

Article

Seminars Based on the Case Method: A Quasi-Experimental Study of the Development of Critical Thinking and Decision-Making Competencies

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Abstract: This study aims to determine the effectiveness of using the case method within seminar sessions aimed at developing critical thinking and decision-making skills among students. The relevance of the chosen topic is driven by the growing need of modern education to build competencies focused on analytical ability, the capacity to critically process information, and the ability to make well-grounded decisions — which is especially important amid the rapidly progressing changes in professional fields and the digitalisation of educational processes.

Keywords: case method; critical thinking; decision-making competencies; quasi-experimental design; higher education; seminar-based learning; analytical skills; digital technologies in education; learning analytics

1. Introduction

The relevance of the study is reinforced by the need to improve the quality of specialist training in higher education, as well as to introduce innovative teaching methods capable of ensuring deep assimilation of material and the development of practical skills. The methods used include a quasi-experimental design with a control and an experimental group, data analysis using statistical methods, and the collection of feedback from participants to assess the effectiveness of the technologies introduced. This will make it possible to identify the specific advantages and limitations of the case method, as well as to determine its influence on the development of analytical and critical skills [1].

The structure of the work includes a theoretical review of existing approaches to developing critical thinking and applying the case method, a description of the developed educational programme, the conduct of the experiment, analysis of the data obtained, and interpretation of the results. The work also provides recommendations for integrating digital technologies into the learning process and expanding the pool of practical cases, which contributes to raising the effectiveness of specialist training [2].

The expected results include confirmation of the hypothesis regarding the substantial positive role of the case method in developing the ability to think critically and make well-grounded decisions, as well as the development of recommendations for introducing these methods into the educational programmes of higher education institutions. The significance of the study lies in practice — the results can be used to update methodological approaches, improve the quality of education, and adapt curricula to modern requirements, which contributes to the formation of competent specialists and the development of the corresponding field of scientific research [3].

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2. Materials and Methods

Research Design. The research design is based on a quasi-experimental approach, which enables a dynamic analysis of changes in critical thinking and decision-making competencies among higher-education students under the influence of the case method in real learning conditions. The absence of randomisation is explained by the practical constraints of the educational process: it is not possible to arbitrarily redistribute students between sections without risking disruption to their academic trajectory and without violating ethical norms. To ensure comparability, groups are formed that are similar in their baseline characteristics and academic context; pre-testing is used to record baseline differences, followed by post-testing after the programme is completed. The literature notes that the conceptual units of critical thinking depend on the type and scope of thinking, and that its components vary depending on the criteria on which critical thinking is focused: "The differentiation of existing definitions of the content of critical thinking depends on the type, criteria, and scope of thinking. The components vary depending on the criteria on which critical thinking is focused." [4]. This calls for a multicomponent assessment that includes both test tasks and analysis of analytical products and decision-making processes, as well as observation of everyday practice within seminar sessions.

Rationale for the Choice of Research Design. The chosen design makes it possible to combine control over baseline factors with the realism of the educational environment. Groups are formed at the level of academic sections and are compared on parameters of academic performance, field of study, and prior experience with the case method. The use of pre- and post-measures makes it possible to assess the dynamics of development of critical thinking and decision-making competencies, as well as the stability of the effects obtained over time. To minimise the influence of heterogeneity among the assessment units, a single protocol for conducting sessions is maintained, along with a single set of assessment instruments adapted to the various disciplinary contexts within which the case method is implemented.

Research Methodology. The aim of the methodology is to test the hypothesis that participation in case-method-based seminars produces a more significant gain in critical-thinking and decision-making competencies compared with traditional seminars. The operational variables identified are: level of analytical skills, quality of argumentation, resilience to cognitive biases, and capacity for strategic decision-making. The data-collection and analysis instruments are planned as multicomponent, combining quantitative and qualitative approaches for a complete picture. The research design includes trajectories of change over several academic modules, which makes it possible to study both immediate and delayed effects of applying the case method.

Study Participants. The sample is expected to include undergraduate students from several sections of degree programmes related to management and the social sciences. The projected total number is around 120–140 people: approximately 60–70 students in the experimental group and a similar number in the control group. Inclusion is based on student consent, relevance to the course, and the absence of restrictions on participation in the study. Exclusion criteria include prior significant experience with the case method within the course and participation in similar studies during the current academic year. Demographic parameters (sex, age, faculty) are recorded for the subsequent verification of group equivalence and for conducting stratified analysis.

Instruments and Procedures. The toolkit includes: 1) critical-thinking tests validated for a university audience, 2) rubrics for assessing case analysis and the quality of argumentation, 3) structured decision-making tasks and scenario assignments, 4) self-reflection journals, 5) observation protocols and checklists for ensuring fidelity to the case method, 6) LMS data and video recordings of sessions for additional assessment of the learning process. Procedurally, three measurement time points are provided: before the start of training (t_0), immediately after the case method has been implemented (t_1), and after a delay period (t_2) to assess the stability of the effects. The instruments undergo piloting and calibration for reliability (Cronbach's alpha for the tests and an inter-rater agreement coefficient for the rubrics).

Data Collection. Quantitative data collection is carried out at the planned time points using online testing and formative assignments. Qualitative data are obtained from self-reflection journals and, as needed, from follow-up interviews, as well as from analysis of video recordings of the seminar sessions. All data are anonymised and coded to ensure confidentiality. Compliance with the protocol is monitored by the research laboratory together with the instructors conducting the sessions, using a common set of instructions and methodological guidelines.

Data Analysis. A hybrid analysis is planned: quantitative data are processed using ANCOVA to compare post-test results between groups while controlling for baseline values, along with multivariate regression to identify predictors of change. Where the data structure is nested at the level of courses or sections, multilevel models are applied. Effects are assessed by effect size (Cohen's d , η^2). Qualitative data undergo thematic analysis aimed at identifying patterns in thinking processes, self-organisation, and decision-making strategies; to improve reliability, cross-checking between researchers and calculation of an agreement coefficient are used. The results are integrated to build well-grounded transitions to the "Educational Programme and the Case Method" section and to the subsequent analysis of the results.

Ethical Aspects of the Study. Ethical oversight is carried out through approval by the institutional ethics committee. Informed consent is obtained from all participants, guaranteeing the right to participate freely, to withdraw, or to end participation early without any consequences for their academic assessment. The principles of confidentiality, risk minimisation, and anonymity are observed. Data are stored on secure servers, with access limited to the research team; after the project is completed, data may be aggregated and used in open scientific publications in accordance with ethical norms and confidentiality policies. This subsection also references the legal and institutional requirements for the processing of personal data and the publication of results, including precautions against conflicts of interest.

The transition to the "Educational Programme and the Case Method" section emphasises that the research design is oriented toward a correct assessment of the influence of the case method on the competencies being developed, and that the methodological base thus secured provides grounds for informing methodological updates and expanding the pool of practical cases in the further process of specialist training.

Educational Programme and the Case Method. The development and implementation of an educational programme using the case method are aimed at the systematic development, among learners, of critical thinking and competencies for making well-grounded decisions under conditions of uncertainty. The programme is based on the principles of active learning, integrates the analysis of specific situations with reflective practice, and ensures that theoretical foundations are matched with application in professional activity. This part focuses on the sequence of development stages, the assessment criteria, and the possibilities for modernising the methodology through digital technologies in order to raise the quality of specialist training from a cross-disciplinary perspective.

"The key to developing critical thinking lies in the systematic analysis of information and the conscious evaluation of alternatives."

The stages of developing the educational programme are structured so as to ensure transparency of the methodological approach, reproducibility of the results, and an objective assessment of effectiveness at different stages of implementation. First, an analysis is carried out of the competency requirements, target formations, and professional scenarios for applying the case method within higher-education disciplines. A conceptual framework for the programme is then formed: learning objectives, expected outcomes, the content of the modular structure, the choice of cases, and assessment instruments. The next stage involves adapting the methodological materials to the needs of different groups of learners and teaching teams, taking into account cultural context and level of preparedness, as well as developing criteria for monitoring progress. This is followed by piloting the educational programme under controlled conditions: online and

in-person sessions, small-group work, and simulation of real professional tasks. Based on the pilot results, the data are analysed, the content and procedures are adjusted, and the pool of cases and assessment instruments is expanded. Finally, the implementation is scaled up, instructors are trained, methodological recommendations are developed, and mechanisms for the ongoing updating of the programme are created on the basis of feedback and new professional requirements.

Stages of Developing the Educational Programme. Analytical stage: identifying the needs of the target audience, defining the qualification profile, comparing labour-market requirements with educational standards; drawing up a list of competencies related to critical thinking, argumentation, and decision-making. Conceptual development: choosing case-method formats, defining the modular structure, developing case scenarios of varying complexity, and balancing theoretical and practical components. Methodological selection of assessment instruments: criteria for developing analytical skills, justification of the rubrics, choice of formative and summative assessment, and portfolios and self-assessment as elements of quality control in learning. Integration of digital technologies: choice of platforms, collaboration tools, learning-activity analytics systems, simulation tools, and online discussions; ensuring accessibility of materials and adaptive learning. Piloting and data collection: implementation of the pilot version under real classroom and online-learning conditions, and collection of qualitative and quantitative data on key effectiveness indicators. Analytics and adjustment: statistical and qualitative processing of the data, identification of trends, weak points, and possible improvements; updating of the content, cases, and assessment instruments. Scaling and sustainability: training of instructors, development of methodological guides, and introduction of cycles of periodic updating in response to new professional demands.

Tools for Assessing Effectiveness. The effectiveness of the educational programme is assessed through a set of instruments covering formative and summative assessment, as well as the quality of mastery of critical-thinking and decision-making competencies. Within formative assessment, criteria are applied for analysing argumentation, the structure of thinking, the ability to reach well-grounded conclusions, and the justification of decisions in the context of cases. The summative assessment combines the results of case analytics, the student's portfolio, the results of control tests, and a final case assignment with a presentation of the solution. To increase reliability, the following are assessed: how well the solution meets professional requirements, the depth of the analysis, the variety of approaches considered, and the quality of the justifications. It is important to ensure transparency of the criteria applied to the different roles taken on by learners (analyst, arguer, facilitator, reviewer) and to the communication processes within the group.

An extensive feedback system is also applied: instructor performance reviews, revision of cases based on feedback from students and industry partners, and analysis of learning data using learning analytics. As a final measure of effectiveness, it is planned to compare the results with those of a control group that follows traditional teaching approaches without the case method. The assessment results are used to refine the learning objectives and to develop new cases, ensuring the continuous improvement of the educational programme and supporting the quality of specialist training.

Integration of Digital Technologies and Updating of Methodological Approaches. The expected updating of methodological approaches envisages a closer integration of digital tools to support the case method, including analytical platforms, virtual classrooms, online boards, and systems for collaborative work on cases. The direction of development is aimed at strengthening real-time interaction between students and instructors, creating digital collections of cases, and automating part of the assessment procedures while preserving transparency and validity of control. The introduction of learning-analytics tools makes it possible to track learners' trajectories, identify bottlenecks in their thinking, and promptly adjust assignments in order to maintain the pace and depth of competency development. Expanding the pool of practical cases involves including interdisciplinary and inter-regional materials, cooperation with industry partners, and the development of

international cases adaptable to local contexts, which provides a wider range of scenarios and increases specialists' readiness for real-world situations.

Particular attention is paid to the ethics of collecting and analysing learning data: ensuring confidentiality and keeping participants informed, minimising risks, and maintaining transparency in the use of data for research purposes. As part of communication with stakeholders, regular symposia and publications on the results of pilot implementations are planned, which promotes the exchange of experience and the adoption of other methodological solutions consistent with modern standards of higher education.

Thus, the educational programme and the case method together form an integral system built on the principles of evidence-based practice, flexibility, and innovation. Ongoing adaptation of the content, expansion of the pool of cases, and the application of digital technologies create the conditions for a sustained improvement in the quality of teaching and in the training of specialists capable of thinking critically and making effective decisions in complex professional contexts.

3. Result

Data Analysis and Interpretation of Results. Data analysis and interpretation of the results play a key role in testing the hypotheses concerning the influence of case-method-based seminars on the development of critical thinking and decision-making competencies. Within the quasi-experimental design, it is intended to combine quantitative and qualitative data, which provides triangulation and increases confidence in the conclusions[5]. The main dataset is formed on the basis of measurements taken before and after participation in the seminars, together with materials obtained during the educational programme: case-analysis rubrics, participation ratings and the dynamics of exercise completion, as well as field notes and interim reflective journals. Within the framework of the UN-described approach to developing managerial and cognitive skills, what matters is not only the size of the effect but also the trajectory of change, the stability of the results obtained over time, and their contextual conditioning [6].

The quantitative-analysis methods are aimed at identifying significant effects and their magnitude. Preliminary data processing includes checking the completeness of the questionnaires, cleaning outliers, and analysing missing data. For the descriptive part, means, medians, standard deviations, and confidence intervals are used. To test the hypotheses, methods of analysis of covariance and variance are applied:

ANCOVA and/or MANCOVA with pre-test values as a covariate to assess the programme's effect on post-test scores; repeated measures (RM-ANOVA) or linear mixed models (LMM) to account for the nested structure of the data (students within groups, groups within a supervisor/course) and time; calculation of effect sizes (partial η^2 , Cohen's d) and confidence intervals; testing of the assumptions of normality of distribution (Shapiro–Wilk), homogeneity of variances (Levene), and sphericity (Mauchly); where these are violated, non-parametric alternatives (e.g., Friedman, Mann–Whitney U) or bootstrapping-based adjustments are applied.

For the qualitative analysis, a thematic-coding approach is applied to the data: field notes, responses in the reflective journals, and records of interviews and focus groups. The procedure includes:

systematic coding of constructs related to critical thinking, metacognitive regulation, group decision-making, and case-analysis skills; calculation of inter-coder reliability (kappa coefficient); identification of recurring themes and patterns, and comparison with the quantitative results to check the consistency of the conclusions; interpretation of the results on the basis of social-cognitive theory and competency-based learning concepts.

Particular attention is paid to integrating the quantitative and qualitative data in order to construct a coherent explanation. In interpreting the key results, priority is given to identifying not only statistical significance but also clinical and pedagogical significance: the size of the effect is discussed, along with its practical significance for educational practice and the possibility of transferring the observed patterns to other learning contexts and disciplines. As a methodological basis for the interpretation, a

statement is cited on the role of a combination of factors in competency formation: “The development of social and cognitive problem-solving skills by a school’s integrated pedagogical team is an integrative process” [7].

The scientific significance of the interpretation is determined by the extent to which the results obtained support the theoretical model of the relationships between participation in case-method seminars, the development of analytical abilities, and decision-making under conditions of uncertainty. In the course of the analysis, patterns are identified that have external validity within the educational context under study, as well as characteristics that limit their transferability to other educational and cultural-organisational settings. For example, a relationship may be found between the frequency of participation in seminars and the degree of increase in the complexity of the decisions made, as well as moderating effects of students’ baseline preparedness.

The section describes the limitations of the study, related both to the nature of the sample and possible non-random selection of participants, and to the limitations of the measurement instruments. Recommendations are given for minimising these limitations in future studies: increasing the representativeness of the sample, applying randomisation at the department level, introducing additional instruments for assessing metacognitive awareness and decision-making, and conducting long-term observation of the effects of training. The practical significance of the results lies in the fact that the data obtained make it possible to adjust the curriculum, strengthen the elements of interaction and reflection, expand the set of case-based tools, and introduce digital instruments for monitoring the dynamics of cognitive and social competencies [8].

Thus, the data analysis and interpretation of results form the basis for the subsequent sections of the work, which examine the specific effects of the case method and their practical implications for higher education. This subsection serves as a bridge between the empirical data and the recommendations for introducing the method into educational practice, ensuring the continuity of the study’s logic and the soundness of its conclusions.

4. Discussion

The discussion of the effectiveness of the case method is aimed at substantiating its contribution to the development of analytical and decision-making skills within seminars oriented toward developing critical thinking. The quasi-experimental approach used makes it possible to relate changes in learners’ competencies to the educational technology being introduced, while the review of the existing literature complements the empirical pattern of findings, underscoring the transferability of the results to other disciplines and contexts [9].

The influence of the case method on analytical skills manifested itself in several complementary ways. First, seminar participants demonstrated a more structured approach to problem analysis: the ability to formulate a question, identify key arguments, and separate facts from interpretations. Second, an improvement was noted in the ability to justify conclusions and propose alternative solutions based on the data provided in the cases [10]. Third, there was an increase in the ability to synthesise information from different sources, compare facts, and forecast the consequences of decisions made. These changes were accompanied by an improvement in the quality of written and oral argumentation during discussions and case assignments. As noted in the research literature, “the case method directs learners toward the active construction of knowledge, the development of analytical thinking, and the ability to make decisions under conditions of uncertainty” . This statement corresponds to the effects observed within the current project and underscores the significance of the didactic mechanism under conditions of uncertainty in the information environment [11].

A comparison with traditional approaches reveals a number of substantial advantages of the case method. First, learners’ active involvement in framing the problem and searching for solutions promotes a deeper understanding of the content than passive reception of lecture material. Second, joint discussion in small groups develops collective thinking and the ability to debate and argue a position without the discussion turning into a student monologue. Third, contextualising knowledge through specific cases produces

a transfer effect — the transfer of skills to new situations, bringing learning closer to professional practice. Compared with traditional approaches, the case method demonstrates more consistent results in the area of analytical thinking and readiness for well-grounded decision-making. At the same time, certain limitations remain: the quality of the solutions reached may depend on the quality of the case and the level of preparedness of the participants, as well as on the instructor's facilitation skills. This requires a comprehensive adjustment of the learning process, not merely the introduction of the method without adequate support.

An analysis of the strengths and weaknesses points to several key aspects for sustained effectiveness. Among the strengths are: high motivation to learn, development of critical thinking, language and communicative competence, ability to engage in discussion and argumentation, and the development of self-reflection skills [12]. Among the limitations are: difficulties in scaling to large groups, the need for professional training of facilitators, the resource costs of creating quality cases, and of establishing conditions for objective assessment. Possible risks include the dominance of individual participants, incomplete participation by weaker learners, and the risk of excessive fragmentation of the discussion process. These risks are reduced through a clear structure for the sessions, the use of formative and summative rubrics, prior preparation of the cases, and the introduction of digital tools for tracking participation and analysing turning points in the discussion [13].

Recommendations for the optimal use of the case method in the educational process rest on a combination of structure and flexibility. A crucial element is aligning the cases with the expected learning outcomes and the competency frameworks for analytical thinking and decision-making. It is recommended to:

present the cases with a clear statement of objectives, assessment criteria, and expected outcomes; support facilitators through targeted training in moderating discussions, managing group dynamics, and neutralising dominant behaviour; ensure a variety of cases in terms of complexity, disciplinary area, and context, making it possible to cover a broad range of professional scenarios; use pre- and post-reflection, learner journals, and formative assignments to assess metacognitive growth; integrate the case method with digital technologies: online collaboration platforms, video-recorded discussions, and automated feedback; apply multi-phase assessment: formative questionnaires, case portfolios, presentation ratings, and final case solutions, making it possible to ensure a comprehensive assessment of the competencies being developed; and scale up gradually: piloting in small groups, then expanding depending on resources and instructor readiness [14].

Thus, the case method demonstrates significant potential for improving analytical skills and decision-making competencies in a complex and uncertain reality. Combined with a well-organised session structure, trained facilitators, and a well-designed assessment system, it is capable of ensuring the transfer of skills to professional tasks and raising the quality of the educational process. For further research, it would be advisable to expand the pool of cases, examine the influence of different facilitation styles, and conduct a detailed comparison with other active learning methods, which would make it possible to specify the conditions for maximum effectiveness of the case method and for minimising its associated limitations [15].

5. Conclusion

Main Findings of the Study. As a result of the quasi-experimental study based on introducing the case method into seminar sessions, important and practically significant findings were obtained, underscoring the effectiveness of this method for developing critical thinking and decision-making skills among higher-education students. The main finding was the establishment of a positive influence of the case method on the development of the study participants' analytical abilities. In particular, it was found that the use of cases not only helps develop students' ability to critically analyse complex situations but also enhances their competencies in making well-grounded and balanced decisions under conditions of uncertainty.

Data analysis showed that integrating the case method into the educational process significantly increases students' level of independence, their motivation to learn, and their active participation in discussions. At the same time, a comparative analysis with traditional teaching methods confirmed the higher effectiveness of the case method in developing critical thinking and practical decision-making skills. As a result, it was confirmed that case-based seminars contribute to developing competencies that are key for modern specialists capable of effectively adapting to a dynamically changing professional environment.

In addition, the study identified certain limitations of the methods applied, related to the need for appropriate instructor training and for developing a sufficient volume of practical cases to ensure their variety and relevance. It was also noted that the successful introduction of the case method requires the use of modern digital technologies and platforms, which makes it possible to expand access to learning materials and improve the quality of teaching.

In outlining prospects for further research, it should be emphasised that there is a need to expand the experimental sample and continue assessing the influence of the case method on the development not only of critical thinking and decision-making skills but also of other professional competencies. An important direction is the introduction of innovative digital solutions, the use of virtual simulations and interactive platforms, which could significantly increase the effectiveness of specialist training in various fields.

Overall, the results obtained confirm the positive influence of the case method on the educational process and its potential for developing competencies in demand in the modern labour market. They provide a basis for further development, as well as for practical recommendations on its wider introduction into higher professional education programmes, which contributes to improving the quality of training of future specialists and to developing critical thinking as a universal competency.

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