

Approaches and Tools for Teaching Biomedical Data Science during the COVID-19 Pandemic. A Systematic Literature Review

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Abstract

Introduction: The COVID-19 pandemic was highly disruptive for the education process at all levels. Worldwide, communities of teachers teamed up to develop and share solutions to the unprecedented challenges, either as open source or under Creative Commons licenses. We conducted a systematic review aimed at identifying educational approaches and tools employed in academic courses related to biomedical data science during the pandemic. *Methods:* Two independent reviewers searched the relevant published literature during April 2020 – July 2021, by using PubMed (pubmed.ncbi.nlm.nih.gov), IEEE Xplore (ieeexplore.ieee.org), and Google Scholar (scholar.google.com). They looked for: teaching methods, learning management systems (LMS), assessment methods, courseware (either open or not), educational software, support for independent and/or adaptive learning, synchronous vs. asynchronous teaching solutions, artificial intelligence employed in education, analytical instruments, whether or not subjective or objective feed-back was collected from learners, and tailored approaches for students with medical vs. technical background. The eligibility criteria were: (a) paper in an academic journal or conference proceedings, with Digital Object Identifier number; (b) teaching/assessment approach or instrument targeting university students; (c) academic subject related to biomedical or health data science. Grey literature and web sites with no published support were excluded from this review. The results were synthesized according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). No meta-analysis was conducted, as no uniform system of metrics is in use. When possible, an educational quality appraisal was performed, according to the principles of the European Union Digital Education Action Plan (www.ec.europa.eu/education) and pan-European initiative OpenupEd (www.openuped.eu). *Conclusions:* A wide variety of digital learning resources have been developed and shared, accompanying and enhancing the educational transformation in biomedical information sciences. The apparent global trend is towards openness in its multiple forms, a symmetrical teaching – learning relationship, and facilitating and empowering the independent initiative.

Keywords: Education; Medical Information Science; Courseware; Teaching Methods; Educational Techniques