https://doi.org/10.63684/dk.2024.12.04

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# *The Evolution of Methodological Textbooks in Hungary (1947–2020): Changing Approaches in Mechanical Engineering Education*

**Abstract:** This study aims to present the development of Hungarian methodological textbooks between 1947 and 2020, with special focus on secondary-level mechanical engineering education. Ten textbooks from different eras were analyzed in terms of language use, terminology density, methodological orientation, and the appearance of digital tools. The results highlight major shifts in pedagogical approaches, the influence of technological advancement, and the growing emphasis on learner-centered methods. The research contributes to a deeper understanding of historical and contemporary trends in Hungarian vocational methodology.
**Keywords:** Methodological development, mechanical engineering education, digital pedagogy.

**Összefoglalás:** A tanulmány célja a magyar szakmódszertani tankönyvek fejlődésének bemutatása 1947 és 2020 között, különös tekintettel a középfokú gépészeti képzésre. A vizsgálat során tíz, különböző korszakokból származó módszertani könyvet elemeztem nyelvhasználat, szakkifejezések aránya, módszertani irányultság és a digitális eszközök megjelenése alapján. Az eredmények rávilágítanak a pedagógiai szemléletváltozásokra, a technológiai fejlődés hatására és a tanulóközpontú oktatási módszerek térnyerésére. A kutatás hozzájárul a magyar szakmódszertan történeti és jelenkori tendenciáinak mélyebb megértéséhez.
**Kulcsszavak:** Szakmódszertani fejlődés, gépészeti oktatás, digitális pedagógia.

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[1] Mccrindle (2020): *Understanding generation alpha.* https://www.researchgate.net/publication/342803353_UNDERSTANDING_GENERATION_ALPHA [Letöltés: 2023. 10. 13.)

[2] Nemes O. (2019): *Generációs mítoszok. Hogyan készüljünk fel a jövő kihívásaira?* Budapest: HVG Könyvek.

## Introduction

Hungarian educational methodology, focusing on secondary education, has undergone numerous changes in the past eight decades, which were closely related to social, economic and technological transformations. In the 1940s, methodological textbooks written in order to strengthen industrialization and professional training focused primarily on the transfer of practical knowledge, while from the 1980s more and more attention was paid to competence development and the support of independent problem-solving ability. In recent decades, technological developments, especially the proliferation of digital tools, have fundamentally changed educational practices.

The aim of this study is to explore the development of methodological textbooks from the 1940s to the present day, with special regard to mechanical engineering subjects of secondary education. During the analysis, I compare textbooks from different periods and show how they reflect changes in pedagogical approaches, changes in language use, methodological and practical recommendations. The study also looks at how textbooks have responded to technological and social changes and how these have affected educational content and methods. The results of the analysis help us understand how Hungarian educational methodology has developed and how it has adapted to the challenges of the modern age.

## The transformation of educational methodology in the period 1940–1989

The methodological books published between 1940 and 1980 responded to the economic and social needs of the period, were practice-oriented, and gradually developed along didactic principles and technological development. In accordance with the centrally regulated system of secondary education, uniform language and support for industrialization dominated. In secondary schools, traditional frontal education and the master-apprentice relationship prevailed. The books were less learner-centered and more educational-centered. In professional textbooks, illustrative materials (drawings, tables) were even less typical. Below I present methodological books from the indicated period:

Zoltán Moneyes's book entitled *'Principles of teaching and methodology in industrial education'* was published in 1947. It was characterized by a practice-oriented approach and typically focused on basic technological and industrial knowledge. Emphasis was placed on student discipline and authority of the instructor.

Béla Szatmári's book entitled *'General methodology of teaching industrial internships'* was published in 1971. Didactic principles as well as detailed methodological guidelines have already been published in the book. Analyses of industrial technologies and work processes were also part of the book.

The *'Subject Methodology Manual'* published in 1973 provided methodological support for the teaching of bodywork-locksmith structure and assembly skills. The methodological foundations of the transfer of profession-specific professional knowledge have already been published in the book. accompanied by detailed technological and technical diagrams. The book provided an opportunity to integrate theoretical teaching materials and practical training.

The *'Plan for vocational education and training for vocational schools'* was published in 1980. The content of the book was still centrally designed, but educational structures were already discussed in detail. It has also focused on increasing the efficiency of industrial production.

As I discussed in an earlier paper, methodological textbooks in the 1980s strongly followed a centralized educational model. State-defined curricula determined pedagogical practice and, accordingly, textbooks preferred frontal educational methods. In vocational education, training courses were adapted to the needs of industrial production. By the end of the 80s, traditional and modern methods of education were already separated. The modern method of education is created when knowledge leads to the solution of a particular problem is not given to students "ready", but they have to acquire it themselves, for example, from various Internet resources, public collections, or even from teachers, parents and classmates. [1]

[1] Budai, G. (2024): The effectiveness of the application of modern methodologies in technical vocational education. *Dunakavics*, 12., (3.), pp. 5–16.

## The impact of the regime change on methodological textbooks

Political and economic transformation has had a significant impact on education, including vocational education. Central control gradually decreased, schools and teachers were given greater autonomy in choosing teaching materials and methods. Industrial restructuring has led to new vocational training needs, for example in services, information technology and modern technologies.

Decentralised curriculum maintenance has allowed teachers more freedom in choosing the curriculum, and methodological textbooks have also become more diverse. Methods supporting interactive and group learning appeared, encouraging active participation of learners. Based on my analysis of my previously published study 'Schools of the Information Society', these principles were also relevant at international level. [2]

The book *'Methodology of practical training'* was published in 1998, which already provided a detailed description of the organisation of practical education, taking into account industrial change and new technological challenges. It described competency-based learning methods, including project-based learning.

## The role of technology in methodological development (2000-present)

Technological progress has had a dramatic impact on pedagogical methods and textbooks. The integration of interactive learning materials, online platforms and digital tools has created new opportunities in education. The results of my previously published research examining the labour market side also emphasize the increasing role of multimedia content and student autonomy in education: From the beginning of the 2000s – due to the market economy environment – it became increasingly necessary to continuously update the knowledge of employees and continuous professional renewal in order to ensure the competitiveness of the company. From the employer's side, the more valuable professional is the one whose cost of providing new information is lower than that of a novice employee due to his already existing experience. [3]

By following technical progress in the 2000s, the main goal of education is to help students develop intellectual tools and learning strategies that are essential for acquiring and even expanding knowledge throughout their lives. During the learning process appropriate for a digital school, students must also be able to think about their own problems appropriately, efficiently and make responsible decisions. (…) The multiplying body of knowledge and the variety of information carriers prepared for them made the planning work of teachers difficult. [2]

[2] Budai, G. (2015): Information society schools: traditional and electronic learning. *Dunakavics,* 3., (9.), pp. 27–42.

[3] Budai, G. (2023): Utilizing knowledge in the labour market, *Dunakavics*, 11., (1.), pp. 35–37.

The period from the 90s to the turn of the millennium already pointed towards interactive teaching, digital technology and learner-centeredness, laying the foundation for later reforms after 2000.

The publication *"Mechanical Methodology"* was published in 2011, which already reflects the innovations of the 1990s, such as the integration of computer simulations and drawing programs into the learning process. In the methodology of mechanical engineering education, the use of CAD software, simulations and other digital tools comes to the fore. The publication also emphasizes active student participation, independent problem solving and creative thinking. Furthermore, the aim of the curriculum is to deepen (develop) students' professional knowledge (competences) and to meet new labour market needs.

The *'Methodology of Teaching Chemistry'* published in 2015 focuses on problem solving and the development of critical thinking and experimental skills. She recommends that teachers encourage students to learn independently through experimentation and project work. For example, it focuses on group work, the use of digital tools (e.g. virtual labs) and the flipped classroom model. The author not only provides methodological advice to teachers, but also encourages educators to constantly train themselves and keep up with technological developments.

The book '*The Theory of Digital Pedagogy'* was published in 2020 and takes a good look at the digital education that took hold in the early 2020s. The book discusses the pedagogical principles of online teaching and the use of digital tools, especially in relation to the digital education needs that have intensified after the COVID-19 pandemic. The author prefers innovative methodologies: blended learning, gamification and other innovative methods are also presented. It also focuses on the pedagogical use of digital technologies.

## Analysis of educational methodology books

I examined ten books on mechanical engineering methodology. The books were published between 1947 and 2020. The books – especially the methodological parts contained in them – were coded beforehand, which allowed me to quantify the results of the analysis later. The categorization of books published between 1947 and 1998 was based on a study published by László Kojanitz in 2003. [4]

[4] László Kojanitz (2003): Comparative study of vocational school textbooks, *Pedagogical journals,* 2003/9.,

Further categorization was based on the book by László Hülber–Dóra Lévai–János Ollé published between 2000 and 2020. [5]

[5] László Hülber–Dóra Lévai–János Ollé (2015): Comparison and evaluation of digital textbooks. *Book and Education,* XVII., pp. 67–89.

I have coded the books with the following codes:

1. Zoltán Moneyes: Principles of teaching and methodology in industrial education, Budapest, 1947 (Coding: Iparoktatás_1947)
2. Béla Szatmáry: General methodology of teaching industrial "internships"; For technical instructors, Budapest University of Technology, Faculty of Mechanical Engineering; Textbook publisher, Budapest, 1971 (Coding: Ipari_szakm_gyak_1971)
3. Subject Methodology Manual – For teaching bodywork-locksmith structure and assembly skills; Institute of Methodology of the Ministry of Labour, Budapest, 1973 (Coding: Kar_lak_1973)
4. Plan for vocational education and training for apprenticeship schools, Ministry of Labour, Budapest, 1980 (Coding: Szakmai_nev_1980)
5. Practical training manual - for vocational teachers in vocational schools and vocational schools conducting apprenticeship; Ministry of Labour, Institute of Vocational Education and Training, Budapest, 1982 (Coding: Gyak_okt_1982)
6. Methodological guide for the training of vocational trainers; Transport Documentation Company, Budapest, 1984 (Coding: Útmutató_1984)
7. Methodology of practical training, Budapest, 1998 (Coding: Gyakorlati_képzés_1998)
8. Gyula Kelemen: Mechanical engineering methodology; Dunaújváros, 2011 (Coding: Szakrajz_Méretezés_Rugalmas_tan)
9. Luca Szalay: Methodology of teaching chemistry, Budapest: ELTE. 2015 (Coding: Teaching chemistry)
10. Zoltán Szűts(2020): The theory of digital pedagogy, Budapest: Akadémiai Publishing House, (Coding: Digitális_pedagógia)

I started the analysis by systematizing the collected data and chose comparative analysis as the research method; I used 'MAXQDA Analytics Pro (24.6.0) with AI Assist' for analysis. The results of the analysis are illustrated in *Table 1:*

***1. Table. Results of analysis of methodological books***

| Book code | Year | Language Complexity (Avg. Sentence Length) | Vocabulary Diversity (%) | Technical Terminology Usage (%) | Methodological Focus (Theory to Practice Ratio) | Digital Tools Referenc (%) |
|---|---|---|---|---|---|---|
| Iparoktatás_1947 | 1947 | 12 | 30 | 25 | 70:30 | 0 |
| Ipari szakm gyak 1971 | 1971 | 15 | 35 | 30 | 60:40 | 0 |
| Kar_lak_1973 | 1973 | 14 | 33 | 28 | 65:35 | 0 |
| Szakmai nev 1980 | 1980 | 13 | 32 | 27 | 70:30 | 0 |
| Gyak_okt_1982 | 1982 | 16 | 34 | 32 | 68:32 | 0 |
| Útmutató 1984 | 1984 | 14 | 33 | 29 | 65:35 | 0 |
| Gyakorlati_képzés_1998 | 1998 | 18 | 38 | 35 | 55:45 | 2 |
| Szakrajz Méretezés Rugalmas tan | 2011 | 20 | 42 | 40 | 50:50 | 5 |
| Teaching chemistry | 2015 | 21 | 45 | 43 | 48:52 | 10 |
| Digitális pedagógia | 2020 | 25 | 55 | 50 | 40:60 | 70 |

Source: Own research.

Based on the results of *Table 1*, I made the following statements:

Change in language use: In earlier books (1947 and 1970s) technical language is more direct, focusing more on instructions, process descriptions and basic rules. Formal simplicity and "do it this way" language are common in these texts. In methodological books published since the early 1990s, technical language is more precise, technically detailed and scientifically based, terms characteristic of the digital age appear, especially in the 2020 edition.

In terms of methodological differences, early books placed great emphasis on teaching basic professional practices (e.g. manual labor, tool handling), while later books, especially after the turn of the millennium, also cover modern mechanical engineering technologies, automation and digital design. . Since the early 2000s, methodological descriptions have increasingly focused on the practical application of theoretical foundations and present a variety of teaching methods.

Didactic changes are also striking, especially in books published in the 2000s. Education tailored to student needs is already appearing in these publications. Teaching methods are more flexible and focus on developing critical thinking, problem-solving and self-study.

## Summary

Analysis of old (1980s) and new (2020s) textbooks highlights differences between pedagogical approaches. For example, earlier textbooks contained mainly static content, while today's textbooks also offer interactive exercises and multimedia materials. There are also significant changes in language use: the simplification of technical language and the emphasis on learner-centred approaches are becoming increasingly apparent. The changes in educational methodology between 1980 and the present reflect social and technological transformations well. The study shed light on how methodological textbooks have adapted to these changes and what directions characterize modern education. In the future, digital technologies and competence-based learning are expected to become even more prominent in education.