International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Case-Based Learning-Oriented Textbook: An Effort to Train Students' Chemistry Problem Solving Skills

Utiya Azizah[1], Mitarlis[1], Nurina Rizka Ramadhania[2]
[1] Chemistry Education Study Program, Universitas Negeri Surabaya, Indonesia
[2] Chemistry Study Program, Universitas Negeri Surabaya, Indonesia

ABSTRACT: Higher education plays a strategic role in developing the intellectual life of the nation and is part of the national education system. Chemistry learning should not only focus on mastering concepts but also on students' ability to apply these concepts in real-world contexts through problem-solving skills to meet the challenges of the 21st century. This research aims to develop a case-based learning-oriented textbook that can train prospective teacher students' chemistry problem-solving skills. This research method used Research and Development (R&D) as proposed by Borg and Gall, limited to the development stage. Data collection used non-test techniques, seeking validation from three subject matter and pedagogical experts. Quantitative descriptive statistics were used for data analysis. The validity test results showed that the case-based learning-oriented textbook was valid, with an Aiken validity index of 0.87 (high validity). Furthermore, the textbook can be used as a means to facilitate student learning activities in case-based learning to train prospective teacher students' chemistry problem-solving skills, so that the function of this textbook can be maximized.

KEYWORDS: case-based learning, textbook, chemistry, problem-solving skill, research and development.

INTRODUCTION

One of the essential 21st-century competencies that prospective chemistry teachers must possess is problem-solving skills [1]. However, several studies show that prospective chemistry teacher students in Indonesia still experience difficulties in understanding and applying chemical concepts in contextual situations that require analytical and solution-oriented thinking [2][3]. This condition is a serious challenge because teachers have a crucial role in developing students' problem-solving skills [4].

Various previous studies have developed contextual problem-based teaching materials which have been proven to improve students' conceptual understanding and active participation in chemistry learning [5][6][7]. However, case-based learning as a pedagogical model for developing chemistry textbooks for chemistry education students remains underexplored. Available textbooks tend to be theoretical and do not provide sufficient space for practicing problem-solving skills based on real-world problems in chemistry education [8][9].

Student-centered education demands a collaborative, problem-solving approach that presents contextual experiences through case-based learning. This learning encourages students to actively engage and independently construct their understanding based on constructivist principles [10]. Prospective chemistry teacher students are presented with a case study based on a real-life problem. They can analyze the solution to the problem retrospectively (by studying existing solutions) or interactively (by trying to solve it themselves) [11]. Prospective chemistry teachers students can practice their thinking skills through case-based learning. Cases are closely related to problems, so that prospective chemistry teacher students can improve their problem-solving skills. The steps in CBL activities are as follows [12]: (1) determining cases that are appropriate to the material, (2) analyzing cases, which begins with optimizing prospective chemistry teacher students' initial knowledge in formulating problems, (3) independently finding information, data, and literature, (4) determining steps to solve the case, and (5) creating solutions to the problem.

This gap indicates an urgent need to develop a case-based learning-oriented textbook that not only conveys material conceptually but also presents real-world problems that stimulate higher-order thinking and problem-solving skills. These textbooks can bridge the gap between theory and practice and enhance the readiness of prospective chemistry teachers to face the complexities of the teaching profession in the future [13][14]. This case-based learning-oriented chemistry textbook is designed to be contextual, interactive, and applicable. It presents cases relevant to chemistry, enabling prospective chemistry teacher students to learn not only theoretically but also to develop solutions to real-world problems using chemical concepts logically and systematically.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Based on these root problems, this study aims to develop a chemistry textbook oriented towards case-based learning that meets validity criteria and can be used to train problem-solving skills on the material of factors that influence reaction rates. Product validity is assessed based on the criteria of content validity, construct validity, presentation validity, language validity, graphic validity, suitability to case-based learning, and suitability to problem-solving skills.

METHODS

This research design applies the Research and Development (R&D) framework proposed by Borg and Gall [15]. In general, this method is a systematic approach to studying, designing, producing, and evaluating the feasibility of a product [16]. The product developed in this study is a valid, case-based learning-oriented textbook. The Borg & Gall design in this study is simplified into three research stages: preliminary study, development, and testing. This research is limited to the development stage.

In the preliminary study stage, the aim is to conduct an analysis of concepts and theories related to the textbook being developed, prospective chemistry teacher student characteristics, as well as a field survey aimed at identifying prospective chemistry teacher students' initial chemistry problem-solving skills, which are investigated through tests.

In the development stage, an initial draft of a case-based learning-oriented textbook was prepared based on the results of a literature study and field survey. The selection of formats, media, references, and the initial design of the textbook were the main activities at this stage. The successfully developed textbook was then validated theoretically (construction and content), namely by requesting input and assessment from three experts in the field of chemistry and chemistry education. For assessment purposes, experts prepared validation instruments to assess and provide input on the developed textbook. Based on input from the experts, the researcher revised the draft of the textbook.

Analysis of the validity of case-based learning-oriented textbooks using the Aiken validity index with the following formula [17].

$$V = \frac{\sum S}{n(C-1)}$$

where:

$S = R - L_0$ (R is the score given by the rater, and L_0 is the lowest rating score)

V = Aiken's index

C = The number of answer choice categories available.

n = the number of experts (raters)

If the Aiken index is greater than 0.8, it is considered high; an Aiken index between 0.4 and 0.8 is considered moderate; and if it is less than 0.4, the validity is considered low.

The collected data were then analyzed using quantitative descriptive statistics techniques, which are methods used to systematically describe data in the form of numbers, graphs, tables, and narratives.

RESULTS AND DISCUSSION

This research applies the Borg and Gall stages of R&D, namely preliminary study, development, and testing. However, this research only reached the development stage.

A. Preliminary Study

The series of analyses carried out in the preliminary study stage includes analysis of concepts and theories related to the textbook being developed, prospective chemistry teacher students' characteristics, and field surveys.

The analysis of chemical material concepts was conducted by identifying the main concepts in the basic chemistry course that will be developed in the textbook, namely, the material on factors that influence reaction rates. Meanwhile, the analysis of educational theory was conducted by reviewing theories related to case-based learning and problem-solving skills as learning models and thinking skills applied in learning. The results of the analysis of chemical material concepts that are in accordance with case-based learning oriented learning for the Basic Chemistry course refer to the lesson plan document developed based on learning outcomes by carrying out the achievement of the vision and mission of the study program.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

In this stage, the researcher examined the characteristics of prospective chemistry teacher students, including their background knowledge and the development of their cognitive abilities. The prospective chemistry teacher students who served as the research data sources were first-semester students of the Chemistry Education undergraduate program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya. The formal operational development stage is achieved by children aged 11 years to adulthood, based on Piaget's cognitive development theory [18]. At the formal operational stage, individuals begin to be able to: (1) think abstractly, namely understanding concepts that are not directly related to physical objects, (2) perform hypothetical and deductive reasoning, such as solving problems through logic and mental experiments, and (3) predict the outcomes of complex situations. Based on this, at this stage children are able to think abstractly and can solve problems. From the results of field observations, prospective chemistry teacher students in the first semester are generally 18 years old and above, so students can think formally to solve problems. But in reality, each child experiences cognitive development at a different speed. Therefore, not all prospective chemistry teacher students at that age are able to think completely abstractly. Therefore, the textbook oriented towards case-based learning that was developed is equipped with pictures and illustrations that can help prospective chemistry teacher students in learning a material.

Regarding the initial problem-solving skills profile of prospective chemistry teacher students, several important things have been discovered, namely: (1) prospective chemistry teacher students' problem-solving thinking skills are still low. The majority of students never determine learning objectives, plan problem-solving strategies, check the implementation of task completion, and re-check answers related to the results of task completion; (2) students' ability to understand problems in order to master material concepts is still low; (3) there are still many concepts in the material on factors that influence reaction rates that are difficult for prospective chemistry teacher students to understand, namely: solution concentration, surface area of contact, and catalysts.

From the results of the literature study and field survey, an initial draft (prototype) of a textbook oriented towards case-based learning was prepared. The selection of the prototype format and model, media selection, and initial design of the textbook are important activities at this stage.

B. Development

This research produces a case-based learning-oriented textbook to train chemical problem-solving skills on the material of factors that influence reaction rates. The design of a case-based learning-oriented textbook in this research is presented including a title page, foreword, table of contents, and five chapters matter, namely: Chapter 1 Introduction, Chapter 2 Case-based learning, Chapter 3 Problem-solving skills, Chapter 4 The relationship between case-based learning and problem-solving skills, Chapter 5 includes worksheets to provide examples of the application of case-based learning in training problem-solving skills and a bibliography [19]. A case-based learning-oriented textbook to train problem-solving skills is a textbook compiled in an effort to enrich, add, or deepen the curriculum content [20]. The following is the cover of the textbook.

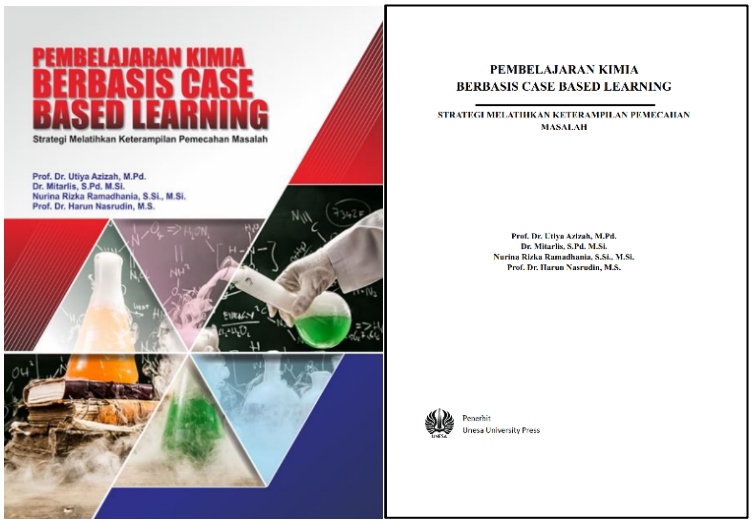

Figure 1. Cover of Texbook

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Bab I
PENDAHULUAN

Pembelajaran abad ke-21 telah berkembang akhir-akhir ini dalam kaitannya dengan kompetensi pebelajar dalam menghadapi tantangan dan peluang di era global saat ini. Secara umum, keterampilan abad ke-21 merujuk pada seperangkat kompetensi yang penting untuk sukses dalam menghadapi tantangan dunia modern yang cepat berubah, seperti keterampilan literasi digital, berpikir kritis, berpikir kreatif, kolaborasi, komunikasi, kreativitas, dan memecahkan masalah yang perlu dilatihkan dalam membantu pebelajar untuk belajar secara efektif, berinovasi, bekerja sama, dan berkontribusi dalam masyarakat.

Dalam rangka menghadapi tantangan kehidupan abad ke-21, salah satu keterampilan yang harus dikuasai oleh pebelajar adalah keterampilan pemecahan masalah (Erdem et al., 2019; Funke et al., 2018; Yoon et al., 2020). Hal tersebut diperkuat oleh suatu pendapat bahwa pendidikan modern yang sering disebut sebagai pembelajaran abad ke-21, menekankan pentingnya untuk membekali pebelajar dengan keterampilan mengidentifikasi masalah, mengumpulkan informasi dari berbagai sumber, terlibat dalam pemikiran analitis, dan berkolaborasi untuk menumbuhkan keterampilan pemecahan masalah dan berpikir kritis (Trilling & Fadel, 2009). Selain itu, dengan keterampilan pemecahan masalah pengalaman baru dapat dipromosikan pada diri pebelajar melalui proses penemuan solusi masalah (Magaji, 2021). Selanjutnya, berdasarkan hasil penelitian Rios et al (2020) ditemukan bahwa salah satu keterampilan abad ke-21 yang paling banyak dibutuhkan dalam dunia kerja adalah keterampilan pemecahan masalah. Dengan demikian, pengembangan keterampilan abad 21 secara optimal, perlu dukungan dari semua bidang pengajaran dan pembelajaran, termasuk dalam pembelajaran kimia.

Keterampilan pemecahan masalah merupakan suatu proses menemukan solusi atas kesulitan atau masalah atau isu yang kompleks, yang merupakan salah satu bentuk keterampilan berpikir (So, 2016; Criswell & Greg, 2014). Dalam pembelajaran kimia, pemecahan masalah merupakan kemampuan yang sangat

1

FAKTOR-FAKTOR YANG MEMPENGARUHI LAJU REAKSI

Untuk memahami materi ini, kerjakan kegiatan-kegiatan berikut.

Memahami Masalah

Perhatikan fenomena berikut!

1. Cermati kasus 1 berikut, selanjutnya lakukan identifikasi informasi-informasi yang telah Anda ketahui terkait hubungan konsentrasi dengan laju reaksi dan suhu dengan laju reaksi!

Indonesia Darurat Sampah Makanan

Pada tahun 2021 Indonesia tercatat sebagai negara penyumbang sampah makanan terbesar ke-2 di dunia setelah Arab Saudi dengan sisa sampah makanan mencapai angka 46,35 juta ton/tahun. Timbunan sampah makanan ini kemudian mengalami penguraian oleh mikroba melalui reaksi aerob dan anaerob sehingga menghasilkan Gas metana (CH_4) dan karbondioksida (CO_2) yang akhirnya terlepas ke atmosfer. Akibatnya, terjadi peningkatan Gas Rumah Kaca (GRK) sebesar 1.702,9 megaton. Meningkatnya sampah makanan di Indonesia memang dipengaruhi oleh beberapa faktor, termasuk pola konsumsi masyarakat yang berlebihan dan fenomena makibeng. Pola konsumsi berlebihan ini mencakup kebiasaan menyisakan makanan, membeli atau memasak lebih dari kebutuhan, serta gaya hidup konsumtif yang semakin meningkat di kalangan masyarakat perkotaan. (Sumber: https://www.detik.com/properti/berita/d-7452071/indonesia-darurat-sampah-makanan-)

Amankah Nitrogen Cair dalam Makanan?

Ice smoothe atau lebih dikenal oleh ngebul, merupakan ciki warna-warni yang dibekukan menggunakan nitrogen cair. Jajanan ini digemari anak-anak karena efek asap yang ditimbulkannya akibat nitrogen cair yang mengalami ketika terjadi kontak dengan benda yang suhunya lebih tinggi. Namun siapa yang akan menyangka saat ini, Kementrian kesehatan telah mencatat 22 anak kemalangan setelah mengkonsumsi ciki ngebul, beberapa diantaranya harus dioperasi lantaran mengalami keboconan pada lambung. Nitrogen cair merupakan cairan tidak berwarna, tidak berbau, dan memiliki titik didih yang sangat rendah yaitu -198°C. Di Industri makanan, Nitrogen cair digunakan sebagai cairan Kriogenik (pembekuan cepat) untuk memperpanjang masa simpan berbagai jenis pangan seperti daging, sayur, atau makanan olahan. Suhu Nitrogen cair yang sangat rendah akan menghambat proses pengurian makanan oleh mikroba sehingga proses kerusakan pangan menjadi lebih lambat. Badan Pengawasan Obat dan Makanan (BPOM) Indonesia dan BPOM Amerika (Food and Drug Administration) menyatakan bahwa penggunaan Nitrogen cair aman untuk bahan pangan selama mengikuti prosedur dan tidak untuk dikonsumsi secara langsung. Sebagai langkah pencegahan, BPOM mengeluarkan pedoman mitigasi risiko nitrogen cair pada pangan olahan terkait bagaimana penggunaan Nitrogen cair yang tepat sesuai standar keselamatan (Sumber: https://www.bbc.com/indonesia/articles/c1w036vd32lo)

44

Figure 2. Introduction and Student Worksheet

The development of the textbook, especially in Chapter 5 related to the example of Student Worksheets based on Case Based Learning, follows the steps of the CBL model learning activities [12], namely (1) determining cases that reflect real problems and complexity, thus enabling students to explore various aspects and perspectives in problem solving; (2) analyzing cases, optimizing students' initial knowledge in formulating problems and hypotheses; (3) independently finding information, data, and literature, for material exploration; (4) determining steps to resolve the case by determining the appropriate solution strategy in resolving the case; (5) making conclusions; and (6) checking the answers, to ensure that the solution/conclusion actually solves the problem and the process is carried out correctly.

Validity testing was based on expert judgment provided by the validators. The validity measures in this study included content validity, construct validity, presentation validity, language validity, graphical validity, suitability to case-based learning, and suitability to problem-solving skills in the textbook. Construct validity is an intervention undertaken by researchers to ensure the developed product meets the logical rationale required for a product, while content validity is an intervention to ensure the design or product is based on scientific knowledge or meets accurate scientific truth [21].

In general, the validity results of the case-based learning-oriented textbook on the factors influencing reaction rates are presented in Table 1.

Table 1. Textbook Validity Results

Number	Rated aspect	Validator Score			Aiken Index	Category
		V1	V2	V3		
1	Content validity	20	25	20	0.83	High validity
2	Construct validity	22	24	23	0.90	High validity
3	Validity of presentation	18	19	18	0.89	High validity
4	Language validity	19	17	17	0,85	High validity
5	Graphic validity	12	14	15	0,89	High validity
6	Suitability for Case Based Learning	22	22	24	0,88	High validity
7	Suitability with problem-solving skills	32	32	31	0,88	High validity

The textbook validity category was obtained by converting the scores for each aspect into a validity conversion table. It can be seen that the developed textbook generally meets the high validity category for content validity, construct validity, presentation validity, language validity, graphic validity, suitability to case-based learning, and suitability to problem-solving skills.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Figure 3 presents the results of the content and construct validity assessment of the five assessment indicators, respectively, by the validator.

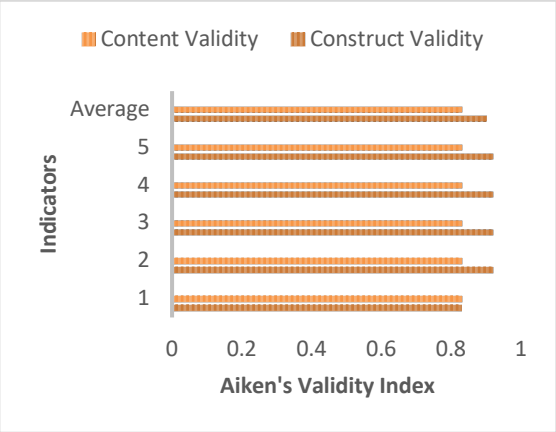

Figure 3. Results of Validity of Content and Construct of Textbook

In terms of content validity, the case-based learning-oriented textbook developed in this study obtained an average Aiken index of 0.83 (high validity), and no assessment indicator was deemed sufficiently valid. This means that the material in all chapters is in accordance with the purpose of writing the textbook, fulfills the truth of the content (facts, concepts, principles, theories and procedures), the content is up-to-date, the suitability of the textbook material to the needs of students, and this book can be used as a guide for both students and lecturers in learning activities. This study's findings align with previous research that systematically arranged teaching materials can improve students' understanding of their content [22].

In terms of construct validity, the validity of the case-based learning-oriented textbook for practicing chemistry problem-solving skills has obtained an average Aiken index of 0.90 (high validity). This finding indicates that this textbook is complete and good, including a cover that presents the contents of the book, an introduction that contains a brief description of the chapter contents and the purpose of writing the textbook, tables/illustrations/pictures that clarify the material, consistency of the writing system, and a bibliography.

Figure 4 shows the results of the presentation and language validity assessment from four assessment indicators, respectively, by the validator.

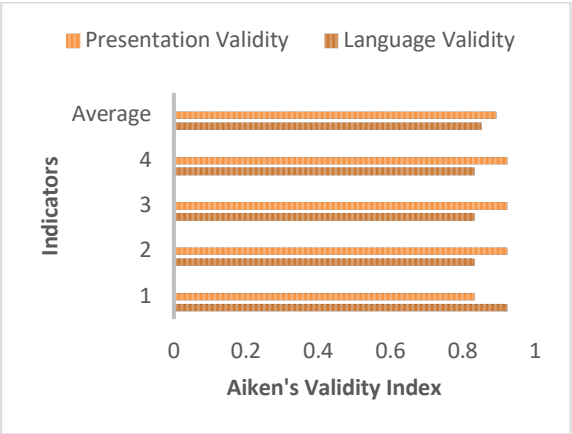

Figure 4. Results of Validity of Presentation and Language of Textbooks

The presentation aspect in this study obtained an average Aiken index of 0.89 (high validity). This finding reflects that the illustrations or images in this book have used an effective layout, aroused motivation/interest/curiosity, are in accordance with the level of student thinking, and encourage students to be actively involved in activities. The language aspect obtained an average

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Aiken index of 0.85 (high validity), which means that the language used in the textbook is appropriate for the age of the students, uses good and correct Indonesian, uses appropriate and understandable terms, and uses terms and symbols consistently.
Figure 5 presents the results of the graphical validity assessment from three indicators by the validator.

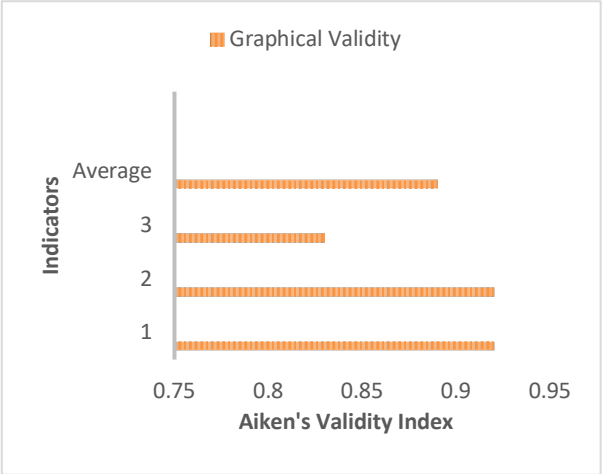

Figure 5. Graphic Validity Results of Textbooks

These data confirm that the validity of the case-based learning-oriented textbook for practicing chemistry problem-solving skills has met graphical validity, with an average Aiken index of 0.89 (high validity). This finding reflects that the developed textbook has an attractive cover design, an accurate typing layout, and an appropriate font type and size.
Figure 6 depicts the results of the assessment of the validity of conformity with case-based learning (five assessment indicators) and the validity of conformity with Problem-solving Skills (7 assessment indicators) by the validator.

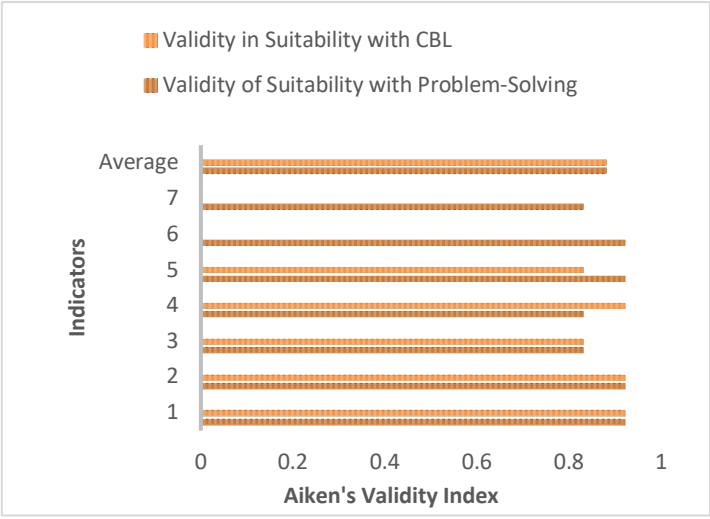

Figure 6. Validity Results of Suitability with Case-Based Learning and Problem-Solving in Textbooks

The aspect of conformity with the case-based learning principles in the textbook received a high validity category with an Aiken index of 0.88. In this case, it shows that the developed textbook is in accordance with the case-based learning model, including students being assigned to analyze the presented case, students being asked to independently find information, data, and literature, determine steps to resolve the case, draw conclusions, and students being asked to re-examine the answers obtained. In addition, it is expected that the implementation of the learning process is colored by student-centered so that students independently build their own knowledge.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

These findings indicate that case study-oriented learning experiences can help student teachers understand concepts [23]. This suggests that case study-based learning has strong potential to serve as a basis for developing more meaningful textbooks. Students need authentic contexts to bridge the gap between chemistry theory and its real-world application [24]. This strengthens the argument that learning models involving higher-order thinking and authentic situations should be integrated into textbook design.

Similarly, the textbook's compatibility with problem-solving skills received a high validity rating, with an Aiken index of 0.88. The compatibility of problem-solving skills is demonstrated by the implementation of problem-solving skill indicators in student worksheets, which exemplify the application of case-based learning. In this case, students are asked to identify existing knowledge based on a given case, formulate problems and hypotheses, establish learning objectives, develop problem-solving strategies, implement problem-solving strategies, draw conclusions, and check answers. Furthermore, learning activities are expected to encourage student activeness in creating solutions to problems.

These findings underscore the need for interventions through textbook design that explicitly direct students to develop and practice chemistry problem-solving skills, beyond simply solving routine problems [25].

CONCLUSION

From the research results, it can be concluded that the final product produced in this study is a case-based learning-oriented textbook to train chemistry problem-solving skills on the material of factors that influence reaction rates and has met a high level of validity. Therefore, the resulting product can be used as a means to facilitate case-based learning activities to train chemistry problem-solving skills of prospective teachers, so that the function of this textbook can be maximized.

REFERENCES

1. García-Pérez, L., García-Garnica, M., & Olmedo-Moreno, E. M. Skills for a Working Future: How to Bring about Professional Success from The Educational Setting. *Education Sciences*. 2021; 11(1): 1–25. https://doi.org/10.3390/educsci11010027
2. Rahmawati, R. D., & Atmojo, S. E. Improving the Problem-Solving Ability of Prospective Elementary School Teacher Candidates Through Blended Project-Based Learning. *1st UPY International Conference on Education and Social Science*. 2022; 227–234. https://doi.org/10.2991/978-2-494069-39-8_21
3. Mikhridinova, N., Ngereja, B. J., Hussein, B., Petegem, W. V, Olaso, J. R. O., & Wolff, C. Competence-Based Support for Project-Based Learning in Virtual Settings. *International Conference on Interactive Collaborative Learning*. 2023; 246–257.
4. Azizah, U., & Nasrudin, H. Problem Solving Thinking Skills: Effectiveness of Problem-Solving Model in Teaching Chemistry College Students. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*. 2022; 8(3): 1462-1469. https://doi.org/10.29303/jppipa.v8i3.1700
5. Yaayin, B., Archie, B., & Dorsah, P. Utilising Context-Based Learning to Promote Students' Conceptual Understanding and Performance in Organic Chemistry. *European Journal of Research and Reflection in Educational Sciences*. 2024; 12(6): 28-44.
6. Arsyad, M., Guna, S., & Barus, S. Enhancing Chemistry Education through Problem-Based Learning: Analyzing Student Engagement, Motivation, and Critical Thinking. *International Journal of Curriculum Development, Teaching and Learning Innovation*. 2024; 2(3): 110-117. https://doi.org/10.35335/curriculum.v2i3
7. Laila, E., Festiyed, Yerimadesi, Yulkifli, & Diliarosta, S. Enhancing Students' Learning Outcomes in Chemistry through Problem-Based Learning: A Systematic Literature Review Supporting Sustainable Development Goal 4 (Quality Education). *Jurnal Penelitian Pendidikan IPA (JPPIPA).* 2026; 12(4): 91-102. https://doi.org/10.29303/jppipa.v12i4.10145
8. Zulkarnain, Zulnaidi, H., Heleni, S., Education, M., Program, S., & Syafri, M. Effects of SSCS Teaching Model on Students' Mathematical Problem-Solving Ability and Self-Efficacy. *International Journal of Instruction*. 2021; 14(1): 475-488. https://doi.org/10.29333/iji.2021.14128a

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-29, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

9. Subramaniam, R. C., Morphew, J. W., Rebello, C. M., & Rebello, N. S. Presenting a STEM Ways of Thinking Framework for Engineering Design-based Physics Problems. *Physical Review Physics Education Research*. 2024; 21(1), 10122. https://doi.org/10.1103/PhysRevPhysEducRes.21.010122
10. Hidayati, F., & Wisudariani, E. The Effect of Case-Based Learning in Improving Student Creativity and Thinking Skills in the Vector and Rodent Control Course. *Proceedings of the 4th Green Development International Conference (GDIC 2022)*. 2022; ASSEHR 772:1063–1071. https://doi.org/10.2991/978-2-38476-110-4_102
11. R. E. Mayer. *The Promise of Educational Psychology Volume II: teaching for Meaningful Learning*. 2002. New Jersey: Pearson Education, Inc.
12. Brett William. The Implementation of Case-Based Learning – Shaping the Pedagogy in Ambulance Education. *Journal of Emergency Primary Health Care*. 2004; 2(3). https://doi.org/10.33151/ajp.2.3.286
13. Imanda, R., Rahmi, A., Setiawaty, S., Dandina, A. D., & Humaira, N. (2022). Development of Chemistry Textbooks Based Scientific Approach in Efforts to Implement Prototype Curriculum at Schools. *Jurnal Penelitian Pendidikan IPA*. 2022; 8(6): 3153–3158. https://doi.org/10.29303/jppipa.v8i6.2317
14. Hidayatulloh, R., Suyono, S., & Azizah, U. (2020). Development of STEM-Based Chemistry Textbooks to Improve Students' Problem-Solving Skills. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan: e-Saintika*. 2020; 4(3): 308-318. https://doi.org/10.36312/e-saintika.v4i3.306
15. Borg, W.R. & Gall, M.D. *Educational Research*. 2003. New York: Longman
16. Fraenkel, Jack R. & Wallen, Norman E. *How To Design and Evaluate Research In Education*. Fifth Edition. 2003. Boston: McGraw Hill.
17. Suhardi, I. Perangkat Instrumen Pengembangan Paket Soal Jenis Pilihan Ganda Menggunakan Pengukuran Validitas Konten Formula Aiken's V. *Jurnal Pendidikan Tambusai*. 2022; 6(1): 4158–4170. https://doi.org/10.31004/jptam.v6i1.3519
18. Lourenço, O. Piaget and Vygotsky: Many resemblances, and a crucial difference. *New Ideas in Psychology*. 2012; 30(3): 281-295. https://doi.org/10.1016/j.newideapsych.2011.12.006
19. Azizah, U., Mitarlis, Ramadhania, N.R., & Nasrudin, H. *Pembelajaran Kimia Berbasis Case-Based Learning: Strategi Melatihkan Keterampilan Pemecahan Masalah*. 2024. Surabaya: Unesa University Press.
20. Kazemi, F., Yektayar, M., & Abad, A. M. B. Investigation The Impact of Chess Play on Developing Meta-Cognitive Ability and Math Problem-Solving Power of Students at Different Levels of Education. *Procedia - Social and Behavioral Sciences*. 2012; 32: 372–379. https://doi.org/10.1016/j.sbspro.2012.01.056
21. Nieveen, Nienke and Plomp, Tjeerd. *Educational Research Design*. 2013. Enschede. Netherland Institute for Curriculum Development (SLO).
22. HB, F. P. M. (2012). Pengembangan Bahan Ajar Science Entrepreneurship Berbasis Hasil Penelitian untuk Mendukung Program Kreativitas Mahasiswa. *Jurnal Penelitian Pendidikan*. 2012; 29(2). https://doi.org/10.15294/jpp.v29i2.5651
23. Donna Governor. Teaching And Learning Science Through Song: Exploring The Experiences of Students and Teachers. Sustainability (Switzerland). 2019; 11(1): 1–14. https://doi.org/10.1080/09500693.2012.690542
24. Brown, B. A., Boda, P., Lemmi, C., & Monroe, X. Moving Culturally Relevant Pedagogy From Theory to Practice: Exploring Teachers' Application of Culturally Relevant Education in Science and Mathematics. *Urban Education*. 2019; 54(6): 775–803. https://doi.org/10.1177/0042085918794802
25. Olivares, D., Lupiáñez, J. L., & Segovia, I. Roles and characteristics of problem solving in the mathematics curriculum: a review. *International Journal of Mathematical Education in Science and Technology*. 2021; 52(7): 1079–1096. https://doi.org/10.1080/0020739X.2020.1738579

Cite this Article: Azizah, U., Mitarlis, Ramadhania, N.R. (2026). Case-Based Learning-Oriented Textbook: An Effort to Train Students' Chemistry Problem Solving Skills. International Journal of Current Science Research and Review, 9(7), pp. 3890-3897. DOI: https://doi.org/10.47191/ijcsrr/V9-i7-29