**Al-Ishlah: Jurnal Pendidikan**
Vol.16, 3 (September, 2024), pp. 3029-3040
ISSN: 2087-9490 EISSN: 2597-940X, DOI: 10.35445/alishlah.v16i3.4904

# Development of a Case Based Learning (CBL) Model Based on a Knowledge Management System to Improve Students' Critical Thinking Skills

**Gunawan Ali[1], Anggy Qurnia Raafy Hasibuan[2], Vitriani[3], Amril[4]**
[1] University of Dharmas Indonesia, Dharmasraya, Indonesia; goenawanalie@gmail.com
[2] University of Dharmas Indonesia, Dharmasraya, Indonesia; anggyhasibuan@gmail.com
[3] University of Muhammadiyah Riau, Pekanbaru, Indonesia; vitriani@umri.ac.id
[4] University of Dharmas Indonesia, Dharmasraya, Indonesia; amril@undhari.ac.id

**ARTICLE INFO**

*Keywords:*

Case-based learning;
Critical thinking skills;
knowledge management system

*Article history:*

Received 2024-01-17
Revised 2024-02-03
Accepted 2024-08-03

**ABSTRACT**

The current era changes the educational situation. There is an urgent need to integrate advanced information technology with innovative teaching models to improve students' analytical thinking skills. It was employed to Vocational High School teachers and students as a learning innovation in the current era. The selection of Vocational High School teachers and students for research is because the researcher focuses on research in the field of vocational education, which is relevant to the researcher's field of knowledge. This study aims to develop and validate a case-based learning model integrated with a knowledge management system that is designed to enhance critical thinking skills among vocational high school students. The paper applies Research and Development with the ADDIE scheme. The latest concept of the model, namely the Case Based Learning Model, can be collaborated with the Knowledge Management System to improve the Critical Thinking Skills of student as a competency needed in the current era. It is expected to have a positive impact and change practices and learning outcomes in the context of the industrial revolution currently taking place.



**Corresponding Author:**
Gunawan Ali
University of Dharmas Indonesia, Dharmasraya, Indonesia; goenawanalie@gmail.com

## 1. INTRODUCTION

The advancement of science and technology in the current era has brought significant improvements to nearly every aspect of life. However, alongside these benefits, various challenges and problems have emerged as a result of this rapid development. Addressing and mitigating the negative impacts of these advancements necessitates the development of high-quality human resources (Anwar et al., 2022). Therefore, enhancing human capital is a critical endeavor that must be pursued in a strategic, substantial, coherent, and well-organized manner. Education plays a pivotal role in this process, serving as a key means of improving the quality of human resources (Ali et al., 2017).

Education is fundamentally a method of fostering one's abilities. By means of education, the skills possessed by someone will be changed into competence. Competency reflects an one's abilities and skills in carrying out assigned jobs (Syarafina et al., 2017). The educators' tasks, for instance, teachers, is to help learners as individuals to foster their abilities into competencies which is inherent

with their goals. Education and learning programs such as those currently taking place must therefore be more directed or more oriented towards individual students (Ali et al., 2017).

Education is someone's needs to measure the establishment of a nation's future. It has a significant role in individuals and wide development and influences individual and social reforms. Without having enough educational process, it will be hard for everyone to adapt to the establishment of future life. Hence, education can be a solution to tackle someone's issues of life in this modern era of chahing lives. Giving the best educational process quality have to be conducted through bunch of efforts consistently and sustainably (Ali et al., 2017).

The challenges and opportunities in the latest era should be faced educational stakeholders in order to enhance the good quality of education in Indonesia (Vitriani et al., 2020). Improving and equalizing the well-organizedveducation refers to Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System. This is also relevant with the 4 foundations of education enacted by UNESCO, namely studying for knowing, studying for doing, learning for being, and learning for living simultaneously. This spirit is implicitly stressed in the 2005-2025 National Long Term Development Plan (RPJPN), namely education to prepare a democratic society, capable of facing competitive global life, and innovative and capable of developing diversity towards the creation of an Indonesian society that is united at the top. cultural richness so that you feel proud to be Indonesian (Ali et al., 2017).

Gaps in educational equality are still a fact found in various corners of Indonesia, with various obstacles emerging to the surface and becoming a hot issue regarding education in Indonesia. The problems that arise now are faced with current issues such as the 21st Century and the Industrial Revolution 4.0, where this provides a warning that competition for graduates from schools, vocational education and universities in obtaining job opportunities is increasingly fierce (Ali et al., 2017). Education and learning programs must be directed and oriented towards programs to develop student potential in collaboration with information technology.

In order to increase the students' qualities and abilities, it is essential to make evolutions or changes in self-directed learning. It offers and boosts students' ability to develop their imagination and skills to learn in an individual form (Arianto & Fauziyah, 2020). SCL learning can be used to foster students' imagination, passion, and cognitive skills in solving a problem through the case-based learning method (Syarafina et al., 2017).

CBL is an efficient and amazing learning approach (Dharmayanthi, 2023). CBL can boost students being effective and creative in discussing real life condition through the use of scenarios or case studies to establish learners' reasoning and abilities in tackling issues. It can help develop effective learning, help in developing interest, motivate them to participate actively, make learning easier and also strengthen students' understanding, this helps students develop logical thinking, reasoning and interpretation (Dewi et al., 2022). Finally, CBL is a strategy for solving student learning problems with active learning that is interesting, effective and students are more challenged in solving problems in the form of cases (Holden Simbolon, 2022).

In Case-Based Learning (CBL), key indicators include mastering basic concepts, defining problems, engaging in independent learning, exchanging knowledge, and conducting assessments. Effective CBL implementation should focus on solving real and current cases, as emphasized by Wati and Sunarti (2020). Additionally, the role of educators in encouraging students to actively engage in problem-solving is crucial to enhance their participation and ability to address various challenges. This study proposes the integration of the CBL model with a Knowledge Management System (KMS) to develop a method that enhances students' analytical thinking. The aim is to create a CBL model grounded in KMS, tailored to improve students' critical thinking skills, specifically applied by educators and students in Vocational High Schools as an innovative approach to learning in the context of the Industrial Revolution 4.0.

This research builds upon previous studies, including Holden Simbolon D's 2022 work on Case-Based Learning, which demonstrated a significant positive impact on learning outcomes following

the implementation of the Case-Based Learning Model (Holden Simbolon, 2022b). It also draws on the research by Vitriani et al. (2020) that explored the use of a Knowledge Management System in training models to enhance teacher professional competence. Building on these findings, this study aims to integrate the Case-Based Learning Model with a Knowledge Management System to enhance students' critical thinking skills.

## 2. METHODS

This research method follows the systematic development steps of the ADDIE model or abbreviation Analysis, Design, Development, Implementation, and Evaluation. This paper was conducted to develop a case-based learning (CBL) learning model and knowledge management system to increase learners' analytical thinking skills. This research was tested experimentally, using a design of using a class for pre-test and post-test, before being treated the model is done pretest, so that the outcomes of the treatment can be deemed more accurately, because you can compare the conditions before and after the treatment(Sugiyono, 2014). The design plan can be described as follows:

| *Pretest* | *Treatment* | *Posttest* |
|---|---|---|
| $T_1$ | X | $T_2$ |

**Figure 1.** Trial Design

The stages of this research are as follows:

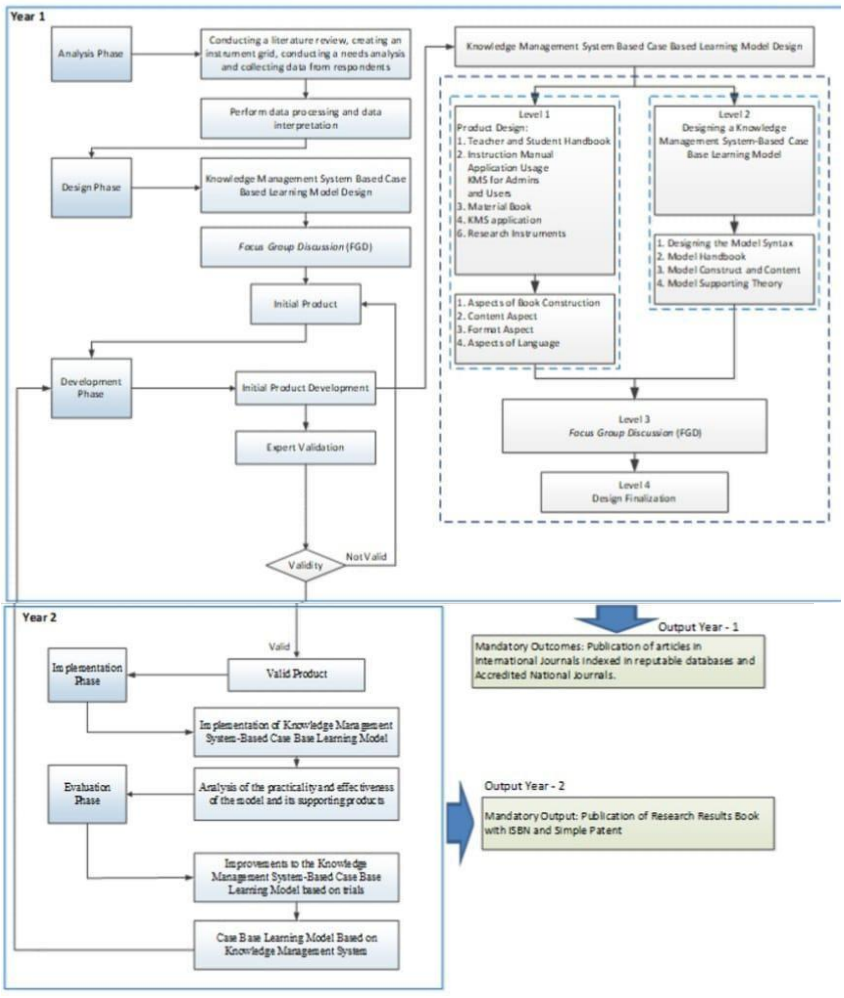


**Figure 2.** Research Stages

The model development in this aspect was conducted by following the ADDIE model work steps described previously. Each phase of ADDIE is done as follows:

1) Analysis Phase

This phase starts with a preliminary study by conducting a needs analysis. It is the first step in development research. This stage aims to raise and determine the basic problems faced in enhancing learners' analytical thinking skills. CBL learning model based on a Knowledge Management System is required. The results of this analysis phase form the basis for the design phase.

2) Design Phase

In this phase, a systematic process is done to measure goals, plan a strategy, explain how to achieve the goal, including the sequence of activities. This phase allows researchers to prepare a blueprint or frame of reference for the model being employed. This phase becomes input for the development phase.

3) Development Phase

CBL learning model based on Knowledge Management System to increase leaners' analytical Thinking Skills which has been fostered and validated by experts or specialists. In this case, the researchers require for validation by experts.

4) Implementation Phase

It has been fostered by conducting model trials to determine the practicality and effectiveness of the model. Carry out practicality tests by giving questionnaires to participants of studies, IT practitioners/assistant teachers and administrators. Employing pretest and posttest to measure the effectiveness of the Knowledge Management System-based Case Based Learning (CBL) learning model to increase learners' analytical thinking skills.

5) Evaluation Phase

This model, which has been tested and revised, is the result of research and development of a model that is relevant with validity, practicality, and effectiveness.

## 3. FINDINGS AND DISCUSSION

### *3.1. Validation Assessment of CBL Model Books Based on Knowledge Management System*

The outcomes of the validator's assessment of the Knowledge Management System Based CBL Model Book can be explored in Figure 3, it shows the validity test results of the Knowledge Management System Based CBL Model from the validator are: 1) The Organizational point has an average score of 0.80, (2) The Format point which got an average score of 0.83 in the valid category (3) Supporting Theory found an average score of 0.90, 4) The Goal framework achieve an average score of 0.93, 5) The Syntax aspect find a score an average of 0.86 with a valid aspect, 6) Social System perspective got an average score of 0.84 with a valid point, 7) Aspects of Reaction Principles receive an average score of 0.76 with a valid aspect, 8) Support System view have an average score of 0.80 with valid category, 9) Instructional/Accompanying Impact Aspect has an average score of 0.81 in the valid category and 10) Model Implementation Aspect has an average score of 0.78 in the valid category. The following is a graphic image of the validation of the Knowledge Management System Based CBL Model Book.

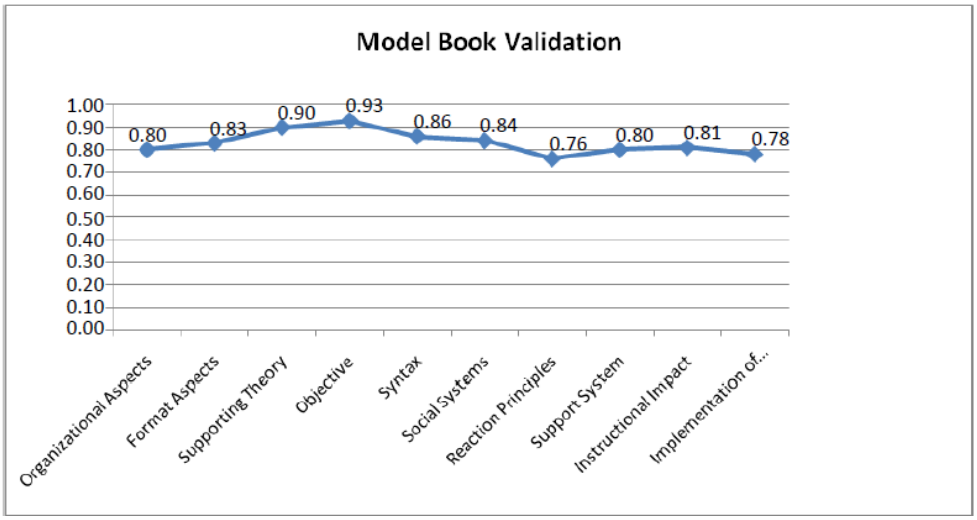


**Figure 3.** KMS-Based CBL Model Validation Graph

### 3.1.1 CBL Learning Implementation Guidebook

Based on Figure 4, it can be deemed that the outcomes of the validity test on the CBL Learning Guidebook from the validator are: 1) The Organizational point receive an average point of 0.85, 2) The Format view receive an average score of 0.83, and 3) The Material point has The average score is 0.88. All of the aspects are categorized in valid categories. The following is a graphic image from the validation of the CBL Learning Implementation Guidebook.

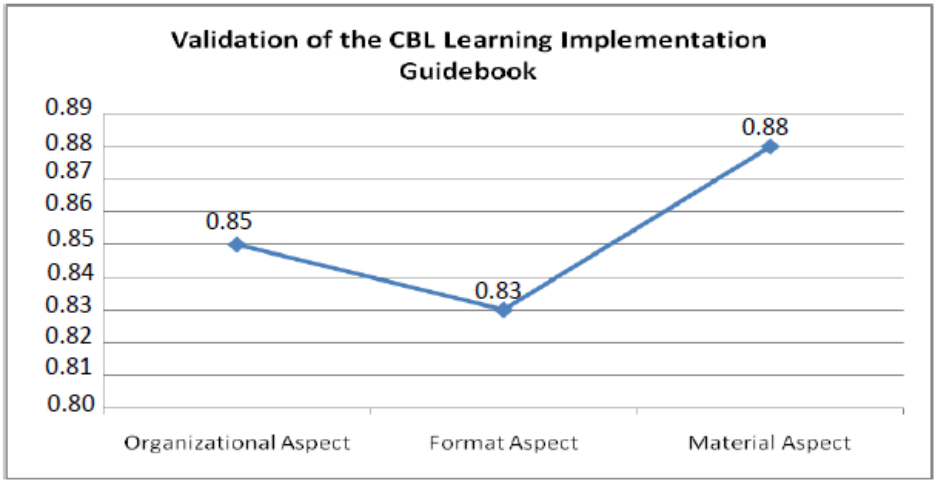


**Figure 4.** Validation graph of the CBL Learning Implementation Guidebook

### 3.1.2 Material Book

Based on Figure 5, the outcomes of the validity point on the Material Book from the validator are: 1) The Organizational point receives an average score of 0.84, 2) The Format view got an average score of 0.86, and 3) The Material area has an average score -average 0.89. All of the points are in valid category. The following is a graphic image from the Material Book validation.

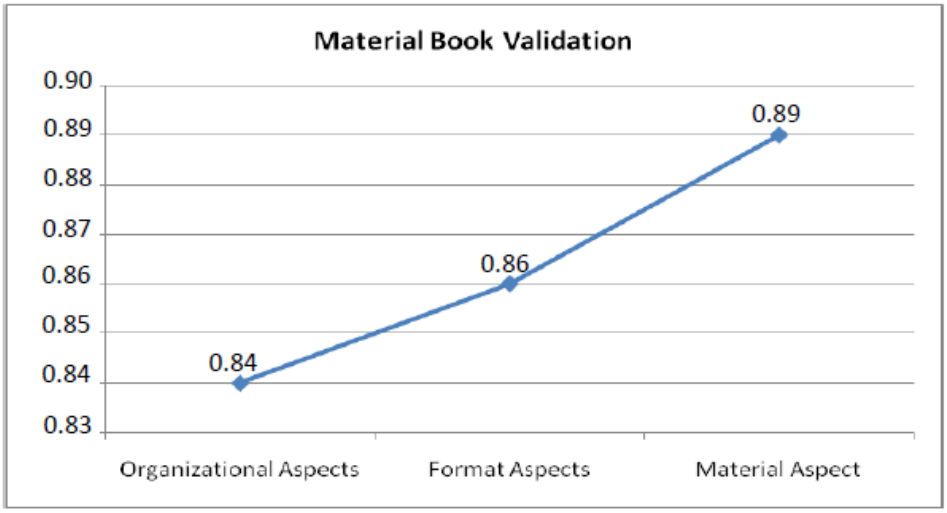


**Figure 5.** Material Book Validation Graph

### 3.1.3 Application User Manual for Administrators

Based on Figure 6, it shows that the outcomes of the validity test on the Application User Manual for Administrators: 1) Organizational view got an average score of 0.82, 2) Format point received an average score of 0.84 3) Aspects The material has an average score of 0.81. Everything is a valid point. Figure 6 below is a graphic from the validation of the Application User Manual for Administrators.

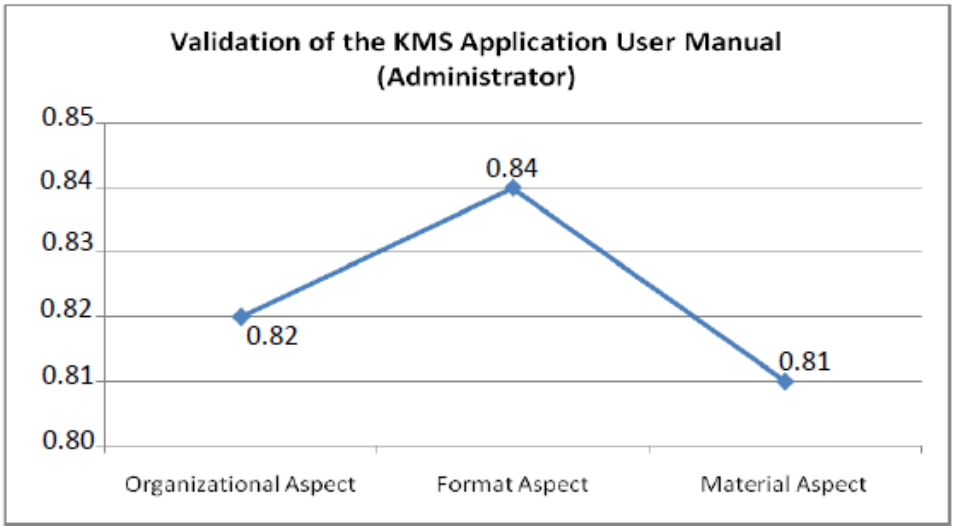


**Figure 6.** Validation graph of the application user manual for administrators

### 3.1.4 Application User Manual for Users

Figure 7 shows that the outcomes of the validity test for the Application User Manual for Users from the validator are: 1) The Organizational point got an average score of 0.84, 2) The Format view received an average score of 0.84 in the valid category, and 3) Aspects The material has a score of 0.82 in the valid category. The following is a graphic image of the validation of the Application User Manual for Users.

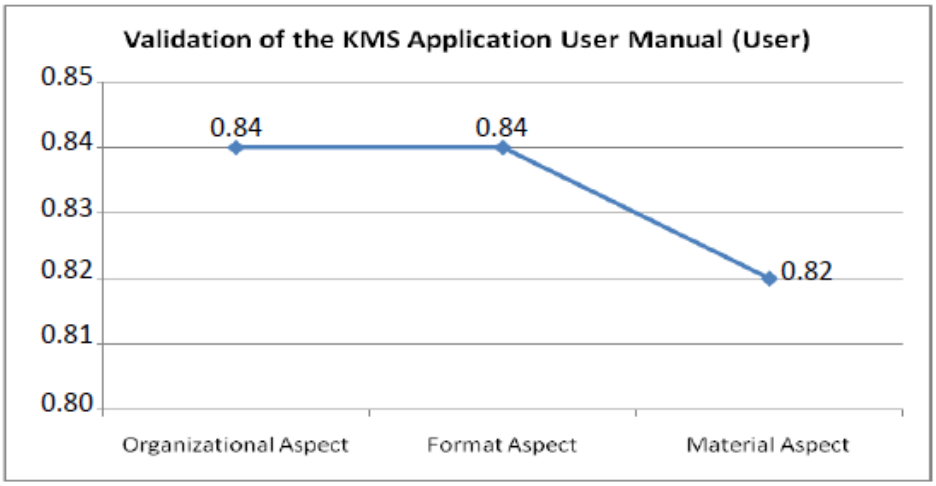


**Figure 7**. Graphic of Application User Manual Validation for User

### 3.1.5 Knowledge Management System Application Media

Based on Figure 8, the outcomes of the validity test on the Knowledge Management System Application from the experts are: 1) The Design point got an average score of 0.83 in the valid category, 2) The Operational point has an average score of 0.83 in the valid category, and 3) The Usefulness view received The average score is 0.82 in the valid form. The following is a graphic image of the Knowledge Management System Application validation.

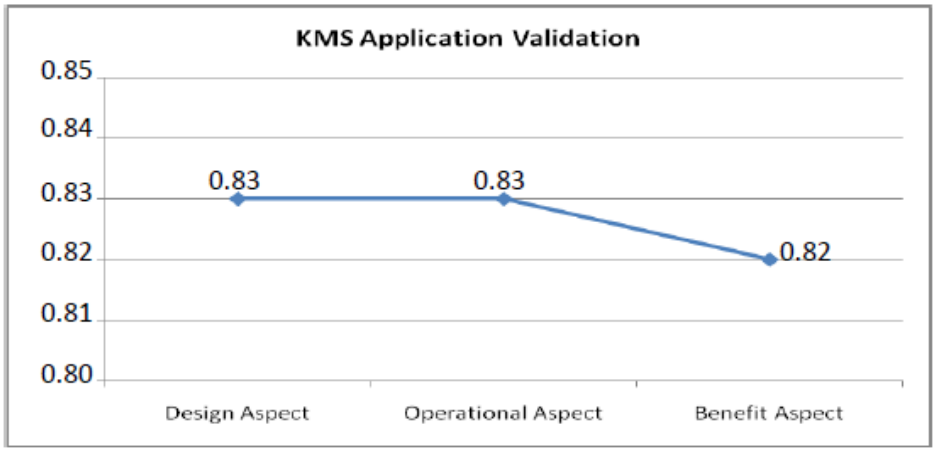


**Figure 8.** Application Validation Graph Knowledge Management System

## 3.2. *Practicality Test*

The practicality of this developmental research is assessed through the applicability of the KMS-based CBL Learning Model in participants' perceptions of using the developed KMS-based CBL learning model.

**Table 1.** Practicality Test Results

| No | Practicality Testing Items | Average Practicality Value | Information |
|---|---|---|---|
| Practicality of Participants' Perceptions | | | |
| 1 | Practicality of CBL Learning Model Based on Knowledge Management System | 90.10% | Very Practical |
| 2 | Practicality of the KMS-Based CBL Learning Model Book | 86.11% | Practical |
| 3 | Practicality of the KMS-Based CBL Model Learning Guidebook | 88.80% | Practical |
| 4 | Practicality of Material Books | 86.74% | Practical |
| 5 | Practicality of the Guidebook for Using the Knowledge Management System Application | 86.06% | Practical |
| 6 | Practicality of Knowledge Management System Applications | 88.04% | Practical |
| Practicality Perceptions of IT Practitioners/Teachers | | | |
| 1 | Practicality of the Guidebook for Using the Knowledge Management System Application | 88.80% | Practical |
| 2 | Practicality of Knowledge Management System Applications | 85.33% | Practical |

### *3.3. Effectiveness Test*

The effectiveness point in this exploration was conducted to assess the level of effectiveness of the KMS-based CBL Learning Model, which was applied to 35 research respondents. It was explored by comparing the Pretest and Posttest aspects. The following is a description of the Pretest and Posttest data.

#### 3.3.1 Pretest

The next part is a description of the research outcomes of research's respondents' pretest data:

**Table 2.** Basic Statistics of Pretest Results

**Statistics**

| | | |
|---|---|---|
| N | Valid | 35 |
| | Missing | 0 |
| Mean | | 71.91 |
| Median | | 73.00 |
| Mode | | 73[a] |
| Std. Deviation | | 9.568 |
| Minimum | | 45 |
| Maximum | | 88 |
| Sum | | 2517 |

a. Multiple modes exist. The smallest value is shown

After examining Table 2 stated above, it can be deemed that when the pretest was conducted, research's respondents had an average skill scores of 71.91. For more clarity, the distribution of Pretest data through interval classes can be stated in the following description:

**Table 3.** Frequency Distribution of Pretest Score Data

| BK | Interval Class | F | % f |
|---|---|---|---|
| 1 | 45 – 51 | 1 | 2.86 |
| 2 | 52 – 58 | 4 | 11.43 |
| 3 | 59 – 65 | 4 | 11.43 |
| 4 | 66 – 72 | 3 | 8.57 |
| 5 | 73 – 79 | 17 | 48.57 |
| 6 | 80 – 88 | 6 | 17.14 |
| | **Amount** | **35** | **100** |

Table 3 above explains that the top pretest score group was in the interval class 73 – 79 with 17 research's subject or 48.57%

### 3.3.2 Posttest

A description of the research results of the research respondents' pretest point can be explored in Table 4.

**Table 4.** Basic Statistics of Posttest Results

| | |
|---|---|
| Valid | 35 |
| Missing | 0 |
| Mean | 80.40 |
| Median | 81.00 |
| Mode | 81 |
| Std. Deviation | 7.605 |
| Minimum | 60 |
| Maximum | 98 |
| Sum | 2814 |

After contemplating Table 4 above, it can be explained that during the Posttest, namely after the application of the Knowledge Management System Based CBL Model, research's subject had an average ability score of 80.40. For more clarity, the distribution of Post-test data through interval classes can be presented in Table 5.

**Table 5.** Frequency Distribution of Posttest Score Data

| BK | Interval Class | F | % f |
|---|---|---|---|
| 1 | 60 – 65 | 1 | 2.86 |
| 2 | 66 – 71 | 3 | 8.57 |
| 3 | 72 – 77 | 5 | 14.29 |
| 4 | 78 – 84 | 16 | 45.71 |
| 5 | 85 – 91 | 8 | 22.86 |
| 6 | 92 – 98 | 2 | 5.71 |
| | **Amount** | **35** | **100** |

Deepening Table 5, it explains that the top posttest scores group was in the interval class 78 – 84 with 16 research subjects or 45.71%.

**Table 6.** Results of Difference in Pretest and Posttest Scores

| Value | Score Average | | |
|---|---|---|---|
| | Pretest | Postest | Gain Score |
| Student Competencies | 71.91 | 80.40 | 8.49 |

### *3.4. Discussion*

This research has developed a product known as the Case-Based Learning (CBL) Model, which is based on a Knowledge Management System (KMS) to enhance learners' analytical thinking abilities. The creation of this model follows procedural steps rooted in identified needs. Key issues in learning, particularly those related to improving learners' analytical thinking abilities, were thoroughly examined. The outcomes of this research demonstrated the validity of the product through expert assessments, where validators confirmed the model's validity across all evaluated aspects. Practicality assessments revealed an average score indicating that the model is practical for educational use, and effectiveness evaluations demonstrated that the application of the CBL model based on the KMS is highly effective in enhancing learners' analytical thinking skills.

These findings are consistent with previous research, such as the study conducted by Anwar et al. (2022), titled Development of Case-Based Learning Model on Biochemistry Online Learning. In that study, the implementation of a CBL model also showed that the stages described in the guidelines could be executed effectively, and students responded positively to the case-based learning approach. This supports the conclusion that the CBL model, as developed in this study, is not only applicable but also beneficial for future research endeavors in related areas.

The product developed in this research, the CBL Model Based on KMS, is specifically designed to enhance learners' analytical thinking abilities. The integration of a knowledge management system within this learning model employs an individualized learning approach, often referred to as the Course Management System (CMS). The KMS facilitates the management and retrieval of information, provides direct access to organizational resources, links documents and data, and offers personalized content access. This system thus enables the creation of new knowledge, ultimately contributing to the improvement of learners' analytical thinking skills. By supporting personalized learning pathways and fostering a deeper engagement with content, the CBL model based on KMS aligns with contemporary educational needs, making it a valuable tool for educators and learners alike (Anwar et al., 2022).

## 4. CONCLUSION

The outcomes of this research indicate that the Knowledge Management System (KMS)-based Case-Based Learning (CBL) model, when applied to vocational high school teachers and students, effectively enhances learners' analytical thinking abilities. The research and development process of this KMS-based CBL model aimed at improving learners' critical thinking abilities has successfully addressed the problem formulation, leading to a clear conclusion for this study. The findings suggest that the CBL model integrated with KMS offers a valuable variation of traditional CBL approaches. Several components were developed and validated, including research instruments, textbooks, material guides, learning guidebooks, application usage manuals for administrators and users, and the KMS media. These components were deemed valid based on analysis using Aiken's V, confirming their reliability and suitability for educational use. The implementation of the KMS-based CBL model has been thoroughly evaluated, and the results show that it is categorized as both practical and highly practical. This is evidenced by the positive responses from users and the significant improvement in learners' outcomes following the application of this model. The effectiveness of the model is particularly notable, as it led to an increase in learners' performance after they engaged with the tasks designed under this framework. Future research is encouraged to further investigate the long-term impact of this KMS-based CBL model on learners' analytical thinking abilities. Additionally, exploring its application across different educational levels or subjects could provide further insights into its broader utility and effectiveness in various learning contexts.

**REFERENCES**

Anwar, Y. A. S., MutiÃ¢â‚¬â„¢ah, M., Idrus, S. W. al, Junaidi, E., & Rahmawati, R. (2022). Development of case-based learning model on biochemistry online learning. *Jurnal Pijar Mipa*, *17*(1), 16–22. https://doi.org/10.29303/jpm.v17i1.2992

Wati, D. A., & Sunarti, T. (2020). Implementation of Case Based Learning (CBL) to Improve Scientific Reasoning Skill on Simple Harmonic Vibration Topic. *Journal of Physics: Conference Series*, *1491*(1). https://doi.org/10.1088/1742-6596/1491/1/012040

Syarafina, D. N., Dewi, E. R., &Amiyani, D. R. (n.d.). *Penerapan Case Based Learning (CBL) sebagaiPembelajaranMatematika yang Inovatif*.

Arianto, H., Niswatul, H., Jurusan, F., Ilmu, T., Alam, P., Tarbiyah, F., & Keguruan, I. (2020). *Students' Response to the Implementation of Case Based Learning (CBL) Based on HOTS in Junior High School Article Information ABSTRACT*. https://jurnal.iainponorogo.ac.id/index.php/insecta

Dharmayanthi, N. P. I. (2023). Penerapan Model Case Based Learning (CBL) untukMengembangkan Critical Thinking Skills SiswadalamPembelajaranGeografi di SMA Negeri 1 Kuta Utara. *Jurnal Pendidikan Geografi Undiksha*, *10*(3), 291–300. https://doi.org/10.23887/jjpg.v10i3.50446

Rihadatul, A. G., & Nani, H. (n.d.). *Case-based learning in improving critical thinking skill on reading comprehension for the eleventh grade students at SMA N 2 Semarang*.

Amin, S., Widiastuti, F., & Sumarni, A. (n.d.). The Covid-19 Pandemic and Students' Perception on the Online Case-Based Learning: The Case of One Online Course How to Cite. *IRJE |Indonesian Research Journal in Education| |Vol. 6| No. 1|June|Year 2022| Indonesian Research Journal in Education |IRJE|*, *6*(1), 71. https://doi.org/10.22437/irje.v6i1.17216

Saleewong, D., Suwannatthachote, P., &Kuhakran, S. (2012). Case-Based Learning on Web in Higher Education: A Review of Empirical Research. *Creative Education*, *03*(08), 31–34. https://doi.org/10.4236/ce.2012.38b007

Holden Simbolon, D. (2022). Pengaruh Model Case Based Learning (CBL) Terhadap Hasil BelajarMahasiswa. In *BULLET :JurnalMultidisiplinIlmu* (Vol. 1, Issue 03).

Abdillah, L. A., Purwanto, T. A., & Agustini, E. P. (2020). Knowledge Management Systems Analysis and Planning for Employees Recruitment and Training. *Journal of Electrical, Electronics and Informatics*, *4*(2), 38. https://doi.org/10.24843/jeei.2020.v04.i02.p01

Ali, G., Rukun, K., &Syahril, S. (2017). *Training Model-Based Knowledge Management System for Vocational High School Teachers Skills Engineering Computer Network*. *00*(00), 186–193. http://repository.unp.ac.id/id/eprint/17618

Amin, S., Widiastuti, F., & Sumarni, A. (2022). The Covid-19 Pandemic and Students' Perception on the Online Case-Based Learning: The Case of One Online Course How to Cite. *IRJE |Indonesian Research Journal in Education| |Vol. 6| No. 1|June|Year 2022| Indonesian Research Journal in Education |IRJE|*, *6*(1), 71.

Arya Sadewa, E. D., Ardi, R., & Suzianti, A. (2019). Knowledge Management System Model Development for Higher Technical Vocational Education. *IPTEK Journal of Proceedings Series*, *0*(3), 102. https://doi.org/10.12962/j23546026.y2019i3.5851

Anggraeni, A. D. (2020). Blended Humor and Mind Mapping in Improving 21st Century Skills. *JurnalIlmu Pendidikan*, *25*(1), 1. https://doi.org/10.17977/um048v25i1p1-5

Budianto, W., &Sardjono, W. (2022). The Implementation of Knowledge Management System (KMS) Evaluation Model in Improving Employee Performance: A Case Study of the State Electricity Company. *ComTech: Computer, Mathematics and Engineering Applications*, *13*(1), 35–43. https://doi.org/10.21512/comtech.v13i1.6873

Nieveen, N., & Folmer, E. (2013). Educational Design Research Educational Design Research. *Netherlands Institute for Curriculum Development: SLO*, 1–206. http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ815766

Perdana, E. M., Manongga, D., & Iriani, A. (2019). Model KonseptualbagiPengembangan Knowledge Management di SMA Menggunakan Soft System Methodology. *Jurnal Teknologi Informasi Dan Ilmu Komputer*, *6*(2), 169. https://doi.org/10.25126/jtiik.201962932

Pelealu, D. R. (2022). The Effect of Knowledge Management System and Knowledge Sharing on Employee Performance and Loyalty. *Indonesian Interdisciplinary Journal of Sharia Economics (IIJSE)*, *5*(1), 371–389. https://doi.org/10.31538/iijse.v5i1.2162

Pratiwi, H., & Priyana, J. (2022). Exploring Student Engagement in Online Learning. *JurnalIlmu Pendidikan*, *28*(2), 66. https://doi.org/10.17977/um048v28i2p66-82

Rian, R. Al, Rukun, K., Refdinal, Novalia, M., Vitriani, &Herlandy, P. B. (2019). *Design of E-Learning Structure Model based on Artificial Intelligence for Constructivism Learning Theory*. *190*, 24–28. https://doi.org/10.2991/iccelst-st-19.2019.5

Supermane, S. and Mohd Tahir, L. (2018). An overview of knowledge management practice among teachers. *Global Knowledge, Memory and Communication*, Vol. 67 No. 8/9, pp. 616-631. https://doi.org/10.1108/GKMC-08-2017-0065

Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D.* Bandung: Alfabeta.

Sonia, N. R. (2020). Implementasi Sistem Informasi Manajemen Pendidikan di Madrasah Aliyah Negeri 2 Ponorogo. *Southeast Asian Journal of Islamic Education Management*, *1*(1), 94–104. https://doi.org/10.21154/sajiem.vli1.18

Syysnummi, P. and Laihonen, H. (2014). Top management's perception of knowledge management in a vocational education and training organization in Finland. *International Journal of Educational Management*, Vol. 28 No. 1, pp. 53-65. https://doi.org/10.1108/IJEM-04-2013-0067

Wardhana, A. C., Nurhadryani, Y., Wahjuni, S., Komputer, D. I., Informatika, F., &Korespondensi, P. (2020). *Knowledge Management System Berbasis Web TentangBudidaya Web-Based Knowledge Management System Concerning Hydroponic Cultivation To Support Smart Society*. *7*(3). https://doi.org/10.25126/jtiik.202072200