A SYSTEM OF INDICATORS FOR MONITORING THE EFFECTIVENESS OF DISTANCE COURSES USING DIGITAL TOOLS

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Abstract. The paper proposes a system of indicators for monitoring the effectiveness of distance courses on the basis of data collected through digital tools. The system was developed through content and comparative analysis of research literature and pedagogical synthesis. The indicators are divided into outcome and process groups, and a digital data source, a measurement method and an initial target value are specified for each of them. A four-stage monitoring cycle and conditions for interpreting the indicators are substantiated. The system has not yet been tested in real courses; a plan for its empirical verification is outlined.

Keywords: distance education, course monitoring, outcome indicators, process indicators, learning analytics, normalised gain, formative assessment.

1. INTRODUCTION

Digital educational technologies widen the opportunities for learning at a distance, but the mere availability of a platform does not automatically improve learning outcomes. The 2023 UNESCO Global Education Monitoring Report stresses that robust evidence on the added value of digital technology in education is still scarce and that decisions on its introduction should be evidence-based [1]. Hence, conclusions about the effectiveness of a distance course should rest not on impressions but on indicators that are collected and checked regularly.

In a distance course, digital tools automatically record traces of each student's activity: test results, submission times, discussion posts and editing histories. However, studies of learning analytics in higher education note that these data are mostly used as behavioural indicators such as the number of clicks and time spent, while studies that analyse several indicators together are rare [2]. According to the principle of constructive alignment proposed by J. Biggs, the indicators being assessed should be aligned with the intended learning outcomes [3].

The aim of this study is to substantiate a system of indicators for monitoring the effectiveness of distance courses on the basis of data collected through digital tools, together with a procedure for its use. The novelty of the work lies in linking each outcome and process indicator to a specific digital data source, a calculation formula, a target value and an interpretation condition, and in integrating these indicators into a four-stage monitoring cycle.

2. RESEARCH METHODOLOGY

The study is theoretical and conceptual; it applies content analysis of sources, comparative analysis and pedagogical synthesis. Sources were selected according to three criteria: being a peer-reviewed publication, an official report of an international organisation or a legal act; being verifiable through official publication data; and being directly related to the assessment of educational effectiveness. The selected sources cover learning analytics [2], the alignment of outcomes and assessment [3], the measurement of learning gain [4], the quality of online discussion [5], factors of online learning effectiveness [6], multimedia design [7], self-regulated learning [8] and feedback [9]. The digital data sources considered are learning management systems (LMS) such as Moodle and Google Classroom, online testing tools, videoconferencing platforms and shared documents.

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3. RESULTS AND DISCUSSION

System of indicators. As a result of the analysis, a system of indicators consisting of two groups is proposed (Table 1): outcome indicators show what a student has achieved, and process indicators show through what activity this was achieved. Learning gain is assessed with the normalised gain coefficient proposed by R. Hake [4]:

$g = (\text{post} - \text{pre}) / (100 - \text{pre}),$ (1)

where *pre* and *post* are the group's average scores, in per cent, on identical or parallel pre- and post-tests. According to Hake, $g < 0.3$ indicates low, $0.3 \le g < 0.7$ medium and $g \ge 0.7$ high gain [4]; since these thresholds were derived from introductory physics courses, their applicability to other disciplines requires empirical verification. The coefficient allows groups with different initial levels to be compared more accurately than the raw score difference does; it is undefined when the pre-test score is 100 % and becomes negative if scores decline. For example, if the pre-test score is 40 % and the post-test score is 70 %, then $g = 30 / 60 = 0.5$, i.e. a medium gain.

Table 1. Indicators for monitoring the effectiveness of a distance course

Indicator (group)	Digital data source	Measurement method
Learning gain (outcome)	Wayground (formerly Quizizz), Google Forms: pre-test and post-test	Normalised gain coefficient g [4]
Achievement of learning outcomes (outcome)	LMS gradebook, rubrics	Students reaching the criterion level / total students × 100 %
Course completion (outcome)	LMS completion reports	Students who completed the module / enrolled students × 100 %
On-time submission (process)	Moodle, Google Classroom reports	Assignments submitted on time / total assignments × 100 %
Discussion quality (process)	LMS forum, Zoom or Microsoft Teams recordings	1–4 point rubric based on the phases of cognitive presence [5]
Use of feedback (process)	LMS assignment versions, Google Docs version history	Works revised after feedback / works that received feedback × 100 % [9]
Student perception (process)	Google Forms survey at the end of the module	Mean score on a 5-point Likert scale

Monitoring cycle. Monitoring is organised as a four-stage cycle: (1) selecting indicators on the basis of the module's learning outcomes [3] and setting their target values; (2) collecting process indicators weekly and outcome indicators at the beginning and end of each module; (3) analysing the indicators together, i.e. comparing LMS data with rubric scores and student survey results [2]; (4) adjusting the course and giving feedback to students, i.e. formative assessment. As initial target values, the author proposes: $g \ge 0.3$, which corresponds to the lower bound of medium gain [4]; at least 70 % of students reaching the criterion level; a course completion rate of at least 80 %; at least 80 % of assignments submitted on time; an average discussion score of at least 2.5; at least 60 % of works revised after feedback; and a mean perception score of at least 3.5. These values are benchmarks to be calibrated

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at the empirical stage. Showing students their own indicators supports the processes of self-monitoring and self-evaluation described by B. Zimmerman [8]. For instance, if a group's *g* is low at the end of a module in the "Information Technologies" course, the learning materials are first checked for compliance with the coherence and segmenting principles described by R. Mayer [7].

Interpretation conditions. Discussion quality is assessed with a 1–4 point rubric adapted by the author and based on the four phases of cognitive presence (triggering event, exploration, integration, resolution) in the Community of Inquiry model proposed by D. Garrison, T. Anderson and W. Archer [5]. According to the meta-analysis by B. Means and co-authors, learning outcomes depend not only on the platform but also on factors such as instructional design and learning time [6]. Therefore, a change in one indicator is assessed together with the other indicators and the course context: for example, late submissions may indicate not low engagement but a barrier related to internet access or devices [1]. Student data are used only for educational purposes: individual indicators are visible only to the student concerned and the teacher, results are reported to others only in aggregated form, video recordings are analysed only with students' informed consent, and the monitored indicators are announced to students in advance.

Limitations. The proposed system is so far substantiated only theoretically; at the next stage it is planned to apply it in several distance courses, to empirically test the relationships between the indicators and their usefulness for teachers, to calibrate the target values and to assess the inter-rater reliability of the discussion rubric (Cohen's kappa).

4. CONCLUSION

Conclusions about the effectiveness of a distance course should rest on outcome and process indicators collected regularly through digital tools. The proposed system links each indicator to a data source, a measurement method and an interpretation condition, while the four-stage cycle directs the collected data towards adjusting the course and giving feedback to students. Given that the Law "On Education" defines distance education as a separate form of education [10], the system can be used for internal quality monitoring of distance courses in higher education institutions and in professional development programmes for teachers.

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