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# A Review of the Content Analysis Studies of Physics Textbooks in Iran's Secondary Education: A Comparison with Several Countries

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*Content Analysis, Physics Textbooks, Secondary Education*

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**ABSTRACT**

Review studies can provide a comprehensive picture of the current state of a specific field by integrating the findings of various research studies. The aim of this study was to review content analysis studies of physics textbooks in Iran's secondary education and to compare these studies with similar research in other countries. The research method used was a systematic review. The statistical population included all articles, theses, and research reports published on the content analysis of physics textbooks from 1997 to 2024 in Iran and several other countries. To access the documents, searches were conducted using keywords in reputable domestic databases [such as Civilica, Noor Specialized Journal Database, SID, ElmNet, Magiran] and international databases [including Google Scholar and ResearchGate]. Among the studies conducted, 34 documents (18 domestic and 16 foreign) that directly addressed the content analysis of secondary education physics textbooks met the criteria for inclusion and were analyzed. The findings showed that more than one-third of the content analysis studies of physics textbooks in Iran only focused on quantitative content analysis using William Romy's method to estimate the engagement coefficient. Most content analysis studies only examined physics textbooks from a single perspective. In comparison, content analysis studies in other countries exhibited greater thematic diversity. The conclusion is that there is no clear pattern governing content analysis studies of Iranian physics textbooks, and many content selection criteria were not included in the analyses. Based on the comprehensive picture derived from this review, it is suggested that future researchers analyze physics textbooks based on other content selection criteria and, in each study, analyze textbooks from all three grades of a discipline simultaneously from multiple perspectives.

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## INTRODUCTION

Due to the expansion of physics as a science and the development of modern science education methods, physics education has advanced significantly, and many countries have developed new national curricula, including physics curricula, at the secondary education level. For instance, the U.S introduced the Next Generation Science Standards in 2013; the UK introduced a new "science programmers of study" for Key Stage 4 in 2014; and Singapore published the O-Level Electronics syllabus and Science syllabus in 2021 [43]. Iran's Ministry of Education also developed its national curriculum in 2012. The learning areas of the national curriculum clarify the content boundaries, methods, processes, and key elements of learning. One of these areas is the learning of experimental sciences. The organizing of content in these areas for the second period of secondary education is presented in terms of academic fields in the form of core topics with a theoretical or applied orientation [29]. Physics as a subject in secondary education is part of the experimental sciences area. Physics curriculum development in secondary education is a systematic process that involves identifying educational goals, selecting content, and designing learning activities, ultimately leading to the formulation of a comprehensive and effective curriculum. Therefore, content, as a key component of the curriculum, must be selected in a way that not only covers the fundamental concepts of physics but also responds to the new needs of learners.

The physics textbooks for secondary education in Iran include Physics 1 (110209), Physics 2 (111209), and Physics 3 (112209) for the Mathematics and Physics field; Physics 1 (110214), Physics 2 (111244), and Physics 3 (112244) for the Experimental Sciences field; and Physics (210146) for the Technical and Vocational Education field. Many experts emphasize the critical role of high-quality textbooks as key tools and resources in the learning process, ensuring the achievement of curriculum goals, advancing education, and fostering national development [38]. Physics textbooks, as an essential educational resource, significantly impact teaching and learning. Given the importance of these textbooks, content analysis has been given considerable attention [43]. Content analysis is a research method used in an objective and systematic way to describe the explicit content] such as textbook content] [10]. Content analysis of a book can tell us what topics the book covers, which points are emphasized more or less, and how the content is organized [10]. Content analysis of textbooks is an important tool for evaluating and improving educational systems. In this regard, the physics textbooks of secondary education, as key resources in basic science education, require careful and comprehensive examination. These analyses can help identify the strengths and weaknesses of the educational content and its compliance with educational standards. The information derived from content analysis can directly inform the revision of related subjects [10].

In recent years, several studies have been conducted on the content analysis of secondary education physics textbooks, each using different approaches and methods. Some studies have focused on the compliance of the content with national and international educational standards, while others have examined the impact of educational content on students' learning and motivation. This study reviews these studies and their findings and aims to extract common patterns and key insights. A review of the research background reveals that many researchers[5,7,8,11,13-

15,19,22,28,31-33,35,36,39,40]. in Iran; and many researchers[1,4,9,16,20,23-26,34,38,40-44]outside Iran have analyzed the content of secondary education physics textbooks from various aspects.

According to Zhang & Chen (2023), a comparative study of secondary physics textbooks can help us understand the similarities and differences between different textbooks in terms of content. Currently, due to the diversity of content analysis studies and their subject dispersion, there is a need for a comprehensive and complete picture of the current state of physics textbooks' content. The information derived from combining the results of multiple content analysis studies can provide valuable and comprehensive insights for revising and improving the physics curriculum, especially revising the content of physics textbooks, which will assist curriculum planners in this subject area and guide future studies in this field. Review studies are critical in scientific research because they help collect, organize, and analyze scattered information in a specific field. These studies not only identify research gaps and contribute to the development of new theories and models, but also enable researchers and decision-makers to make more informed decisions based on documented evidence. Based on the research background, no study was found that has systematically reviewed the content analysis studies on physics textbooks in Iran. There is also no detailed information regarding the strengths and weaknesses of these textbooks based on the findings from various studies. Therefore, the aim of this paper is to review previous studies on the content analysis of secondary physics textbooks to provide a comprehensive and integrated picture of the current state of these textbooks by combining the findings from different content analysis studies. Specifically, this paper seeks to answer the following questions: 1. what aspects of the content have content analyses of physics textbooks in Iran and globally focused on? 2. What methods have been used in these analyses? 3. What results have these analyses yielded, and what picture of the current status of physics textbooks, along with their strengths and weaknesses, emerges from the integration of the findings of content analysis studies? What gaps exist in content analysis studies of physics textbooks, and which aspects should future studies focus on?

## The first Results

Table A.1 presents a summary of the content analysis studies of secondary education physics textbooks in Iran, showing that 18 studies analyzed various aspects of different physics textbooks for this level. These studies almost all examined the seven physics textbooks for grades 10, 11, and 12 in the Experimental Sciences and Mathematics & Physics field, as well as the physics textbook for the Technical and Vocational Education fields, from various perspectives. The names of the researchers, year of implementation, objectives, methods, population and sample, and the findings of each study are presented in columns one, two, and three of Table A.1, respectively in the Appendix.

Table A.2 presents a summary of the content analysis studies on secondary education physics textbooks from various countries, including Indonesia, Greece, Saudi Arabia, Turkey, China, Australia, and Libya. It includes 16 studies that analyzed different aspects of these textbooks. The names of the researchers and the year of

implementation, the objective, method, population and sample, and the findings of each study are presented in columns one, two, and three of Table A.2 in Appendix, respectively.

## Discussion and Conclusion

The findings revealed that out of the eighteen studies identified on the content analysis of physics textbooks in Iran, seven studies [5,7,11,19,22,28] more than one-third of the studies, focused on calculating the engagement coefficient and examining the level of activity in the content of the textbooks using William Romy's method. Two studies [13,32], one-ninth of the studies, focused on examining attention to different aspects of the nature of science. The subject of two studies [12,15], one-ninth, was the content analysis of the textbooks in terms of attention to Bloom's cognitive domain. Two studies [19,40], one-ninth of the studies, analyzed the readability of the physics textbooks. Two studies [19,35], one-ninth of the studies, analyzed the textbooks from the perspective of creativity. One study [8] analyzed the textbooks in terms of content selection criteria. One study [31] examined the textbooks based on Merrill's model of displaying components. One study [36] analyzed the content of physics textbooks with respect to energy consumption patterns. Among these studies, Karimi Hajikhademi & Ameri (2018) analyzed the textbooks simultaneously from three perspectives: activity level, creativity, and readability. Derakhshanfar et al. (2022) compared the attention to cognitive domains in the physics content between Iranian and Russian textbooks. One study [40] conducted a comparative study of the curriculum elements of physics in Iran and countries like Singapore, Turkey, India, the UK, and Australia.

The findings also revealed that out of the sixteen studies identified on the content analysis of physics textbooks in other countries, three studies [21,38,42] analyzed textbooks from the perspective of scientific literacy. Two studies [16,26], both in Indonesia, examined attention to different aspects of the nature of science. Two studies [4,9] analyzed the textbooks in terms of reflecting multiple intelligences. Two studies [34,37] analyzed the content from the perspective of critical thinking. One study [43] examined the representation of conceptual, epistemic, and cultural aspects in physics textbooks. One study [44] conducted a comparative study of high school physics textbooks on energy and sustainable development. One study [41] examined attention to scientific process skills in the textbooks. One study [21] analyzed physics textbooks from the perspective of project-based learning. One study [1] analyzed physics textbooks based on Next Generation Science Standards. One study [21] examined the attention to ideal textbook features in Grade 9 physics textbooks. One study [24] analyzed the extent to which physics textbooks help achieve stated objectives based on Bloom's cognitive domain. One study [37] analyzed textbooks from the perspectives of critical thinking and Bloom's higher-order thinking skills. One study [34] examined context-based physics textbooks with respect to their impact on learning 21st-century skills, critical thinking, and essential competencies for everyday life application.

The findings indicated that the content analysis studies conducted on physics textbooks in Iran have numerous weaknesses. A comparison of the content analysis studies conducted in Iran and other countries in terms of the study subject shows that other country studies exhibit thematic diversity. In the sixteen other country studies, textbooks were analyzed from fifteen different aspects, while the eighteen studies

conducted in Iran examined textbooks from only eight aspects. Evidence suggests that there is an excessive attention in Iran on quantitative content analysis of textbooks using William Romy's method. For example, seven studies (more than one-third) focused on analyzing engagement and activity of the content using William Romy's method. In contrast, five out of six studies on Indonesian physics textbooks identified in this study covered diverse topics. This thematic dispersion in the other country studies seems to provide more useful insights for curriculum planners in Iran.

Moreover, textbooks can be analyzed from numerous other perspectives that have not been addressed in these studies. For instance, multiple criteria such as content suitability with learners' needs and characteristics—such as interests, preferences, talents, cognitive development, and learnability—should be considered in selecting content for textbooks, including physics textbooks [38]. In the analyzed studies, no physics textbooks were examined with regard to many content selection criteria. Furthermore, adhering to many criteria for selecting curriculum content, including physics, is a challenging task. For example, Aina (2018) has argued that the current physics teacher education curriculum in many countries may not adequately accommodate multiple intelligences.

The evidence also showed that out of the eighteen content analysis studies of physics textbooks conducted in Iran, only two studies [8,19] analyzed textbooks from more than one perspective. As mentioned earlier, seven studies focused solely on calculating the engagement coefficient and being active of content using William Romy's method. According to the author of this paper, given the numerous criteria involved in selecting textbook content, it is neither cost-effective nor logical to conduct a content analysis study focusing only on calculating the engagement coefficient. Every study should aim to address more than one aspect and analyze textbooks from various perspectives simultaneously.

Furthermore, in the second cycle of secondary education in Iran, there are seven physics textbooks: six for grades 10, 11, and 12 in the Experimental Sciences and Mathematics-Physics field, and one for the Technical and Vocational Education fields. Almost all of these textbooks have been examined using content analysis. However, it should be noted that the distribution of studies on the seven physics textbooks is not uniform. The content of some textbooks has been analyzed by multiple researchers, while the content of some textbooks has been analyzed less frequently. This is an important issue because each study has only examined one aspect of the content, which is insufficient.

In conclusion, it can be stated that content analysis research in Iran is conducted sporadically and without regard to prior studies. Each researcher analyzes the content of textbooks from only one perspective. On the other hand, it is unclear to what extent the consumers of content analysis findings, such as curriculum planners and content developers, consider the findings of various content analysis studies during the process of revising textbooks. This is because the dispersion of studies may confuse them. This study is significant because it provides an overview of the content analysis studies on secondary education physics textbooks in Iran. The findings of such a study provide a comprehensive picture of the content status of textbooks by integrating the findings of various studies, which can assist curriculum planners. Consequently, the findings from

reviewing previous content analysis studies indicated which aspects of physics textbooks for different fields and grades have been studied and which aspects have been neglected. Additionally, it points out which textbooks for grades 10, 11, and 12 in both theoretical and technical vocational tracks have not been analyzed. This, in turn, provides valuable information for curriculum revisers and helps guide future research.

One limitation of this study is that it focused on content analysis studies from several countries, mostly from Asia. This limitation is justifiable given the primary objective of this research, which was to review content analysis studies on physics textbooks in Iran. Although comparisons with other country studies were also included as a secondary objective. Two recommendations are specifically made for future content analysis research: First, each content analysis study should analyze at least the content of the physics textbooks for grades 10, 11, and 12. Second, the content of physics textbooks should be analyzed from perspectives not addressed in previous studies, and each study should analyze at least the content of textbooks from three different perspectives simultaneously.

**References**

[1] Ahamad, A.N., Samsudin, M.A., Ismail, M.E., & Ahmad, N.J. (2021). Enhancing the Achievement in Physics' Motion Concept through Online Multiple Intelligence Learning Approach. Eurasia Journal of Mathematics, Science and Technology Education. 17. Em1941. 10.29333/ejmste/9698.

[2] Aina, J.K. (2018). Physics learning and the application of multiple intelligences. Revista Brasileira de Gestão Ambiental e Sustentabilidade. 5. 381-391. 10.21438/rbgas.050926.

[3] Alahmad, N., & Albaqami, M. (2017). An Analysis of the Physics Textbook Content within the Next Generation Science Standards (NGSS), Jordan. Journal of Educational Sciences, 13(3), 309–326. https://jjes.yu.edu.jo/index.php/jjes/article/view/696

[4] Alshiyab, M .(2013). The extent of Including of Multiple Intelligences at 1st Secondary School Grade Physics textbooks at Saudi Arabia.

[5] Bagheri, M., and Soni Shargh, R. (2019). Content analysis of 11th grade experimental physics using William Rumi's method. Quarterly Journal of Physics Education Development, 125, 16-21. https://www.magiran.com/p2113636

[6] Bahrami, S. & Rezvani Nasab, S. (2017). The relationship between Gardner's multiple intelligences and students' achievement in third year physics of high school in the Varamin city. New Trends and Issues Proceedings on Humanities and Social Sciences. [Online]. 11, pp 613-623. DOI: 10.18844/prose. v4i1.2307

[7] Baktash, M., Abol-Hosseini, M., Shamshiri-Ardakani, M. (2019). Content analysis of the 10th grade physics textbook using the William Rumi method. Seventh International Conference on Psychology, Educational Sciences and Lifestyle.

https://civilica.com/doc/1193953

[8] Benzaraki-Nehan, M. and Zarei, A. (2017). Analysis, critique, and review of the 10th grade physics textbook. Provincial Scientific Research Conference on Strategies and Solutions for Improving Quality in Education, Minab. https://civilica.com/doc/697485

[9] Christopoulou, M. & Skoumios, M. (2013). An Analysis of a School Physics Textbook According to Gardner's Multiple Intelligences Theory. International Journal of Science, Mathematics and Technology Learning. 19. 99-109.

10.18848/2327-7971/CGP/v19i02/58995.

[10] Delavar, A. (2017). Theoretical and Practical Foundations of Research in the Humanities and Social Sciences. Tehran: Roshd.

[11] Delavari, M., Khojier, K. (2024). Analysis of the content of the 10th grade physics book of the experimental sciences discipline (academic year 2023-2024) based on William Rumi's method. Innovation in Teaching, Learning and Evaluation, 1(2), 55-69. https://doi.org/10.22034/jitle.2024.477470.1012

[12] Derakhshanfar, A., Ahmadi Kalateh Ahmad, F. and Shekarbaghani, A. (2022). Comparison and analysis of educational content in textbooks physics of Iran and Russian on magnetism subject. Popularization of Science, 13(1), 39-49. Doi: 10.22034/popsci.2022.325486.1157

[13] Fathi, M. R. and Oroji, Z. (2023). Content analysis of the eleventh-grade physics textbook in the field of mathematics-physics based on the nature of science approach. Research in Experimental Science Education, 2(7), 24-36.

[14] Farzannahad, Y. (2024). Modern Physics in Iranian High School Textbooks. Physics Journal | Farhangian University, 1(1), 85-91. Doi: 10.48310/esip.2024.17596.1009

[15] Hafezi, R. (2013). Content analysis of questions in physics textbooks for tenth, eleventh and twelfth grades in mathematics based on Bloom's taxonomy. Curriculum Development and Modern Teaching Methods, 4(2), 71-76.

[16] Halawa, S., Hsu, YS. & Zhang, WX. (2023) .Analysis of Physics Textbooks through the Lens of Inquiry Practices. Asia-Pacific Edu Res 32, 497–506. https://doi.org/10.1007/s40299-022-00671-4

[17] Kalean, A. & Rafafy Batlolona, J. (2023). Gardner Intelligence in Physics Students in Maluku, Indonesia. Journal Penelitian Pendidikan IPA. 9. 305-314. 10.29303/jppipa. v9i1.2383.

[18] Karimi, M. H., kiani, F. and Shamshiri, B. (2019). Content Analysis of Middle School Physics Teacher's Guide Based on the Approach to the Nature of Science - Qualitative Research. Journal of Curriculum Research, 8(2), 70-97. Doi: 10.22099/jcr.2019.5120

[19] Karimi Haji Khademi, A. and Ameri, L. (2018). Content analysis of the 12th grade Physics 3 textbook based on Frye's method, Gunning's method, Guilford's creativity factors and William Rumi's. The 5th Scientific Research Conference "From the Teacher's Perspective", Minab. https://civilica.com/doc/866508

[20] Kavaz, S. (2006). Analysis of high school physics textbooks [M.S. - Master of Science]. Middle East Technical University.

[21] Kavcar, N. & Erdem, A. (2017). Analysis of physics textbooks for 10th and 11th grades in accordance with the 2013 secondary school physics curriculum from the perspective of project-based learning. AIP Conference Proceedings. 1815. 070006. 10.1063/1.4976427.

[22] Khairandish, A. and Farhoumand, A. (2023). Content analysis of the book Physics 1, 10th grade, experimental subject based on the William Rumi method. 21st National Conference on Physics Education and 11th Physics and Laboratory Conference, Karaj. https://civilica.com/doc/1930503

[23] Khoja, S .(2018). An Analytical Study of the Questions of the Physics and Science Textbooks and Basic Education Level Leaving Certificate's Examinations in Libya. Bulletin of Faculty of Arts, University of Tripoli, Vol. (28), 325 - 354. (Arabic)

[24] Khoja, S .& Ventura, F .(1997). An Analysis of the Content and Questions of the Physics Textbooks of the Basic Education Level (Ages 13-15) in Libya. Mediterranean Journal of Educational Studies.

[25] Kollas, S., Halkia, K., & Stavrou, D. (2007). A quantitative analysis of Greek physics textbooks with respect to scientific literacy.

[26] Koto, I., & Safhira, N. (2024). Analysis of Physics Textbooks Used in Senior High School for Insertion of the Nature of Science. KnE Social Sciences, 9(8), 733–742. https://doi.org/10.18502/kss.v9i8.15639

[27] Kurniawan, A., Rustaman, N., Kaniawati, I., & Hasanah, L. (2019). Development of multiple intelligence test instrument for teen students in perspective of physics learning. Journal of Physics: Conference Series. 1157. 032060. DOI: 10.1088/1742-6596/1157/3/032060

[28] Mardani, R. (2021). Content analysis of the book Physics 1, Mathematics and Physics, published in 2020, based on the William Rumi content analysis model and the Merrill educational design model, 20th Iranian Physics Education Conference and 10th Physics and Laboratory Conference, Ilam. https://civilica.com/doc/1270061

[29] Ministry of Education. (2012). National Curriculum of the Islamic Republic of Iran.

[30] Modares Torbati, M. (2018). Content analysis of physics section of first year secondary science books using Merrill method. Quarterly Journal of Physics Education Development, 120, p. 50. https://www.magiran.com/p1831962

[31] Mohammadi, Y. and Adibmanesh, M. (2020). Content Analysis of the Tenth Grade Physics Textbook in the Field of Mathematics and Physics Using Merrill's Component Theory. Sociology of Education, 5(2), 80-91.

https://10.22034/ijes.2020.43767

[32] Mohammadipour, N., Zarghami, S., & Davoodpanah, M. (2022). Content Analysis of the physics 2 textbook of the high school based on the approach to the Nature of Science. Journal of Research in Science Education, 1(2), 38-54. SID.

https://sid.ir/paper/1039100/en

[33] Mohseni, M., Mohseni, M. and Turkizadeh, H. (2018). Content analysis of the 12th grade Physics 3 textbook in the field of experimental sciences based on the William Rumi technique. The 5th Scientific Research Conference "From the Teacher's Perspective", Minab. https://civilica.com/doc/866637

[34] Oktrisma, Y. & Ratnawulan, R. (2021). Analysis of contextual-based physics textbook development on static fluid materials for 21 st century skills learning. Journal of Physics: Conference Series. 1876. 012046. DOI: 10.1088/1742-6596/1876/1/012046

[35] Porahsan, S., Rahimi, M. and Zandvanian, A. (2020). A Content Analysis of the Physics Textbook 2 for the Students of Mathematics and Physics Based on Plsek's (1997) Creativity Training Model. Journal of Curriculum Research, 10(1), 134-156. DOI: 10.22099/jcr.2020.5821

[36] Ravan, K., Bayani, A. A. (2021). Content analysis of physics textbooks in the field of mathematics and physics in terms of attention to the components of the optimal consumption pattern (energy).

[37] Sebastian, R., Jumadi, J., Winingsih, P. H., & Hapsari, N. A. P. (2023). Content analysis of the independent curriculum physics science textbook from the perspective of

critical thinking aspects and HOTS. Momentum: Physics Education Journal, 7(2), 232-246. https://doi.org/10.21067/mpej.v7i2.8293

[38] Sahriani, S., Samsudin, A. & Sinaga, P. (2021). Analysis of physics textbook reviewed from the aspects of scientific literacy in the Bandung city. Journal of Physics: Conference Series. 2098. 012005. DOI: 10.1088/1742-6596/2098/1/012005

[39] Shekarbaghani, A. (2016). Comparative Study of Physics Curriculum in Iran with Several Other Countries. International Education Studies. 9. 112-112. 10.5539/ies.v9n8p112.

[40] Shirinnoush, S., Ahmadi Kalateh Ahmad, F. and Alamirzaii, B. (2022). Analysis the content of Physics textbook for technical and professional and work -knowledge branches by quantitative method (Gunning, Flash, and McLaughlin). Popularization of Science, 13(23), 201-242. Doi: 10.22034/popsci.2023.376258.1243

[41] Tunga, M. F., & Jumadi, J. (2022). Content Analysis of Physics Textbooks for Senior High School on the Principle of Direct Current Circuits. Journal Penelitian Pendidikan IPA, 8(1), 414–422. https://doi.org/10.29303/jppipa.v8i1.1294

[42] Wilkinson, J. (1999). A quantitative analysis of physics textbooks for scientific literacy themes. Research in Science Education, 29, 385–399. https://doi.org/10.1007/BF02461600

[43] Yan, X., He, Y., Wang, J., Li, X., Ping, X., and Zhou, D. (2023). Analysis of physics textbook content (CH), in The International Handbook of Physics Education Research: Physics Education Research Special Topics, edited by M. F. Taşar and P. Heron (AIP Publishing, Melville, New York, (2023), pp. 16-1–16-34. DOI: 10.1063/9780735425514_016

[44] Zhang, Z.Y. and Chen, X.W. (2023) Comparative Analysis of High School Physics Textbook “Energy and Sustainable Development”. Open Access Library Journal, 10, 1-11. Doi: 10.4236/oalib.1110572.

# Appendix A

**Table A.1:** Summary of Content Analysis Studies on Physics Textbooks in Iran

| **Researchers** | **Method** | **Findings** |
|---|---|---|
| Farzannahad (2024) | Purpose: To assess the inclusion of modern physics topics compared to classical physics in Iranian secondary physics textbooks. Method: Content Analysis. Population and Sample: Physics textbooks for grades 10, 11, and 12. | Findings; Physics books 1 and 2 are entirely dedicated to classical physics, with only 27 topics in Physics 3 covering quantum ideas. Relativity is not included in these books, and only 9% of the content is dedicated to quantum physics. |
| Khairandish & Farhmand (2024) | Purpose: Content analysis of physics textbooks from the perspective of activity levels (active or passive). Method: Quantitative content analysis using William Romy's method. Population and Sample: Physics 1 for grade 10, Experimental Sciences field (2023 edition). | Findings: The engagement coefficient for the text was 0.29 and for the images, 0.35, indicating their passive nature. |
| Delavari & Khojier (2024) | Purpose: Content analysis of Physics 1 for assessing engagement coefficients. Method: Quantitative content analysis using William Romy's method. Population and Sample: Physics 1 for grade 10, experimental sciences filed (2022-2023 academic year). | Findings; An engagement coefficient of 0.8 was achieved, meaning both the text and images actively engage students. However, exercises and activities do not actively engage students. |
| Fathi & Orouji (2023) | Purpose: To examine the components of the nature of science in the physics curriculum. Method: Content analysis. Population and Sample: The latest edition of Physics textbook for grade 11, Mathematics-Physics field. | Findings: The book emphasizes creativity, the relationship between science and technology, and evidence, with implicit references to limitations in science, theory, and law. Social and cultural influence and the unique scientific method are not well presented. |
| Hafezi (2023) | Purpose: Content analysis of physics textbooks based on Bloom's Taxonomy classification. Method: Quantitative content analysis. Population and Sample: Physics textbooks for grades 10, 11, and 12, Mathematics-Physics field (2022 edition) including questions. | Findings: The application level had the highest percentage of questions. The evaluation level had the fewest questions in grades 10 and 12, and grade 11 focused more on knowledge. Overall, the textbooks overly emphasized procedural knowledge and computational problems. |
| Shirinnosh et al. (2022) | Purpose: To determine the readability level of technical and vocational physics textbooks. Method: Quantitative content analysis using Gunning's, Flesh, and McLaughlin's methods. Population and Sample: Entire content of the Physics textbook. | Findings: Readability was higher than grade 10. Based on the Gunning method, readability was at a university first-year level; according to McLaughlin, it was suitable for grade 11; according to Flesh, it was appropriate for the final years of university. |
| Mohammadip our et al. | Purpose: Content analysis of Physics 2 for secondary education based on | Findings: The emphasis was more on the creative aspect of science, compared to the |

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| (2022) | aspects of the nature of science. Method: Qualitative content analysis (categorization). Population and Sample: Physics 2 for grade 11, Experimental Sciences field. | other aspects of the temporality and functionality of science, as well as the comparison between theory and law in science. |
| Derakhshanfar et al. (2022) | Purpose: Comparative content analysis of Iranian and Russian physics textbooks based on Bloom's cognitive domain. Method: Mixed-method content analysis (qualitative and quantitative). Population and Sample: Physics textbooks from Iran (2016) and Russia (2014), focusing on electromagnetism. | Findings: The application of Bloom's cognitive levels in the Russian physics textbooks was more appropriate compared to the Iranian textbooks. |
| Ravan (2021) | Purpose: Content analysis of physics textbooks with respect to the components of energy consumption patterns. Method: Content analysis and Shannon entropy technique. Population and Sample: Physics textbooks for grades 10, 11, and 12, Mathematics-Physics field, including texts, images, activities, and end-of-chapter exercises. | Findings: Of 111 counted units, the largest number (43) related to the use of electricity in daily life, while the smallest number (0) referred to the importance of water conservation. The book for grade 11 was better than the others in addressing energy consumption patterns. |
| Mardani (2021) | Purpose: Content analysis of physics textbooks regarding the active nature of content and levels of engagement. Method: Content analysis based on Merrill's model and William Romy's method. Population and Sample: Physics 1 for Mathematics-Physics field (2020 edition), including texts, images, and questions. | Findings: The text's engagement coefficient was lower than desirable, while the questions had a higher engagement coefficient. The images were appropriately engaging, while the book mainly presented facts and elicited recall responses from learners. |
| Poorahsan et al. (2020) | Purpose: Content analysis of physics textbooks based on Plesk's creativity education model. Method: Content analysis. Population and Sample: Physics 2 for grade 11, Mathematics-Physics field, 2017-2018 academic year. | Findings: In the text, exercises, and images, the percentages of attention to the principles of focus, divergence, and motion were 50%, 50%, and 78%, 33%, 48%, and 19%, and 17%, 2%, and 3%, respectively. The balance in the Plesk cycle was not well established in the content of the book. |
| Mohammadi & Adibmanesh (2020) | Purpose: Content analysis of physics textbooks based on Merrill's components. Method: Quantitative and qualitative content analysis. Population and Sample: Physics textbook for grade 10. | Findings: Attention was given to various types of content (facts, concepts, principles, and methods), but most evaluations were focused on recall and application, with minimal attention to discovery and innovation. Most content used primary presentations, reinforced by secondary presentations. |
| Baghery & Sonei Shargh (2019) | Purpose: Content analysis of physics textbooks. Method: William Romy's content | Findings: The engagement coefficients for the text, images, and activity focus of the book were 0.44, 0.48, and 0.77, indicating |

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| | analysis.<br>Population and Sample: Content analysis of Physics 1 for grade 11 (2017 edition), including text, images, and exercises. | that the text, images, and activities were actively engaging. |
| Bektash et al. (2019) | Purpose: Content analysis of physics textbooks regarding the active nature of content.<br>Method: Content analysis using William Romy's method. Population and Sample: Physics 1 for grade 10 (2020 edition), including texts, images, and activities, selected by random sampling. | Findings: The engagement coefficients for text, images, and activities were 0.75, 1.11, and 2.18, respectively, showing that while the text and images were actively presented, the activities were passive. |
| Karimi Hajikhademi & Ameri (2018) | Purpose: Content analysis of the readability of textbooks using readability formulas, Guilford's creativity, and William Romy's method.<br>Method: Quantitative content analysis. Population and Sample: Physics 3 for grade 12, Experimental Sciences field (2018-2019). | Findings: According to the Fry and Gunning methods, the readability level was low, and the age and class level were not suitable. Guilford's creativity emphasized convergent thinking, with weak attention to divergent thinking and evaluation. The engagement coefficients for text and images were 0.02 and 0.06, respectively, indicating a lack of engagement, while questions had a coefficient of 0.62. |
| Mohseni et al (2018) | Purpose: Content analysis of physics textbooks regarding content activity.<br>Method: Content analysis using William Romy's technique. Population and Sample: Physics 3 for grade 12, Experimental Sciences field (2018 edition), including text, images, exercises, and questions. | Findings: The engagement coefficients were 0.41 for text, 0.23 for images, and 1.15 for exercises and questions, indicating that while the text and exercises were engaging, the images did not engage students. |
| Benzaraki-Nehan & Zarei (2017) | Purpose: Content analysis of physics textbooks in terms of content relevance to society, layout, suitability for the comprehension level of students, and effectiveness of practical activities.<br>Method: Content analysis. Population and Sample: Physics textbook for grade 10 (2017 edition). | Findings: Chapter 1 focused on modeling in physics and estimation for the first time, while Chapter 2 dealt with concepts most relevant to physical phenomena. The final chapters on buoyancy, Archimedes' principle, and fluid motion were either not previously covered in the Iranian curriculum or were presented briefly and without practical application. The content was higher than the comprehension level of the students but did make physics somewhat more tangible. |
| Shakrbaghani (2016) | Purpose: Comparative study and comparison of the curriculum elements of physics in Iran with those of Singapore, Turkey, India, the UK, and Australia.<br>Method: Qualitative study. Population and Sample: Educational system structure, physics curriculum, teaching methods, assessment methods. | Findings: The number of physics textbooks and their content volume in Iran was higher than in other countries. |

**Table A.2:** Summary of Content Analysis Studies on Physics Textbooks in Some Countries

| **Researchers** | **Method** | **Findings** |
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| Koto & Safira (2024) - Indonesia | Purpose: To analyze textbooks for the inclusion of four aspects of the nature of science.<br>Method: Content Analysis.<br>Population and Sample: Analysis of two Grade 10 physics textbooks.<br>Tool: Rubric scoring by one physics teacher and two teachers. | Findings: The first textbook: (a) 58.46% for science as a body of knowledge, (b) 26.28% for science as a method of investigation, (c) 31.78% for science as a way of thinking, and (d) 16.86% for science and its interaction with technology and society. The second textbook: (a) 49.55% for the first aspect, (b) 13.88% for the second, (c) 24.55% for the third, and (d) 12.01% for the fourth aspect. Half of the content in both books was dedicated to science as a body of knowledge. |
| Yan et al. (2023) - China | Purpose: To examine the representation of conceptual, cognitive, and cultural aspects in physics textbooks.<br>Method: Systematic Review. Statistical<br>Population: Empirical studies on content analysis of physics textbooks (1940-2022). | Findings: There is an increasing focus on the validity of concepts, readability of texts, nature of science, reasoning, and equal issues as hot topics in science education research. |
| Sebastian et al. (2023) - Indonesia | Purpose: To analyze critical thinking features and Bloom's higher-order thinking skills in an independent curriculum physics textbook.<br>Method: Quantitative and Qualitative Content Analysis.<br>Population and Sample: All secondary school physics textbooks, with a sample from grade 10. | Findings: High-order critical thinking features like interpretation, analysis, evaluation, explanation, inference, and self-regulation were present. The interpretation aspect was 35.14% in Book A, and 33.35% in Book B. No questions related to higher-order thinking skills were found. Both books were dominated by questions that required lower-order thinking. |
| Halawa et al. (2023) - Indonesia | Purpose: To analyze learning purposes, the nature of science, research skills, understanding research, and types of research in high school physics textbooks.<br>Method: Content Analysis.<br>Population and Sample: Physics textbooks for grades 10, 11, and 12. | Findings: The focus was more on cognitive aspects rather than epistemological, affective, and socio-cultural aspects. Emphasis was placed on science as a cognitive-epistemological system, and structured research was emphasized over guided research. There was more emphasis on observation and communication skills. |
| Zhang & Chen (2023) - China | Purpose: Comparative analysis of secondary school physics textbooks regarding energy and sustainable development topics.<br>Method: Content Analysis.<br>Population and Sample: Six versions of physics textbooks. | Findings: Six versions of the new physics textbooks meet the requirements of the new curriculum on energy and sustainable development. The versions from Popular Education and Shanghai Science and Education align with the physical and mental growth of students, presenting content logically. The Luok version focuses more on student attention during practice selection. The science, technology, society, and environment section |

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| | | should cover a wide range of topics, and content should be updated. |
| Tung & Jumadi (2022) Indonesia | Purpose: To examine the skills related to the scientific process in physics textbooks.<br>Method: Descriptive-Analytical, with a Qualitative-Quantitative Approach.<br>Population and Sample: High school physics textbooks, with a sample of two textbooks from the 2013 curriculum. | Findings: Both textbooks included all aspects of scientific process skills with varying percentages. The most significant aspect was observation, with 29.27% in Book A and 36.36% in Book B. |
| Oktrisma & Ratnawulan (2021) Indonesia | Purpose: To analyze physics textbooks and determine the effectiveness of context-based physics textbooks on static fluid materials for learning 21st-century skills, critical thinking, and essential competencies for daily life application.<br>Method: Research and Development.<br>Population and Sample: Grade 11 students, Physics textbook for grade 11, topic: Static Fluids. | Findings: Analysis of graduate competency standards showed that the learning process primarily demanded an attitudinal dimension, leading to a lack of formation of 21st-century learning. Relevant educational materials were available in textbooks and workbooks. The highest average score was in the attitudinal dimension (86.15), and the lowest average score was in the knowledge dimension (74.71). |
| Sahriani et al. (2021) - Indonesia | Purpose: To examine the attention to scientific literacy in grade 11 physics textbooks.<br>Method: Descriptive, Documentary.<br>Population and Sample: All grade 11 physics textbooks (2013 revised 2016 curriculum). | Findings: The reflection of scientific literacy categories in the three books was: 44% for knowledge of science; 31% for science as a research nature; 18% for science as a way of thinking; and 7% for interaction between science, technology, and society. |
| Kavcar & Erdem (2017) Turkey | Purpose: To analyze physics textbooks from the perspective of project-based learning.<br>Method: Qualitative Survey.<br>Population and Sample: Physics textbooks for grades 10 and 11, from the 2013 curriculum; 10 final-year physics teacher students (2015-2016). | Findings: Most educational achievements in physics textbooks for grades 10 and 11 were supported by experimental activities. However, project-based assignments are necessary. |
| Alahmad & Al-Baqami (2017) Saudi Arabia | Purpose: To analyze physics textbooks based on Next Generation Science Standards.<br>Method: Descriptive-Analytical.<br>Population and Sample: High school physics textbooks focusing on energy. | Findings: Three principles with low applicability (33.33%) were applied. Discipline-based concepts with medium-level applicability (51.9%) were the most frequent; interdisciplinary concepts with low applicability (31.1%); scientific and engineering practices with very low applicability (16.35%) were present in physics textbooks. |
| Christopoulou & Skoumios (2013) | Purpose: To analyze second-year high school physics textbooks based on Gardner's Multiple | Findings: Verbal intelligence was present in every activity in the textbook. Logical-mathematical and spatial intelligence were |

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| Greece | Intelligences Theory.<br>Method: content analysis<br>Population and Sample: 793 activities identified and analyzed. | typically included, but other types of intelligence were significantly limited. |
| Alshayab (2013) Saudi Arabia | Purpose: Content analysis of a first-year high school physics textbook in terms of the inclusion of multiple intelligences.<br>Method: Content Analysis.<br>Population and Sample: First-year high school physics textbook. | Findings: There was an imbalance in the inclusion of multiple intelligences in the first-year high school physics textbook. Linguistic intelligence (25.6%), logical/mathematical intelligence (25.3%), and naturalistic intelligence (25.2%) were included, while other intelligences were either ignored or had very low frequency. |
| Kollas et al. (2007) Greece | Purpose: Quantitative analysis of physics textbooks from the perspective of scientific literacy.<br>Method: Content Analysis.<br>Population and Sample: Secondary school physics textbooks. | Findings: Physics textbooks mainly focused on the knowledge aspect of science, while the other three aspects of scientific literacy, as stated in the general curriculum objectives, were practically absent from all the textbooks analyzed. |
| Kavaz (2006) Turkish Republic of Northern Cyprus | Purpose: To examine the attention to features of ideal physics textbooks in Grade 9 physics textbooks.<br>Sample: 591 students, 18 physics teachers, 4 textbook committee members, 3 science education trainers, and 4 physics textbook authors in the spring term of 2005-2006. Tool: Textbook evaluation questionnaires. | Findings: The ideal characteristics of physics textbooks were consistent with the literature for most participants. However, according to the majority of textbook authors, teachers, students, and textbook committee members, the analyzed textbooks included most of these features (except for the teaching approach, according to teachers and students). |
| Wilkinson (1999) Australia | Purpose: Quantitative analysis of physics textbooks from the perspective of scientific literacy.<br>Method: Content Analysis.<br>Population and Sample: Physics textbooks in Victoria between 1967 and 1997. | Findings: The physics textbooks emphasized science as a method of inquiry and had limited emphasis on science as a way of thinking. Texts produced after 1990 gave more emphasis to the science, technology, and society theme compared to texts produced before 1990. |
| Khoja et al. (1997) Libya | Purpose: To determine the extent to which physics textbooks help achieve stated objectives and compare the distribution of questions across Bloom's cognitive domain levels based on the distribution proposed by the literature.<br>Method: Quantitative Content Analysis.<br>Population and Sample: Content of physics textbooks for grades 7, 8, and 9. | Findings: The content's contribution to achieving the stated objectives was limited to acquiring basic facts and concepts. There was a significant difference between the observed and proposed distribution of questions at various levels. 51.6% of the questions were at the lower cognitive domain level (knowledge or recall), and only 2.5% of the questions were at higher levels. |