETUP Modules

- ✓ Structured scaffolding around the DS processes and practices (EDUCATE framework)
- ✓ PSTs (as learners) work with authentic “messy” data (e.g., bee hive sensors, mental health survey, young people’s news consumption), preparing, cleaning, analyzing, and visualizing data themselves
- ✓ AI and machine learning (ML) activities are introduced as extensions of DS
- ✓ Computational thinking is embedded in data and ML practices as reasoning about patterns, abstraction, and processes
- ✓ Ethical considerations are embedded within data and AI activities through critical examination of data sources, bias, and societal consequences

# Challenges and Concerns in the Turkish Context

- High-stakes assessment culture (admission to selective secondary schools and access to higher education)
  - Centralized exams (single correct answers, time-limited performance) strongly shape teaching and learning
- Limited formal preparation in DS or AI during initial teacher education
- Slight teacher confidence in guiding open-ended data exploration in a context
- Insufficient experience with digital tools for data exploration in math classrooms (for both teachers and students)
- Need more instructional resources for teachers

Thank you for listening