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Teachers' Perspectives on the Practical Experiences and Development Paths of Technical Education

Abstract: I examined the educational methodology possibilities of technician training for the period 2021–2023 in a secondary school in Dunaújváros. The aim of the study is to explore the possibilities of modern educational methodology, especially in the fields of the use of digital tools, dual training, project-based learning and competence development.
During the period under review, one of the most important elements of the reform of technician training was the integration of digital technologies into classrooms. Another significant methodological innovation of the period under review was the further development of dual training. Project-based learning and problem-oriented education also played an important role in the methodological renewal of technician training. The emphasis on competence-based education was also an essential element of the methodological developments of technician training.
My study was carried out using a questionnaire method. I interviewed 40 full-time technical teachers during the period from June 1–12, 2024.
By the end of my research, I came to the conclusion that the developments in educational methodology between 2021 and 2023 contributed to the fact that technician training responds to the challenges of the 21st century more flexibly and effectively. The integration of digital tools, dual training, project-based learning and competence development has all provided educational methodology opportunities to enable technician training to continue to adapt to a rapidly changing economic and technological environment.
Keywords: Technician training; Vocational training; Teaching methodology; Dual training.

Összefoglalás: A kutatás célja a technikusképzésben megvalósult oktatásmódszertani fejlesztések vizsgálata egy dunaújvárosi középiskolában a 2021–2023 közötti időszakban. A tanulmány kiemelten foglalkozik a digitális

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eszközök tanórai integrációjával, a duális képzés szerepével, a projektalapú és problémaorientált tanulás alkalmazásával, valamint a kompetenciafejlesztés gyakorlatával. A vizsgálat kérdőíves módszerrel zajlott: 2024. június 1–12. között 40 főállású műszaki tanár osztotta meg tapasztalatait és véleményét.
Az eredmények azt mutatják, hogy a digitális technológiák elterjedése, a duális képzés továbbfejlesztése, valamint a projektalapú tanulás széleskörű alkalmazása érdemben hozzájárult a technikusképzés rugalmasságának és hatékonyságának növeléséhez. A kompetenciaalapú oktatás hangsúlyosabbá válása tovább erősítette a tanulók munkaerőpiaci felkészítését. A módszertani megújulások összességében lehetővé tették, hogy a technikusképzés eredményesebben reagáljon a 21. század gyorsan változó gazdasági és technológiai kihívásaira.
Kulcsszavak: Technikusképzés; szakképzés; oktatásmódszertan; digitális eszközök; duális képzés; projektalapú tanulás; kompetenciafejlesztés.

Introduction

The rapidly changing economic and technological environment of the 21st century presents significant challenges for education systems, particularly for vocational education and, within it, technician training. In order to respond flexibly and effectively to the needs of the labour market, the continuous renewal of educational methodologies is essential. In technician training, special attention is given to innovative teaching solutions that combine the acquisition of theoretical knowledge with the deepening of practical experience.

Between 2021 and 2023, methodological development in education focused primarily on the classroom use of digital tools, dual training, project-based learning, and competence-based education. The COVID–19 pandemic considerably increased the role of digital technologies, resulting in lasting changes in pedagogical practices. At the same time, the reforms of vocational education contributed to improving the adaptability of technician training to modern challenges.

The aim of this study is to explore modern methodological opportunities in technician training, with particular emphasis on the impacts arising from recent innovations within the examined period. In my research, I connected students' academic performance with teachers' experiences in order to provide a comprehensive picture of the effectiveness of the applied methods. Data were collected through a questionnaire survey conducted among 40 full-time teachers working in technical schools.

The results of the research highlight that methodological innovations in technician training – such as the integration of digital tools, dual education, and competence development – have significantly contributed to enhancing the flexibility and efficiency of education. These findings may serve as valuable guidance for future educational reforms, ensuring that technician training continues to meet the challenges of the 21st century.

Literature Review

The development of educational methodology during the period under review increasingly focused on integrating practical and theoretical knowledge, as well as on developing students' competences. Technological progress and the demands of both global and domestic labour markets have posed new challenges [1] for the education system, to which institutions had to adapt rapidly and effectively. These changes have had a particularly strong impact on technician training, which now places modern, flexible, and innovative methodological elements at its centre.

[1] Falus, O.–Jóźwiak, P.–Kővári A. (2022): "Gólyakalifa" a 21. században: Joghézag és analógia a virtuális valóság jogában. *Jogelméleti Szemle,* 2022., (2.), pp. 20–32.

Foundations of the Renewal of Educational Methodology

Secondary education underwent significant transformation during the examined period, largely influenced by labour market demands, the spread of digitalisation, and shifts in pedagogical approaches. This chapter aims to present, through an analysis of the Hungarian literature, how pedagogical methodologies have evolved and what new expectations have emerged towards the education system. Based on various research studies and professional publications, a comprehensive overview is provided of the changes in secondary education.

In Hungary, during the analysed period, the leaders of secondary education placed the continuous renewal of teaching methodologies at the forefront in order to respond flexibly and effectively to the needs of the labour market.

Reviewed Literature

The selection of the literature analysed in this study was based on the thematic relevance, time frame, and geographical focus of the research, particularly those works that address methodological changes in education. Although numerous authors have published on this topic, the studies listed below were examined in detail, as their findings most clearly reveal the national dimensions of methodological renewal in pedagogy.The starting point of the present research was the author's previous studies, which examined educational methodologies and technician training from different perspectives.

[2] Budai G. (2023): A tudás hasznosítása a munkaerőpiacon. *Dunakavics,* 2023., (01.), pp. 34–38.

[3] Kőkuti T. (2022). Mesterséges intelligencia és foglalkoztatás. In: Keszi-Szeremlei Andrea–Rajcsányi-Molnár Mónika–András István (Szerk.): *Gazdasági növekedés és fenntarthatóság: Globalizáció a 21. században.* Dunaújváros, DUE Press. pp. 39–51.

[4] Budai G. (2015): Információs társadalom iskolái: hagyományos és elektronikus tanulás, *Dunakavics,* 2015., (9.), pp. 27–43.

[5] Budai G. (2014): Tanulói és tanulási utak a rendszerváltástól napjainkig, *Dunakavics,* 2014., (6.), pp. 5–27.

[6] Budai, G. (2024a): Historical development of education: changes in hungarian education methodology, *Dunakavics,* 2024., (12.), pp. 29–36.

[7] Fehérvári A. (2022): Tanítási gyakorlat tantermi jelenlét nélkül: tanárjelöltek tapasztalatai a Covid-lezárás idején, Szeged: Szegedi Tudományegyetem Neveléstudományi Intézet, MTA Pedagógiai Tudományos Bizottság. pp. 222–238.

[8] Komlos J.–Falus O. (2023): Van-e jogunk stresszmentes élethez?: A stressz egyes gazdasági és jogelméleti aspektusairól. *Civil Szemle,* 2023., (20.), pp. 145–156.

[9] Fekete M. (2020): Digitális átállás – az első hét tapasztalatai. *Iskolakultúra,* 30., (9.), pp. 77–95.

[10] Kőkuti T. (2021). Hallgatói munkaérték-preferenciák a digitális oktatási formák bevezetésének fázisában In: Balázs László (Szerk.): *Digitális kommunikáció és tudatosság.* Budapest: Hungarovox. pp. 65–77.

These investigations highlighted the importance of methodological innovation and the interrelationship between labour market needs and the education system.

Budai's study [2] demonstrates that four distinct roles can be identified within companies during the examined period: the professional specialist, the manager, the leader, and the supporting staff. This differentiation reflects not only labour market expectations but also the direction of change in pedagogical methodologies. Employment is also influenced by the emergence of artificial intelligence. [3].

In another study, Budai [4] argues that traditional pedagogical tools and methods are becoming less effective – especially for Generation Z – and are no longer sufficient for acquiring knowledge on their own. Due to the transformation of information access enabled by ICT use, new learning environments are needed that prioritise creativity and communication. This educational paradigm shift has emerged not only in Hungary but also at the international level. As early as 2000, the European Union declared that public education must enable learners to engage in lifelong learning. Budai's [5] study points out that this objective shifts the focus from teaching to the learning process itself, which requires a transformation of pedagogical roles.

The changes brought about by the COVID–19 pandemic further accelerated this process. Budai [6] emphasises that the role of digital technologies has grown significantly, leading to lasting changes in the applied pedagogical methodologies. Fehérvári's [7] research highlights that the sudden introduction of distance education posed challenges for many teachers; however, in the long run, the exclusive use of online learning is not desirable as it can interpreted as a stress-factor for both sides [8].

The digital mode of instruction also brought positive experiences. According to Fekete [9], the emergency situation encouraged teachers to innovate and prioritise experiential learning, as well as the importance of self-directed learning and collaboration. Student attitudes were also favorable during the introduction phase of digital forms of education [10].

Nahalka [11] points out that teachers who employed a constructivist approach to learning were able to adapt more successfully to these challenges. Budai's [12] study further refines the picture of methodological transformation in schools, highlighting that since the early 2000s, cooperative group work, research-based learning, and problem- and project-based learning have increasingly come to the forefront in classrooms.

This shift promotes greater student activity and a broader understanding of the learning process. Györgyi [13] outlines the future prospects of vocational education and training (VET) based on the CEDEFOP (2020) analysis, which presents three possible scenarios: plural[1], distinctive[2], and marginalised[3] vocational education. These scenarios are relevant not only for the future of VET itself but also for broader educational strategies.

SUMMARY

The literature review has highlighted the continuous transformation of secondary education and pedagogical methodologies. The role of digital technologies and the preparation for lifelong learning have gained particular importance. The studies I have reviewed in this field demonstrate that the adaptability and openness to innovation of all actors within the education system – teachers, students, and policymakers alike – are essential for successful renewal. The presented research findings contribute to a deeper understanding of how secondary education can become even more responsive to the challenges of the modern era.

[11] Nahalka I. (2021): Koronavírus és oktatáspolitika. *Educatio,* 30., (1.), pp. 22–35.

[12] Budai, G. (2024b): The effectiveness of the application of modern methodologies in technical vocational education, *Dunakavics,* 2024., (03.), pp. 5–16.

[13] Györgyi Z. (2022): A negyedik ipari forradalom és a hazai szakképzés, *Educatio,* 31., (1.), pp. 56–69.

1 Plural vocational education: This form of vocational education seeks to combine various educational forms and methods, placing great emphasis on diversity in education and on learners' opportunities to choose among different learning paths.

2 Distinctive vocational education: This type of VET is clearly separated from other forms of education, following specific objectives and methods that focus primarily on the acquisition of professional knowledge and skills.

3 Marginalised vocational education: In this scenario, the social and economic role of VET diminishes, becoming peripheral within the education system and receiving less priority from policymakers and the public.

Research Questions and Hypotheses

The evaluation of methodological developments and their effectiveness plays a crucial role in improving the quality of technician training. Following the review and analysis[4] of the relevant literature, several key research questions and corresponding hypotheses were formulated to guide the investigation. The main research questions and their related hypotheses are presented below.

Research Questions

During the research, I sought to answer the following key questions:

– *Evaluation of methodological developments*
How do technical school teachers evaluate the methodological developments introduced between 2021 and 2023?
Objective: To assess teachers' overall satisfaction and the acceptance of new teaching methods.

– *Identification of effective methodological elements*
Which methodological elements have proven to be the most effective in technician training?
Objective: To highlight the methods and tools that have been successfully applied in practice.

– *Impact of digital tools and project-based learning*
How have digital tools and project-based learning forms influenced the development of students' competences?
Objective: To explore the role and effectiveness of innovative learning forms.

– *The role of dual training*
In what ways has dual training contributed to making education more flexible and effective?
Objective: To examine the effectiveness of practical training compared to theoretical education.

4 The analysis of the literature was supported by the use of the ChatGPT-4o artificial intelligence tool, which facilitated the identification of conceptual patterns and the formulation of research hypotheses.

Hypothesis

The following hypothesis was formulated for the study:
The methodological developments introduced between 2021 and 2023 – particularly the integration of digital tools, dual training, project-based learning, and competence development – have had a significant positive impact on the effectiveness and adaptability of technician training in a rapidly changing economic and technological environment.
The central elements of this hypothesis focus on how methodological innovations have contributed to improving the quality of education and enhancing the adaptability of both students and teachers.

SUMMARY

The research questions and the related hypothesis cover the key aspects that determine the effectiveness and development of methodological practices in technical education. The purpose of the study is to contribute to the further improvement of technician training through a detailed analysis of individual methods and tools, with particular attention to the educational challenges of the 21st century. The findings are expected to provide a foundation for future methodological directions and professional decisions.

Research Method

To examine the attitudes of technical school teachers in Dunaújváros toward methodological developments, a questionnaire-based research method was applied[5]. The purpose of the research was to obtain a comprehensive picture of the effectiveness of the applied teaching methods, as well as the role of modern educational technologies and approaches in technician training. The questionnaire items specifically focused on the period under investigation.

Description of the Research

The study was conducted using a questionnaire survey, in which the opinions of 40 full-time technical school teachers in Dunaújváros were collected between 1–12 June 2024. The questionnaire is included in *Appendix 1*.

5 The design and formulation of the questionnaire items were supported by the use of the ChatGPT-4o artificial intelligence tool.

The respondents' answers to the previously formulated research questions provided the basis for evaluating the research hypotheses.

Research Methods

Among the methods applied in the study, special attention was given to capturing the diversity of teachers' opinions, which made it possible to conduct a comprehensive analysis. The examination of teaching methods, digital tools, and dual training helped to reveal potential methodological changes that occurred during the analysed period. When developing the groups of research questions, I aimed to explore distinct but interconnected areas such as teaching methodologies, the use of digital tools, dual training, project-based learning, and competence development. The questions below were formulated for these areas to provide a complex overview of the current state of methodological practices in technician education.

Teaching Methods

What teaching methods did you apply in your teaching practice between 2021 and 2023?
How has the proportion of applied methods changed over the past three years?
Which methods do you consider the most effective in improving students' performance, and why?

Digital Tools

Do you use digital tools during your lessons? If yes, which ones and for what purposes?
How do you evaluate the effectiveness of digital tools in improving student performance?
What difficulties did you face when introducing digital tools into your teaching practice?

Dual Training

How do you assess the role of dual training in technician education?
What impact does dual training have on students' practical knowledge and professional development?
In your experience, how well does dual training integrate with theoretical education?

Project-Based Learning

Have you applied project-based learning methods? If yes, what types of projects have you implemented?
How did students respond to project-based learning approaches?
In your opinion, to what extent does project-based learning contribute to the development of students' skills and competences?

Competence Development

Which competences do you consider the most important in technician training?
How have you integrated competence development into your teaching practice?
How successful do you consider the implementation of competence-based education to be?

The Challenges of the 21st Century

In your opinion, what challenges does technician training face in the 21st century?
How do you see the role of methodological developments in addressing these challenges?
What further suggestions would you make for the modernisation of teaching methodologies?

SUMMARY

The main aim of my research was to explore the opinions of technical school teachers in Dunaújváros regarding methodological developments and their impacts. The questionnaire-based study provided a detailed analysis of the application of teaching methods, digital tools, dual training, project-based learning, and competence development, as well as the responses to the challenges of 21st-century education.

The results highlighted the methodological changes that occurred during the examined period, their effectiveness, and the difficulties perceived by teachers. The teachers' recommendations may contribute to the modernisation of technician training and to the further improvement of students' performance.A kérdőívekre adott válaszok kiértékelése

In the research on methodological opportunities applied in technician training, the analysis of the questionnaires provided valuable insights into the practices and innovations of the 2021–2023 period. The following section presents the most important findings, organised according to the groups of research questions[6].

6 The analysis of the questionnaire responses was supported by the use of the ChatGPT-4o artificial intelligence tool, which facilitated

Results

Use of Teaching Methods

Eighty percent of the respondents indicated that frontal instruction and group work were the most frequently used teaching methods. Over the past three years, the daily use of digital tools – particularly Microsoft Teams – has become predominant (70%). Eighty-five percent of teachers considered group work and project tasks highly effective in improving students' performance.

Use of Digital Tools

Ninety percent of the respondents used digital tools, primarily projectors and interactive whiteboards. Their use in classroom teaching proved particularly beneficial for members of Generation Z and Generation Alpha (85%). However, a major challenge in implementation was that not all teachers were adequately prepared for the digital transition (70%).

Dual Training

Ninety-five percent of respondents evaluated the role of dual training in technician education as appropriate, specifically highlighting the professional preparedness of dual partners. According to 80% of teachers, students successfully acquired practical knowledge directly at the partner companies, which substantially increased the effectiveness of education.

Project-Based Learning

Eighty-five percent of respondents regularly applied project-based learning methods, particularly during preparation for sectoral examinations. Students responded very positively to these approaches (90%), and their competences were significantly enhanced as a result (85%).

data interpretation and pattern recognition.

Competence Development

Eighty-five percent of respondents identified professional, personal, social, and general employability competences as the most important in technician training. Ninety-five percent stated that they developed these competences through methods and materials that emphasised active student participation and practical application. Competence-based education was generally evaluated as successful (85%).

21st-Century Challenges and Responses

Seventy-five percent of respondents indicated that the greatest challenges facing technician training include keeping pace with technological progress, motivating students, and ensuring teachers' preparedness. Methodological developments such as interactive learning, the use of digital tools, and the inclusion of real-world problem-solving were considered key to overcoming these challenges (90%). Further development areas identified included closer cooperation with industrial partners and expanded teacher training opportunities (80%).

General Feedback

Seventy-five percent of respondents believed that the methodological developments implemented between 2021 and 2023 met the expectations of students and their parents. The most significant success identified was the application of the project-based method (85%), while teacher training in the use of digital tools was recognised as an area requiring further development. Additional support was also deemed necessary for the integration of modern methodologies into classroom teaching (75%).

Summary of the Questionnaire Results

The results of the questionnaire survey revealed that the methodological innovations introduced between 2021 and 2023 significantly contributed to improving the effectiveness and flexibility of technician training. The integration of digital tools, the development of dual training, and the application of project-based learning have proven to be key elements enabling education to meet the expectations of the modern era.

Hypothesis Testing

The results of the questionnaire survey clearly confirmed that the methodological innovations introduced between 2021 and 2023 had a significant positive impact on the efficiency and adaptability of technician education. The integration of digital tools, the expansion of dual training, and the application of project-based learning proved to be effective instruments that allowed education to align with the requirements of the modern age.

Based on my findings, I consider my hypothesis confirmed, as the results clearly support the assumption that the methodological developments implemented between 2021 and 2023 had a notable positive effect on the effectiveness and adaptability of technician training.

Conclusion

The results of my study clearly demonstrate that the methodological developments introduced between 2021 and 2023 had a substantial positive impact on technician training in the examined institution. The data collected revealed that these innovations not only improved the efficiency of the learning process but also fundamentally transformed the role of technician education in 21st-century teaching.

The introduction of digital tools opened a new dimension in the presentation and practical application of learning materials, proving especially beneficial for technical training. The use of modern methodological tools made both teaching and learning more effective, although further development of teachers' preparedness remains necessary.

Furthermore, the dual training model represented a major step forward by allowing students to gain deeper insight into labour market requirements and expectations. This model helped students strengthen their work-related competences through practical experience and develop a clearer understanding of real-world work environments. Dual training thus supported not only the deepening of professional knowledge but also the enhancement of students' confidence and practical skills.

Project-based learning and competence-development programmes produced additional positive outcomes. These approaches helped students acquire key skills essential for success in a rapidly changing technological environment. Their creativity, problem-solving ability, and collaboration skills improved considerably – contributing not only to individual success but also to economic and social development.

In summary, the integration of modern methodological elements has significantly strengthened the flexibility and innovative capacity of technician training. This adaptability and innovation serve as a crucial foundation for meeting the challenges of the 21st century, ensuring that technician education remains relevant and effective in an ever-changing economic and technological landscape.

Appendix 1. Questionnaire

Questionnaire: Methodological Developments in Technician Training (2021–2023)
Dear Respondent,
The purpose of this questionnaire is to assess the impact of methodological opportunities and innovations applied in technician training.
Please answer all questions and share your experiences.
Completing the questionnaire takes approximately 10 minutes.

1. Use of Teaching Methods
   1.1. What teaching methods did you apply in your teaching practice between 2021 and 2023?
   1.2. How has the proportion of applied methods changed over the past three years?
   1.3. Which methods do you consider the most effective in improving students' performance? Why?

2. Use of Digital Tools
   2.1. Do you use digital tools during your lessons?
   2.2. If yes, which tools do you use and for what purposes? (You may select more than one.)
   2.3. How do you evaluate the effectiveness of digital tools in improving student performance?
   2.4. What difficulties did you face when introducing digital tools?
3. Dual Training
   3.1. How do you assess the role of dual training in technician education?
   3.2. What impact does dual training have on students' practical knowledge and professional development?
   3.3. In your experience, how well does dual training integrate with theoretical education?
4. Project-Based Learning
   4.1. Have you applied project-based learning methods?
   4.2. If yes, what types of projects have you implemented?
   4.3. How did students respond to project-based learning approaches?
   4.4. In your opinion, to what extent does project-based learning promote the development of students' skills and competences?
5. Competence Development
   5.1. Which competences do you consider the most important in technician training? (You may select more than one.)
   5.2. How have you integrated competence development into your teaching practice?

5.3. How successful do you consider the implementation of competence-based education?

6. 21st-Century Challenges and Responses

6.1. In your opinion, what challenges does technician training face in the 21st century?

6.2. How do you see the role of methodological developments in addressing these challenges?

6.3. What further suggestions would you make for the modernisation of teaching methodologies?

7. General Feedback

7.1. How do you evaluate the methodological developments implemented between 2021 and 2023?

7.2. Which of these do you consider particularly successful, and which areas would still require improvement?

7.3. Are there any areas where additional support would be needed from the educational system?

Thank you for your answers!
Your experience and feedback greatly contribute to the further development of technician training.