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Methods and target values used to evaluate teaching concepts, with a particular emphasis on the incorporation of digital elements in higher education: A systematic review

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ADMINISTRATIVE INFORMATION

Support - This review is part of the project 'Optimize, promote and transform face-to-face and online sports science teaching' [Sportwissenschaftliche Praesenz- und Online-Lehre optimieren, renommierten und transformieren – SPort] at the German Sport University Cologne, Cologne, Germany, funded by the Foundation for Innovation in University Teaching [Stiftung Innovation in der Hochschullehre].

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 17 June 2024 and was last updated on 17 June 2024.

INTRODUCTION

Review question / Objective The objective of this review is to provide a comprehensive overview of the methods and target values used to evaluate teaching concepts, with a particular emphasis on the incorporation of digital elements in higher education. The objective is to provide a comprehensive and systematic overview of the methods and target values used for special attention on the incorporation of digital elements in teaching concepts.

Rationale The evaluation of teaching quality in universities typically relies on course evaluations (CE), which are primarily conducted by students. CE criteria cover student competence, framework conditions, teaching, lecturers, and learning outcomes. However, the integration of digital elements in education has received little attention

so far. This inquiry examines the extent to which current course evaluations (CE) need to be adapted for digital components and formats.

Condition being studied Sports science has unique characteristics due to its physical nature. The curriculum includes practical sports courses and traditional lectures and seminars, requiring a different approach with the use of digital elements. It also includes modules that align with content areas found in other academic programs, such as statistics, health, nutrition, medicine, biology, management, psychology, and education. This dual aspect, which requires a nuanced integration of digital resources, presents specific challenges and opportunities in sports science education. In order to address this aspect, only university subjects related to the teaching of sports science were included.

METHODS

Search strategy The search syntax for title and abstract queries utilized the following terms in both German and English, without imposing restrictions on the publication period. However, the school context (school, pupil/s) was excluded:

- digital elements: online based, e-learning, online/digital learning/teaching/tool/education/method, e-teaching, technolog* tool, technology enhanced learning
- setting: university, higher education
- teaching concept: concept/s, approach/es
- evaluation: evaluat*, measur*, assessment, analysis, intervention, effectiveness, survey, test, exploration, impact, effect, investigation.

Participant or population Participants had to be students enrolled in universities or universities of applied sciences, taking courses related to sports science, such as anatomy, exercise science, biology, biomechanics, health sciences, management, medicine, physiology, psychology, physical education, or statistics.

Intervention The intervention must have included a comprehensive teaching concept implemented over a minimum of one semester, integrating digital components such as gaming or quiz formats, videos, podcasts, and an explanation of their use, such as in a blended learning context.

Comparator The study's outcomes were required to include precise target values and the instruments used to measure them, as described in the scholarly publication.

Study designs to be included The research design encompassed both quantitative and qualitative methods, inclusive of cross-sectional or longitudinal studies, as well as pilot studies.

Eligibility criteria The inclusion criteria, defined as (1) to (5), are specified below:

- (1) Participants had to be students enrolled in universities or universities of applied sciences, taking courses related to sports science, such as anatomy, exercise science, biology, biomechanics, health sciences, management, medicine, physiology, psychology, physical education, or statistics. Programs unrelated to sports studies, such as art or music, were excluded.
- (2) The intervention must have included a comprehensive teaching concept implemented over a minimum of one semester, integrating digital components such as gaming or quiz formats, videos, podcasts, and an explanation of their use, such as in a blended learning context.

- (3) The study's outcomes were required to include precise target values and the instruments used to measure them, as described in the scholarly publication. Outcomes related to 'digital competency' or 'digital literacy' were excluded from the scope of this analysis, as they have been extensively examined in previously published systematic reviews.

- (4) The research design encompassed both quantitative and qualitative methods, inclusive of cross-sectional or longitudinal studies, as well as pilot studies.

- (5) Eligibility requires that studies are accessible as full-text articles published in scientific journals, with the language of publication being either German or English.

Information sources The literature search was conducted using several databases, including Scopus, Web of Science, ERIC (Education Resources Information Center), PubMed, and the 'FIS-Bildung' literature database (Education Information System in the Education Specialist Portal Pedagogy).

Main outcome(s) The review analyzed 22 articles published between 2004 and 2023 from a pool of 11,851 manuscripts. The findings indicate a significant gap in comprehensive quality criteria and instrument references. Self-developed questionnaires and performance examinations were prevalent, mostly classified under the lowest evidence level (C). A limited number of studies focused on psychological outcomes and the evaluation of digital teaching concepts, fulfilling all criteria for the highest evidence level (A). The results indicate a focus on using open-ended questions, interviews, and feedback mechanisms to gain insights into students' perceptions, which are essential for refining teaching concepts.

Additional outcome(s) There is a need to develop and validate evidence-based measurement techniques to better accommodate digital elements integration in teaching evaluations for future university pedagogy enhancements. The findings of this review provide a robust foundation for this purpose.

Data management Microsoft Excel and the Rayyan web platform are used for data management.

Quality assessment / Risk of bias analysis This systematic review follows the PRISMA guidelines. To account for the heterogeneity in the sophistication of the methods and target values, the authors developed a taxonomy with three

levels of evidence (A to C). All included studies were classified into one of these three levels in order to assess the extent to which underlying evidence (theoretical framework based on references, quality criteria) supports the methods and target values. Studies that explicitly described both the quality criteria and references for the measurement instrument were assigned to evidence level (A). For evidence level (B), studies presented either the quality criteria or references of the method. For evidence level (C), studies lacked both quality criteria and references.

Strategy of data synthesis Two independent reviewers screened and determined study eligibility according to predefined inclusion criteria. Any discrepancies in study assessment between reviewers were collaboratively addressed, and reasons for exclusion were discussed, leading to a consensus on whether to include or exclude the study.

Subgroup analysis Subgroups of quantitative and qualitative methods together with the three predefined levels of evidence are analyzed.

Sensitivity analysis A Sensitivity analysis was not part of this review.

Language restriction Language of publications had to be either German or English.

Country(ies) involved Germany.

Keywords evaluation; digital tools; teaching; university.

Dissemination plans The review and its results should be published in a scientific research journal.

Contributions of each author

Author 1 - Tobias Morat - Author 1 conceptualized the study. Both authors screened the studies and decided about inclusion and exclusion of relevant manuscripts. Both authors synthesized the results from articles included.

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Author 2 - Anna Hollinger - Author 2 conceptualized the study. Author 2 performed the literature searches in all databases. Both authors screened the studies and decided about inclusion and exclusion of relevant manuscripts. Both authors synthesized the results from articles included.

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