Review of Learning Outcomes Prioritisation Approaches

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Abstract. *This paper reviews approaches to prioritising learning outcomes (LOs) by defining LO prioritisation, identifying existing methods, and evaluating their applicability in educational contexts. The study combines a literature review with a qualitative expert-based analysis of multi-criteria decision-making (MCDM) methods. Of 286 papers analysed, only 12 addressed LO prioritisation and were classified into four categories. Experts proposed and compared six methods: simple additive weighting, analytic hierarchy process, analytic network process, SWING, decision making trial and evaluation laboratory, and social network analysis process. Their applicability and complexity were assessed, demonstrating how LO prioritisation can support learning design and educational alignment.*

Keywords. Learning outcomes, weights, prioritisation, multi-criteria decision-making methods

1 Introduction

In contemporary education systems, courses and study programmes are typically defined through intended learning outcomes (LOs), referring to explicit statements describing what learners are expected to know, understand, or be able to do upon completion of a learning process. The increasing emphasis on outcome-based education, particularly within frameworks such as the Bologna Process (European Commission, 2015), highlights the importance of clearly defined and measurable LOs in curriculum design, implementation, and evaluation.

However, not all LOs are equally important. Some LOs represent core knowledge and competencies essential for achieving the overall purpose of a course, while others play a more supportive or complementary role. Despite this, LOs are often treated as having equal importance in practice, which may lead to suboptimal curriculum design, assessment strategies, and resource allocation. Consequently, prioritising LOs - i.e., determining their relative importance and assigning weights (Divjak et al., 2021) - emerges as a meaningful and necessary process for improving the effectiveness and coherence of teaching and learning. In this paper, prioritisation is operationalised as determining the relative importance of learning outcomes through weighting methods. Consequently, weighting is considered the quantitative implementation of prioritisation rather than an alternative decision task.

This paper addresses the challenge of LO prioritisation by exploring existing approaches and identifying suitable methods for its implementation. First, it provides the findings of a systematic review of the literature conducted to identify how LOs and related constructs such as learning objectives, goals, and competencies have been prioritised in the reviewed research. Second, it presents a qualitative analysis of potential LO prioritisation methods from the perspective of experts in decision-making, recognising that this problem can be framed as a multi-criteria decision-making task. Based on this, we propose a set of applicable methods for LOs prioritization and discuss their characteristics, particularly in terms of complexity and practical usability.

This research is conducted within the framework of the Erasmus+ project Streamlining AI in Learning Reimagination (SAILeR). The project aims to empower educators to enhance the quality of teaching and learning in the era of artificial intelligence by supporting the development of innovative learning design practices, including prioritization of LOs. Within the project, there is also a plan to enhance the Balanced Design Planning (BDP) learning design tool (Divjak et al., 2022) by integrating one of the identified prioritisation methods, taking into account their complexity and the level of understanding among educators who are not experts in multi-criteria decision-making.

2 Background

2.1 Learning Outcome Prioritisation

Learning outcomes (LOs) have a central role in learning and curriculum design. Terminology varies across contexts and learning objectives, learning goals, or learning competencies are also used when describing courses and curricula. These constructs are not synonymous, but in practice they often overlap and are sometimes used interchangeably. However, the central construct in contemporary education is that of LOs, referring to statements describing what learners are expected to know, understand, and be able to do upon completion of a learning process (European Commission, 2015). LOs describe observable and measurable learner achievements, while in competence-based education, competencies integrate knowledge, skills, and attitudes into demonstrable capabilities applied in professional and real-world contexts (Mulder, 2014).

Within a curriculum or a course, not all LOs are equally important. In particular, prior research has demonstrated that LOs differ in their relevance depending on multiple criteria, such as their importance for future professional practice, cognitive level (e.g., based on Bloom's taxonomy), contribution to the development of generic skills, and the required student workload (Divjak et al., 2021). This leads to LO prioritisation, defined as the process of determining the relative importance of LOs within a course or curriculum. This process typically results in assigning weights to LOs, where LO weight represents a quantitative or qualitative measure reflecting the importance of an LO relative to other LOs and its relative contribution to the overall educational goals.

The need for prioritisation has been recognised in prior research on assessment validity and learning design (Divjak et al., 2023), showing that determining LO weights is a prerequisite for constructing valid assessment plans and ensuring constructive alignment between LOs and assessment tasks. Furthermore, recent research in learning design has emphasised that effective course design requires considering the relative importance of LOs and aligning both formative and summative assessment with the LOs to support student mastery. This paper builds on these research streams, extending prior work on LO weighting and decision-making approaches (Divjak et al., 2021; Divjak et al., 2025; Divjak et al., 2024).

Prioritising LOs provides several key benefits:

- First, it enhances constructive alignment, supporting coherence between LOs, teaching and learning activities and assessment (Biggs, 1996). When LOs are prioritised, assessment tasks can be designed to reflect their relative importance. For example, in Divjak et al. (2021), LO weights were used to distribute assessment points across tasks, ensuring that more important outcomes contributed more significantly to final grades. This leads to improved validity and transparency of assessment.
- Second, prioritisation enables the organisation of time and resources helping educators allocate effort toward the most critical LOs. For instance, LOs associated with higher cognitive levels (e.g., analysis, evaluation, creation) can be allocated more instructional time and more complex learning activities, while lower-level LOs receive proportionally less emphasis.
- Third, prioritisation supports the appropriate distribution of workload (reflected in ECTS credits) across student activities (Divjak et al., 2023). The ECTS framework is based on student workload required to achieve LOs (European Commission, 2015). Since LOs differ in complexity, their weights can inform how workload, and consequently credits, should be distributed. For example, outcomes requiring project-based or collaborative work (often associated with higher weights) correspond to a larger share of student effort (Kumpas-Lenk et al., 2018).
- Finally, prioritisation of LOs enables more effective learning design (Divjak et al., 2023). Contemporary learning design approaches emphasise structured, data-informed planning of learning experiences. Learning analytics can be used to analyse how assessment design and its alignment with prioritized LOs influence students' mastery of those LOs (Divjak et al., 2025).

In summary, prioritising LOs is an important step in improving the quality and coherence of learning design and its implementation. It provides a foundation for valid assessment, efficient resource allocation, appropriate workload distribution, and advanced learning design practices. This research builds on prior work in this area and extends it by systematically reviewing prioritisation approaches and analysing suitable decision-making methods.

2.2 Prioritisation Approaches

As presented in Fig. 1, Divjak et al. (2024) classify approaches to LO prioritization according to two key criteria: influence on learners (stakes associated with educational context - i.e., the potential consequences of prioritization decisions for learners, institutions, or professional practice) and the complexity of LOs and their context (e.g., the number of stakeholders, interdependencies, and decision criteria).

Four approaches are proposed:

- The Simple approach is appropriate for educational contexts characterised by low-complexity LOs and low stakes for learners. Typical examples include non-formal learning, short professional development courses, or personal learning contexts where prioritisation decisions have limited consequences for learners. In such situations, LOs can be prioritised using intuitive methods, such as

direct estimation or simple weighting, requiring relatively little time and effort from educators and other stakeholders.

- The Standard approach is suitable when a more structured prioritisation process is desirable. This approach can rely on methods such as ranking, scoring, or other straightforward decision-making procedures. It is practical and not overly demanding in terms of resources and stakeholder involvement.
- The Complicated approach is intended for contexts involving either more complex LOs or a greater need to consider multiple stakeholder perspectives. Such contexts require a systematic and participatory prioritisation process, but they do not necessarily require highly sophisticated techniques. Structured expert consensus methods and stakeholder-informed prioritisation are characteristic of this approach.
- The Complex approach is appropriate for contexts characterised by highly complex LOs and high stakes for learners, such as formal degree programmes, certifications, or learning programmes with significant implications for learners' careers. Prioritisation requires substantial time, expertise, and analytical rigour. Divjak et al. explicitly recommend the use of structured decision-making methods, such as the analytic hierarchy process (AHP), to support comprehensive analysis from multiple expert perspectives and to ensure that the resulting priorities adequately reflect the complexity and importance of the educational context.

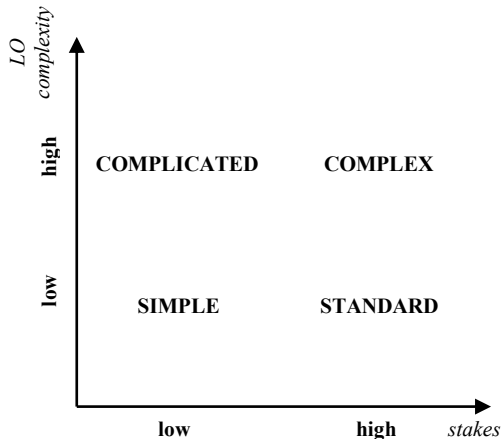


Figure 1. LO prioritisation approaches (adapted from Divjak, 2024)

Detailed guidance for classifying educational contexts according to LO complexity and stakes is provided by Divjak et al. (2024), while this paper focuses on selecting suitable prioritisation methods for each category.

2.3 Multi-Criteria Decision-Making Methods

Multi-Criteria Decision-Making (MCDM) refers to a family of methods designed to support decision-making in situations in which multiple, often conflicting criteria must be considered simultaneously. Depending on the decision context, MCDM approaches can be used for selection, ranking, classification, or prioritisation of alternatives based on predefined criteria and stakeholder preferences (Saaty, 2008; Hwang & Yoon, 1981).

LO prioritisation shows many characteristics of a typical MCDM problem. Educational stakeholders frequently need to determine which LOs are more important than others when designing curricula, allocating teaching time, constructing assessment plans, or distributing student workload. Such decisions rarely depend on a single factor. In this context, prioritisation of LOs can be conceptualised as a prioritisation-oriented MCDM problem rather than a selection problem, since all LOs remain relevant but differ in their relative importance. Consequently, LO prioritisation can be analysed using MCDM methods according to the following structure:

- Goal: determine the relative weights of LOs;
- Alternatives: LOs;
- Criteria: characteristics used to evaluate LOs (e.g., complexity/Bloom's level, contribution to programme outcomes, required workload, and professional relevance). The final selection of criteria depends on the educational context and should involve the relevant stakeholders (e.g., teachers, programme coordinators, employers or accreditation bodies).

3 Methodology

This study adopts a qualitative research approach to investigate LO prioritisation from two complementary perspectives: existing practices in the literature and potential methods derived from decision-making theory. Accordingly, the study is guided by the following research questions (RQs):

- RQ1: Which methods and approaches are currently used for LO prioritisation, and do they align with respective educational contexts?
- RQ2: Which prioritisation methods are most suitable for educational contexts characterised by different combinations of LO complexity and decision stakes?

To address the RQs, two methodological approaches were employed: (1) systematic literature review (SLR) and (2) qualitative expert-based analysis.

3.1 Literature Review (RQ1)

RQ1 was addressed through an SLR aimed at identifying scientific contributions that explicitly or implicitly deal with the prioritisation or weighting of LOs. The selection of papers is presented in Fig. 2 based on the PRISMA approach (Page et al., 2021). The literature search was conducted in two major scientific databases: Web of Science (WoS) and Scopus. The search queries were designed to capture variations in terminology related to LOs. The following keywords and combinations were used: *OR((("learning outcome*" OR "learning objective*" OR "learning goal*" OR "learning competence*" OR "learning competenc*") NEAR/3 weight), (("learning outcome*" OR "learning objective*" OR "learning goal*" OR "learning competence*" OR "learning competenc*") NEAR/3 prioritisation), ("learning outcome*" OR "learning objective*" OR "learning goal*" OR "learning competence*" OR "learning competenc*") NEAR/3 importance), ("learning outcome* assessment" NEAR/3 weight), ("competenc* weighting"), ("outcomes-based education" NEAR/3 weight), ("MCDM" NEAR/3 "learning outcome*"). "educational measurement" NEAR/3 weighting))*.

In the Scopus database, the proximity operator W/3 was used instead of NEAR/3. The search scope included Title, Abstract, and Keywords fields in WoS and Topic in Scopus.

The criteria applied to ensure the relevance and quality of the selected studies were focused on: language (English), publication type (journal articles, conference papers, book chapters, reports), and accessibility (full-text availability).

The initial search resulted in 214 records from WoS and 295 records from Scopus. After removing duplicates, a total of 286 unique records remained for further analysis. The literature review was conducted in several phases.

- Phase 1. Titles and abstracts of all 286 records were analysed by six reviewers to determine whether the study addressed LO prioritisation. Finally, 61 papers were selected for further analysis. Each paper was independently reviewed by two reviewers, while disagreements were resolved through discussion until consensus was reached.
- Phase 2. A full-text analysis was conducted to determine whether papers are in fact relevant and to identify methods and approaches used for prioritising LOs. An additional filter of full-text accessibility was applied, resulting in a final sample of 50 papers for in-depth analysis. During deep analysis of papers, 38 papers were excluded since they do not deal with LO prioritisation.
- Phase 3. The remaining 12 papers were classified according to the approach by Divjak et al. (2024). Given the exploratory nature of this review and the heterogeneity of the included studies, no formal risk-of-bias assessment was conducted.
- Phase 4. A list of prioritisation methods identified in the literature was compiled.

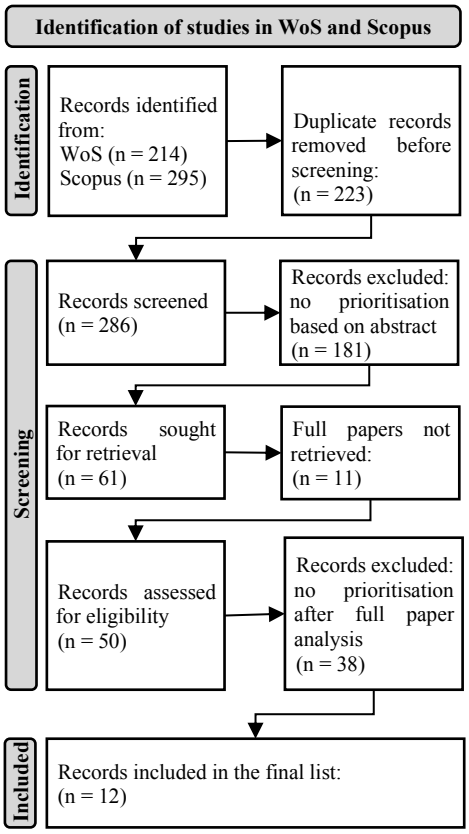


Figure 2. SLR flow (PRISMA)

3.2 Expert-Based Analysis (RQ2)

RQ2 was addressed through qualitative research, in two phases. Experts were selected purposively based on their research and practical experience in MCDM and educational decision-making as well as their availability in the SAILeR project. The discussions were analysed using qualitative thematic synthesis focused on identifying common viewpoints regarding applicability, complexity and usability of the proposed methods.

First, an expert-based analysis was conducted, grounded in the assumption that LO prioritisation can be conceptualised as an MCDM problem. In this context, LOs represent alternatives, while various criteria (e.g., importance, complexity, and workload) can be used to evaluate and prioritise them. To explore suitable methods for this purpose, an initial expert group analysis was conducted involving three experts (authors of this paper) in decision-making and MCDM methods experienced in applying decision-making methods in educational and organisational contexts. The experts discussed the characteristics of the LO prioritisation problem and identified an initial set of six MCDM methods that can be used for LO prioritisation.

Second, under the scope of SAILeR project, two focus groups were held in December 2025, with a total of 15 participants. During the focus group session, the participants were asked to (a) reflect on the LO prioritisation problem, (b) discuss the six MCDM methods identified by the experts, (c) evaluate the suitability of these methods in terms of complexity, interpretability, and practical applicability in educational settings, (d) discuss the applicability for implementation in the BDP tool for learning design, for educators that are typically not experts in MCDM.

4 Results

4.1 Literature Review Results

Table 1 presents an analysis of the approaches used in the final 12 papers. The analysis is focused on LO complexity, influence on learners (educational stakes), prioritisation approach, prioritisation method and appropriateness of the prioritisation method for the educational context, based on Divjak et al. (2024).

With respect to the classification of prioritization approaches proposed by Divjak et al. (2024), the majority of the studies were classified as Complex (n = 8), followed by Simple (n = 2), Standard (n = 1), and Complicated (n = 1).

Table 1. Categorisation of LO prioritisation papers according to Divjak et al. (2024)

Study	Topic	LO Complexity	Influence on Learners	Approach	Method	Appropr.
Sullivan et al. (2025)	Communication curriculum for dementia care partners	High	High stake – affects care quality and healthcare communication	Complex	Three-round Delphi process, ranking and priority ranking of learning objectives (Likert scale)	Medium
Persell (2010)	Introductory sociology learning goals	Low	Low stake – introductory course	Simple	Expert survey and ranking of learning goals (Likert scale)	High
Andayani et al. (2016)	Weighting learning competencies for student assessment	High	High stake – credentialing and certification	Complex	Rating scale combined with Fuzzy Analytic Network Process (FANP)	High
Ali (2024)	Outcome-based education (OBE) assessment framework	High	High stake – formal student assessment	Complex	Weighted outcome-based education framework with outcome and module weighting	High
Yoon et al. (2013)	IFRS knowledge, skills and abilities in accounting education	Low–Medium	High stake – professional accounting practice	Complicated	Employer survey of relative importance of learning objectives (Likert scale followed by ranking)	Low
Duke (2002)	Marketing learning outcomes assessment	Medium	Medium stake – curriculum improvement	Simple	Importance ratings, skill ratings, and priority index calculation (Likert scale followed by raking)	High
Baker et al. (2016)	Relative importance of criminal justice learning objectives	High	High stake – accreditation and professional preparation	Complex	Conjoint analysis and stakeholder ranking exercises	High
Eckel et al. (2017)	Scientific competencies in medical education	High	High stake – medical education and evidence-based practice	Complex	Curriculum inventory, expert consultation, and LO prioritisation process (Likert scale)	High
Boettcher et al. (2024)	Importance of laboratory learning objectives in engineering education	Medium	Medium stake – preparation for engineering work	Standard	Likert-scale survey of perceived importance of LOs	High
Beaudoin et al. (2013)	Biomedical informatics learning objectives in medicine	High	High stake – medical practice	Complex	Student survey of LO importance and desired emphasis	Low
Varga et al. (2020)	LOs and pedagogical skills in medical education	High	High stake – medical education quality	Complex	Importance–delivery gap analysis using questionnaires	Low
Moore et al. (2017)	Neonatal ethics teaching programme	High	High stake – neonatal clinical decision-making	Complex	Explicit weighting of LOs to construct a knowledge test	High

This distribution suggests that most published research on LO prioritisation can be classified as Complex (Sullivan et al., 2025; Andayani et al., 2016; Ali, 2024; Baker et al., 2016; Eckel et al., 2017; Beaudoin et al., 2013; Varga et al., 2020; Moore et al., 2017), meaning they are situated in educational contexts characterised by high influence on learners (stakes) and/or high complexity LOs and learning environments, particularly in professional disciplines such as medicine, healthcare, engineering, and criminal justice. These studies involve professional competencies, certification, clinical practice, or curriculum-wide decision-making. The two studies classified as Simple (Persell, 2010; Duke, 2002) addressed relatively straightforward curricular decision-making problems with limited consequences and comparatively low levels of outcome interdependence. One study, Boettcher et al. (2024), where prioritisation was undertaken in moderately complex educational settings using conventional survey-based approaches. Only one study, Yoon et al. (2013), was classified as Complicated, reflecting a

context characterised by multiple stakeholders and complex communication competencies, addressed through a structured expert consensus process.

With respect to the prioritization methods, the reviewed studies employed a diverse range of methods that can be grouped into five broad categories.

- First, several studies relied on survey- and rating-based approaches, including importance ratings, Likert-scale assessments, and stakeholder surveys (Persell, 2010; Yoon et al., 2013; Boettcher et al., 2024; Beaudoin et al., 2013; Varga et al., 2020). These approaches represent the least formalised forms of LO prioritisation and are primarily used to elicit the perceived importance of LOs.
- Second, expert consensus methods were represented by Sullivan et al. (2025), who employed a multi-round Delphi process to establish LO priorities. Delphi methods introduce structure and transparency into the prioritisation process while maintaining reliance on expert judgement.
- Third, Baker et al. (2016) employed conjoint analysis, a preference-modelling technique that derives the relative importance of LOs from stakeholders' evaluations of alternative competency profiles. Unlike direct importance ratings, conjoint analysis allows priorities to emerge from structured trade-offs among competing attributes.
- Fourth, Eckel et al. (2017) utilised curriculum inventory, mapping, and expert prioritisation procedures to identify and organise scientific competencies within a medical curriculum. Although not based on formal MCDM, this approach represented a systematic and curriculum-wide prioritisation process.
- Finally, the most sophisticated approaches were found in Andayani et al. (2016), Ali (2024), and Moore et al. (2017), who employed formal weighting procedures. These included the Fuzzy Analytic Network Process (FANP), weighted outcome-based education (OBE) frameworks, and explicit weighting of LOs within assessment blueprints. Such approaches closely resemble MCDM methodologies and provide transparent, quantitative prioritisation mechanisms.

To evaluate the appropriateness of the selected prioritisation methods, each study was examined for alignment between the characteristics of the educational context (i.e., LO complexity and influence on learners) and the sophistication of the prioritisation method employed. Of the 12 studies analysed, nine demonstrated strong alignment, one demonstrated partial aligment, and two demonstrated weak alignment.

- Strong alignment was observed when the chosen prioritisation method appeared appropriate for the complexity of the educational context and stakes for learners. This group included Persell (2010), Duke (2002), Yoon et al. (2013), Boettcher et al. (2024), Andayani et al. (2016), Ali (2024), Baker et al. (2016), Eckel et al. (2017), and Moore et al. (2017). In lower-complexity contexts, simple ranking procedures and importance ratings were considered adequate. Conversely, in highly complex and high-stakes settings, studies employed formal weighting methods, preference-modelling techniques, or structured curriculum-wide prioritisation processes. In particular, Andayani et al. (2016), Ali (2024), and Moore et al. (2017) represent exemplary applications of advanced methods in contexts where educational decisions carry substantial consequences.
- Only Sullivan et al. (2025) was classified as demonstrating partial alignment. The study addressed highly complex communication competencies in a high-stakes healthcare context and employed a rigorous Delphi process involving multiple rounds of expert consensus. However, although the Delphi method provides a structured prioritisation process, it does not offer the formal weighting and modelling capabilities associated with advanced MCDM approaches. Consequently, the method was considered appropriate but not fully aligned with the expectations of a Complex prioritisation context.
- Weak alignment was identified in Beaudoin et al. (2013) and Varga et al. (2020). Both studies addressed highly complex LOs within medical education and therefore operated in contexts characterised by both high complexity and high stakes. Nevertheless, prioritisation was based primarily on importance ratings and questionnaire responses. While such methods are useful for identifying stakeholder perceptions, they provide limited support for systematic prioritisation in contexts where educational decisions may have significant implications for professional competence and practice. These studies illustrate situations in which the sophistication of the prioritisation method appears insufficient relative to the complexity of the educational context.

4.2 Qualitative Analysis Results

RQ2 aimed to identify which methods and approaches could be used for LO prioritisation according to the educational context. This question was addressed through a qualitative analysis involving experts in MCDM. The expert analysis confirmed that LO prioritisation can be effectively conceptualised as a MCDM problem. The experts emphasised that LO prioritisation is a prioritisation problem rather than a selection problem, meaning that all alternatives (LOs) remain relevant but differ in importance.

The initial expert discussion was focused on analysing the MCDM methods, resulting in a proposal of six methods, which were later discussed from user perspective in larger focus groups. These methods differ primarily in terms of their structural assumptions

(e.g., independence vs. interdependence of elements) and computational complexity. The six methods are:

1. Simple Additive Weighting (SAW): The simplest approach, based on a flat structure consisting of a goal, criteria, and alternatives. Each LO is evaluated against predefined criteria, and weights are calculated through aggregation. This approach is intuitive and easy to apply, making it particularly suitable for educational contexts where users may not have expertise in decision-making methods. However, it assumes independence among criteria and LOs. (Fishburn, 1967; Hwan et al., 1981)
2. Analytic Hierarchy Process (AHP): Introduces a hierarchical structure, allowing criteria to be decomposed into sub-criteria. For example, LO complexity can be further divided into cognitive demand (level of LO) and content specifics (context). AHP enables pairwise comparisons and consistency checks, providing a more structured and theoretically grounded approach than SAW. It is suitable when decision-makers require greater analytical rigour while maintaining interpretability. (Saaty, 1980; Saaty, 2008)
3. Analytic Network Process (ANP): Extends the AHP by allowing interdependencies between elements (criteria and/or LOs). This is particularly relevant because some LOs may depend on or influence others. However, experts highlighted that modelling such dependencies introduces significant complexity, both in terms of model construction and interpretation. This raises practical challenges, especially for non-expert users. (Saaty, 1996; Saaty, 2004)
4. SWING Method – Truncated Structure: Represents a simplified approach that focuses on direct evaluation and ranking of alternatives without explicitly modelling a full criteria hierarchy. It involves ranking LOs and assigning relative importance through normalisation. This method is less demanding in terms of input data and computational effort, making it suitable for quick assessments and participatory decision-making settings. (von Winterfeldt, 1986; Mustajoki, 2005)
5. Decision Making Trial and Evaluation Laboratory (DEMATEL) – Truncated Network Structure: Used to analyse relationships and influences between elements. In LO prioritisation, it can be applied to identify causal relationships between LOs. This method is particularly useful when dependencies between LOs are important, such as when certain LOs serve as prerequisites for others. However, interpreting these relationships in an educational context may not always be straightforward. (Gabus, 1972; Si et al., 2018)
6. Social Network Analysis Process (SNAP) – Combined Network Approach: It combines elements of network-based approaches (such as ANP and DEMATEL) with social network analysis. It aims to reduce complexity while preserving the ability to model relationships between elements. Experts identified SNAP as a promising method that balances analytical power and usability. Compared to ANP, it requires fewer inputs and is easier to interpret, which makes it more suitable for practical application in education. (Kadoić et al., 2017; Kadoić et al., 2019)

These methods were analysed by expert and focus groups' participants considering their complexity. The discussion also involved the suitability of the methods for LO prioritization for implementation in the BDP learning design tool. The expert and focus group discussions revealed several important insights. First, the choice of method depends on the trade-off between complexity and ease of use.

While advanced methods (e.g., ANP, DEMATEL, SNAP) provide more accurate modelling of relationships and dependencies, they are also more difficult to implement and understand, particularly for educators without a background in MCDM. Second, the role of dependencies between LOs remains an open question. Although network-based methods allow modelling such dependencies, experts questioned whether this added complexity is always necessary or beneficial in practice. Third, simpler structures were recognised as more suitable for practical implementation in educational settings, especially when the goal is to support teachers in curriculum design and assessment planning.

5 Discussion

The comparison of the identified methods highlights key differences in their applicability to LO prioritisation (Table 2). Simpler approaches, such as SAW and SWING, are characterised by low complexity, minimal data requirements, and high usability, making them particularly suitable for educators without expertise in decision-making methods. AHP represents a balanced approach, offering increased analytical rigour through a hierarchical structure while remaining relatively interpretable. In contrast, ANP, DEMATEL, and SNAP enable modelling of dependencies between LOs, which may be relevant in educational contexts where outcomes are interrelated and the stakes are high, e.g., at the study programme level. However, these methods introduce higher complexity and lower usability, which may limit their practical adoption.

The methods discussed in this paper primarily represent compensatory decision models, allowing lower performance on one criterion to be offset by stronger performance on another. Extending the framework to include non-compensatory decision models based on thresholds or veto conditions represents an interesting direction for future research.

The choice of method depends on the trade-off between analytical rigour and ease of use. While network-based approaches provide richer modelling

capabilities, simpler methods may be more appropriate in practice, especially when prioritisation is conducted by non-experts or a dedicated functionality is implemented in a learning design tool (e.g., BDP). There is potential for broader adoption of advanced prioritisation approaches, including MCDM methods, in future curriculum design and assessment research.

Table 2 compares selected LO prioritisation methods based on criteria relevant to the prioritisation context, including support for modelling interdependencies among LOs, complexity handling, data requirements, ease of use, and result interpretability. Based on these characteristics and the framework proposed by Divjak et al. (2024), each method is associated with the prioritisation approach for which it appears most suitable. Simpler methods such as SAW and SWING are better suited to low-complexity and low-stakes contexts, whereas methods such as AHP, ANP, and Conjoint Analysis are more appropriate for highly complex and high-stakes educational settings. DEMATEL and SNAP occupy an intermediate position by supporting the analysis of relationships among LOs while maintaining a moderate level of methodological complexity. Approaches based on Likert-scale evaluations, can be conceptually aligned with the SWING method due to their reliance on direct scoring and normalisation of importance.

Table 2. Comparison for LO prioritisation methods

Criterion	SAW	AHP	ANP	SWING	DEMATEL	SNAP	Conjoint Analysis
Structure of the MCDM model	Flat (additive)	Hierarchical	Network	Simplified ranking	Network (influence-based)	Network (hybrid)	Preference-based
Support for modeling LO interdependencies	Not supported	Not supported	Supported	Not supported	Supported	Supported	Partially supported
Support for modeling LO complexity	Low	Medium	High	Low	Medium–High	Medium–High	Medium–High
Data requirements	Low	Medium	High	Low	Medium	High	High
Ease of use for educators	Very high	Medium	Low	Very high	Low	Medium	Medium–Low
Interpretability of results	High	High	Medium–Low	High	Medium	Medium	Medium
Prioritisation Approach	Simple	Complex	Complex	Simple	Complicated	Complicated–Complex	Complex

The SLR findings provide substantial support for the conceptual framework proposed by Divjak et al. (2024). There is a clear progression from simple ranking and survey methods in lower-complexity contexts, through expert consensus approaches, to formal weighting and preference-modelling techniques in highly complex and high-stakes educational settings.

The majority of studies (75%) demonstrated strong alignment between the characteristics of the educational context and the prioritisation method used. Nevertheless, the presence of partially and weakly aligned studies suggests that LO prioritisation in some high-stakes domains, particularly medical education, continues to rely heavily on stakeholder perceptions rather than on formal decision-making methodologies.

Several limitations of the study should be acknowledged. First, the SLR was limited to English-language publications indexed in WoS and Scopus. Second, the expert analysis involved a relatively small number of experts. Third, the proposed methods were analysed conceptually and through expert evaluation rather than by applying them to a real educational case. Consequently, future work should empirically compare the proposed methods in authentic learning design settings.

Future research should therefore focus on empirical validation of the identified methods in authentic educational contexts, comparison of prioritisation results across stakeholder groups (e.g., teachers, students, employers), and development of practical software-supported prioritisation tools. Additional research should also investigate whether modelling dependencies between LOs provides sufficient added value to justify the increased complexity of network-based methods such as ANP, DEMATEL, and SNAP.

6 Conclusion

This paper addresses the problem of LO prioritisation from the perspective of multi-criteria decision-making (MCDM) by applying a qualitative approach (expert analysis and focus groups) and by analysing approaches in the literature. The study demonstrated that, despite the growing importance of LO-based education, the relatively low number of studies explicitly addresses the prioritisation of LOs.

The literature review identified several existing approaches to LO prioritisation, including survey- and rating-based approaches, expert consensus methods, conjoint analysis, and fuzzy analytic network process. The expert-based analysis demonstrated that LO prioritisation can be effectively conceptualised as a MCDM problem. Six candidate methods were identified as particularly suitable for this purpose: SAW, AHP, ANP, SWING, DEMATEL, and SNAP. The comparison of these methods revealed an important trade-off between analytical rigour and practical usability. Simpler methods, such as SAW and

SWING, appear more suitable for educational practitioners due to their interpretability and ease of use, while more advanced network-based methods provide richer modelling capabilities at the cost of increased complexity. Finally, the choice of MCDM method depends on LO complexity and influence of the decision on learners.

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References

References marked with an asterisk indicate studies included in the systematic literature review.

*Ali, Q. I. (2024). Towards more effective summative assessment in OBE: A new framework integrating direct measurements and technology. *Discover Education, 3*, 107. https://doi.org/10.1007/s44217-024-00208-5

*Andayani, S., Hartati, S., Wardoyo, R., & Mardapi, D. (2016). Combining rating scale and FANP to determine the important weight of learning competency for students' assessment. AIP Conference Proceedings, 1755, 070009. https://doi.org/10.1063/1.4958504

*Baker, W. M., Holcomb, J. E., & Baker, D. B. (2017). An assessment of the relative importance of criminal justice learning objectives. Journal of Criminal Justice Education, 28(1), 129–148. https://doi.org/10.1080/10511253.2016.1172650

*Beaudoin, D. E., Richardson, S. J., Sheng, X., & Mitchell, J. A. (2013). Medical students' perspectives on biomedical informatics learning objectives. International Journal of Medical Education, 4, 1–8. https://doi.org/10.5116/ijme.50ce.316b

Biggs, J. (1996). Enhancing teaching through constructive alignment. Higher Education, 32(3), 347–364. https://doi.org/10.1007/BF00138871

*Boettcher, K., Kaufhold, N., Schade, M., Terkowsky, C., & Ortelt, T. R. (2024). Perceived importance of laboratory learning objectives by female and male engineering students. In M. E. Auer et al. (Eds.), Shaping the Future of Learning and Teaching Engineering (Lecture Notes in Networks and Systems, Vol. 1027, pp. 44–55). Springer. https://doi.org/10.1007/978-3-031-61891-8_4

Divjak, B., Kadoić, N., & Žugec, B. (2021). The use of decision-making methods to ensure assessment validity. Proceedings of the IEEE TEMSCON-EUR 2021. https://doi.org/10.1109/TEMSCON-EUR52034.2021.9488603

Divjak, B., Grabar, D., Svetec, B., & Vondra, P. (2022). Balanced Learning Design Planning: Concept and Tool. Journal of Information and Organizational Sciences, 46(2). https://doi.org/10.31341/jios.46.2.6

Divjak, B., Barthakur, A., Kovanović, V., & Svetec, B. (2025). The impact of learning design on the mastery of learning outcomes in higher education. Proceedings of the 15th International Learning Analytics and Knowledge Conference (LAK '25). https://doi.org/10.1145/3706468.3706565

Divjak, B., Svetec, B., Horvat, D., & Kadoić, N. (2023). Assessment validity and learning analytics as prerequisites for ensuring student-centred learning design. British Journal of Educational Technology, 54(1), 313–334. https://doi.org/10.1111/bjet.13290

Divjak, B., Svetec, B., Rienties, B., Astles, P., Matthews, C., Tillmann, A., Eichhorn, M., & Schmitt, J. (2024). Prioritizing learning outcomes in different learning design contexts. In Proceedings of the 35th International Scientific Conference on Information and Intelligent Systems (CECIIS 2024) (pp. 333–338). Faculty of Organization and Informatics, University of Zagreb.

*Duke, N. K., & Pearson, P. D. (2002). Effective practices for developing reading comprehension. In A. E. Farstrup & S. J. Samuels (Eds.), What research has to say about reading instruction (3rd ed., pp. 205–242). International Reading Association.

*Eckel, J., Schüttpelz-Brauns, K., Miethke, T., Rolletschek, A., & Fritz, H. M. (2017). The inventory as a core element in the further development of the science curriculum in the Mannheim Reformed Curriculum of Medicine. GMS Journal for Medical Education, 34(2), Article Doc23. https://doi.org/10.3205/zma001103

European Commission. (2015). ECTS Users' Guide. https://doi.org/10.2766/87192

European Commission/EACEA/Eurydice. (2015). The European Higher Education Area in 2015: Bologna Process implementation report. Publications Office of the European Union

Fishburn, P. C. (1967). Additive utilities with incomplete product sets: Applications to priorities

and assignments. Operations Research, 15(3), 537–542. https://doi.org/10.1287/opre.15.3.537

Gabus, A., & Fontela, E. (1972). World problems, an invitation to further thought within the framework of DEMATEL. Battelle Geneva Research Centre.

Hwang, C. L., & Yoon, K. (1981). Multiple attribute decision making: Methods and applications. Springer. https://doi.org/10.1007/978-3-642-48318-9

Kadoić, N., Begičević Ređep, N., & Divjak, B. (2017). A new method for strategic decision-making in higher education. Central European Journal of Operations Research, 25(3), 571–592. https://doi.org/10.1007/s10100-016-0453-8

Kadoić, N., Divjak, B., & Begičević Ređep, N. (2019). Integrating DEMATEL with the analytic network process for effective decision-making. Central European Journal of Operations Research, 27(3), 653–678. https://doi.org/10.1007/s10100-018-0539-5

Kumpas-Lenk, K., Eisenschmidt, E., & Veispak, A. (2018). Does the design of learning outcomes matter from students' perspective? *Studies in Educational Evaluation, 59*, 179–186. https://doi.org/10.1016/j.stueduc.2018.07.008

*Moore, G. P., Ferretti, E., & Daboval, T. (2017). Developing a knowledge test for a neonatal ethics teaching program. Cureus, 9(12), e1971. https://doi.org/10.7759/cureus.1971

Mulder, M. (2014). Conceptions of professional competence. In S. Billett et al. (Eds.), International handbook of research in professional and practice-based learning. https://doi.org/10.1007/978-94-017-8902-8_5

Mustajoki, J., Hämäläinen, R. P., & Salo, A. (2005). Decision support by interval SMART/SWING—Incorporating imprecision in the SMART and SWING methods. Decision Sciences, 36(2), 317–339. https://doi.org/10.1111/j.1540-5414.2005.00077.x

Page, M. J., Moher, D., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., MayoWilson, E., McDonald, S., … McKenzie, J. E. (2021). PRISMA 2020 explanation and elaboration: updated guidance and exemplars for reporting systematic reviews. BMJ, n160. doi: 10.1136/bmj.n160

*Persell, C. H. (2010). How sociological leaders rank learning goals for introductory sociology. Teaching Sociology, 38(4), 330–339. https://doi.org/10.1177/0092055X10378822

Saaty, T. L. (1980). The analytic hierarchy process. McGraw-Hill.

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1(1), 83–98. https://doi.org/10.1504/IJSSCI.2008.017590

Saaty, T. L. (1996). Decision making with dependence and feedback: The analytic network process. RWS Publications.

Saaty, T. L. (2004). Fundamentals of the analytic network process—Dependence and feedback in decision-making with a single network. Journal of Systems Science and Systems Engineering, 13(2), 129–157. https://doi.org/10.1007/s11518-006-0158-y

Si, S. L., You, X. Y., Liu, H. C., & Zhang, P. (2018). DEMATEL technique: A systematic review of the state-of-the-art literature on methodologies and applications. Mathematical Problems in Engineering, 2018, 3696457. https://doi.org/10.1155/2018/3696457

*Sullivan, S. S., Wittenberg, E., West, L. J., Gill, A. S., Tomko, C., & Mann, C. (2025). Development of a communication curriculum for family care partners of persons living with dementia. Dementia. Advance online publication. https://doi.org/10.1177/14713012251342029

*Varga, Z., Pótó, Z., Czopf, L., & Füzesi, Z. (2020). Do we need special pedagogy in medical schools? Attitudes of teachers and students in Hungary: A cross-sectional study. BMC Medical Education, 20, Article 472. https://doi.org/10.1186/s12909-020-02385-x

von Winterfeldt, D., & Edwards, W. (1986). Decision analysis and behavioral research. Cambridge University Press.

*Yoon, S. W., Vedd, R., & Jones, C. G. (2013). IFRS knowledge, skills, and abilities: A follow-up study of employer expectations for undergraduate accounting majors. Journal of Education for Business, 88(6), 352–360. https://doi.org/10.1080/08832323.2012.727889