Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

# The nexus between principal competence, learning leadership, facility feasibility, and public elementary school quality in Cikande, Serang District, Indonesia

Siti Laela *, Syadeli Hanafi, Sudadio Sudadio

*Doctoral Program in Education, Graduate School, Universitas Sultan Ageng Tirtayasa, Serang, Indonesia*

ARTICLE INFO

*Article history:*
Received 18 May 2023
Received in revised form
30 August 2023
Accepted 2 September 2023

*Keywords:*
Principal competence
Learning leadership
Facility feasibility
School quality
Elementary education

ABSTRACT

This research endeavors to expound upon the intricate interplay between the caliber of public elementary schools in Cikande, Serang District, Indonesia, and the proficiency of school principals in their managerial roles, their capacity for learning leadership, and the overall viability of school facilities. Employing a quantitative research paradigm with a descriptive correlational approach bolstered by a verification process, the study utilizes a closed questionnaire as the primary data collection tool. The dataset, stemming from 32 public elementary schools in Cikande, Serang District, located within Banten Province, Indonesia, and encompassing a total population of 308 teachers, is meticulously distilled through both descriptive and numerical analysis techniques. The findings underscore the presence of a substantial and statistically significant association between managerial competence and the feasibility of school facilities at the population level. Likewise, a pronounced and statistically significant correlation exists between learning leadership and the suitability of school facilities at the population level. Moreover, the research elucidates a noteworthy connection between school feasibility and the overall quality of these institutions across the population. Most notably, a comprehensive interrelationship emerges, where managerial acumen, learning leadership, and facility feasibility converge to exert a substantial impact on school quality at the population level. In light of these empirical insights, the study strongly advocates that school administrators prioritize the enhancement of their managerial competencies, foster adeptness in learning leadership, and diligently uphold and enhance facility feasibility as integral strategies to elevate school quality.



## 1. Introduction

The teachers' efforts in the school level to develop students' learning achievement have been conducted by several previous studies such as in the teaching strategy implementation, Rifqiawati et al. (2021) implemented the distance learning, Mayer (2004) implemented the discovery learning, Wahyuni et al. (2022a) implemented the guided inquiry learning model, Ratnasari et al. (2022) implemented the problem based learning (PBL) model, Dyamayanti et al. (2023) implemented the discovery learning model, Kartini (2023) used of the Think-Pair-Share, Pujiastuti and Haryadi (2023) implemented the STEM–based video approach, Rusmiyati at al. (2021) implemented the biotechnology learning using pulau tunda's local potential, Sari et al (2022) conducted a systematic review on the implementation of bioinformatics learning in senior high school, Haryadi and Pujiastuti (2022) implemented STEM-PJBL model, Hendriyani et al. (2023) used the project report through the STEM integrated project based learning model, and Widyastuti et al. (2022) used discovery learning model through the aptitude treatment interaction (ATI). In the media learning, Baga et al. (2021) used the comic media, Awaliyati et al. (2021) developed the bacteria magz, Khastini et al. (2022) developed the monopoly digestive media based on educational games, Wahyuni et al. (2022b) developed the question card game, and Alya et al. (2023) used the poster media, Syahfitri et al (2022) implemented the online learning using google classroom, Subagja et al (2022) conducted the student needs analysis of the scientific literacy oriented interactive multimedia,

* Corresponding Author.
Email Address: 7782200002@untirta.ac.id (S. Laela)
https://doi.org/10.21833/ijaas.2023.09.018
Corresponding author's ORCID profile:
https://orcid.org/0000-0002-4915-5172

and Yuliani et al (2022) conducted a bibliometric analysis on mapping research on multimedia biology, Khastini et al (2023) implemented the e-student worksheets, and Ernawati and Sujatmika (2021) developed a worksheet based on a scientific approach. In the student learning outcomes, Fitriana et al. (2022) analyzed the learning difficulties of class xii high school students and Yuliasari et al. (2023) identified the students' misconceptions on the photosynthetic and plant respiration concepts using a two-tier diagnostic test. In the assessment, Ikawati et al. (2022) developed the portfolio assessment instruments based on scientific literacy, Al-Ansi and Al-Ansi (2023) introduced the module for STEM development and assessment. In the teacher education, Sastria (2023) surveyed the Indonesian pre-service and in-service science teachers' TPACK level, Rafik (2023) surveyed the relationship between biology education students' learning period and grade point average (GPA), Stonier and Adarkwah (2023) implemented the STEM professional development sessions on Chinese pre-service early childhood teachers. In the learning content, Marianingsih et al. (2023) analyzed the biology learning content on aves diversity. In the educational revitatilation, Santoso, et al. (2019) did a high vocational education revitalization on the quality of information technology.

The government's implementation of accreditation is one of the efforts to ensure the quality of education and education services. This is done so that all schools always try to improve in providing services and organizing education for the community (Sukma and Hasanah, 2021). School accreditation is one of the instruments from the government that is determined to determine the condition of the quality of education at the district/city level, provincial level, and national level, which is used as a measure of achieving the quality of a school because accreditation is an institution that has an independent mandate to accredit eight National Education Standards in education units, namely the National Accreditation Board for Schools/Madrasas (Raharjo et al., 2018). School accreditation is one way to measure school/madrasa achievement from national education standards carried out by government agencies, namely the National Accreditation Board for Schools/Madrasas (Dewi and Ali, 2020). However, in 2020, the school/madrasa accreditation system changed from a compliance-based system to a performance-based one. This system is implemented in line with the 2020 Education Unit Accreditation Instrument, the latest school/madrasah accreditation instrument has been implemented as a school/madrasa accreditation instrument since 2020 for all schools/madrasas in Indonesia (Hasanah et al., 2021).

We employed criteria for assessing school quality that align with the educational quality standards delineated in a national framework known as the National Education Standards. Accredited educational institutions are categorized into three tiers: those achieving a commendable status designated with an A rating, those deemed as good and designated with a B rating, and those meeting the minimum requirements but with room for improvement, denoted as a C rating. Conversely, schools or madrasas yet to undergo accreditation are assigned a grade of D or E. It is pertinent to underscore that the apex aspiration set forth by the National Educational Standard Board is the attainment of an A ranking. In more straightforward terms, the quality evaluation of a school ranges from A, denoting excellence, to non-accreditation.

The assurance, evaluation, and preservation of school quality are facilitated through a periodic process known as school accreditation. According to the standardized appraisal conducted by the National Accreditation Board, the pinnacle of school quality is represented by an A ranking. Nonetheless, the empirical landscape illustrates that numerous schools have yet to realize this coveted score. Within Banten Province, Indonesia, it is discerned that 100 Public Elementary Schools have undergone accreditation. Regrettably, these data reveal that public elementary schools still grapple with achieving the optimal rating.

To recapitulate, this study delves into the Determination of Results and Recommendations for School/Madrasa Accreditation in 2021, with a particular focus on Public Elementary Schools within Banten Province, Indonesia.

In the forthcoming year, 100 public elementary schools scattered across Banten Province, Indonesia, will undergo accreditation under the purview of the National Accreditation Board for Schools/Madrasas. Of these, 84 schools have secured an A rating, 14 schools have received a B rating, while two schools have garnered a Grade C; none have received a "Not Accredited" designation. These statistics cast a light on the scope for improving the quality of public elementary education in Banten Province, Indonesia.

Notably, issues pertaining to school quality also pervade the public elementary schools in Cikande, Serang District, Banten Province, Indonesia.

The preliminary assessments concerning the condition of public elementary schools in Cikande, Serang District, Banten Province, Indonesia reveal that there is considerable room for enhancing school quality. These evaluations are predicated on the accreditation scores assigned by the National Accreditation Board, an authoritative body entrusted with quality assurance and the accreditation process. Specifically, 18 schools, equivalent to 59.4%, have garnered a "Rank B" designation, while one school, representing a mere 0.32%, remains unaccredited.

The subpar quality of Public Elementary Schools in Cikande, Serang District, Indonesia, can be attributed to the suboptimal managerial prowess of the school principals. This assertion is substantiated by observations and interviews conducted with school supervisors and several teachers. These sources assert that the managerial competencies of school principals are in need of significant improvement. This is exemplified by the principal's

inability to effectively execute their supervisory functions, the absence of concerted efforts to enhance school quality, and a general dearth of strategic initiatives aimed at elevating the overall quality of the institution. In sum, the capacity of school principals to implement apt strategies for augmenting school quality is deemed insufficient.

Another cause of the low quality of Public Elementary Schools in Cikande, Serang District, Indonesia, is that the school principal must still be competent in learning leadership. This is indicated by the principal needing to change the curriculum and supervision, carried out as a formality without any follow-up. The principal rarely invites teachers to discuss lesson plans. So that the teacher's performance could be more optimal. Research conducted by Suryana (2018) supported that one of the factors that influence the quality of teacher teaching performance is the learning leadership of the school principal. The results of the study show that of all the work that school principals must carry out, only 10% is allocated to learning leadership. The school principal must carry out a balanced role so that inequality and neglect do not occur. "Many studies have concluded that school principals who focus on learning leadership produce better student achievement than those who focus less on learning leadership.

Darwansah et al. (2021) showed that there is a significant effect of school facilities on the performance of teachers. Additionally, there is a significant influence jointly with the managerial competence of school principals and school facilities on the performance of the elementary school. So, this study focused on the relationship between school quality and the principal managerial ability, learning leadership, and feasibility of facilities: a case study in the public elementary schools in Serang district, Indonesia.

The low output is another indicator that can show the quality of public elementary schools in Cikande, Serang District, Indonesia. This is evidenced by the Minimum Mastery Learning scores students achieve. Referring to data obtained from several public elementary schools in Cikande, Serang District, Indonesia, and the authors observed that the achievement of the learning and teaching activity was between 55-80%.

## 2. Method

We used quantitative research with descriptive correlational and verification to obtain an explanation of the relationship between the managerial abilities of school principals, learning leadership, and the adequacy of facilities and the quality of public elementary schools in the Cikande, Serang District, Indonesia (Bloomfield and Fisher, 2019). The analytical method used to process the data in this study is descriptive analysis, verification analysis, and Spearman rho correlation coefficient analysis as a tool in concluding (Lawless et al., 2010). Descriptive analysis of research data can be used to enrich the discussion; through this analysis, it can be seen how respondents respond to each variable indicator studied. This study used a proportional random sampling technique of 171 teachers at public elementary schools in Cikande, Serang District, Indonesia (Cohen et al., 2017).

## 3. Results and discussion

### 3.1. The principal managerial ability variable (X1)

The field data results showed that most respondents agreed with statements about the Principal Managerial Capability variable (X1). From the 171 respondents who sent out questionnaires, they obtained answers regarding the Managerial Capability of the Principal. Principal Managerial Ability (X1) with a total of 31 statement items and a total of 171 respondents, a total score equal to the range of scores for each category is determined as follows:

$$\text{Average Score} = \frac{20.838}{31 \times 171} = 3.93$$

The sum of the response scores from the 31 statements submitted regarding the Principal Managerial Ability variable (X1) shows that the respondents' responses regarding the Principal's Managerial Ability are included in the "Good" category.

### 3.2. Learning leadership variable (X2)

The field data results showed that most respondents agreed with statements about physical environment variables. From 171 respondents who sent questionnaires, they got answers regarding learning leadership. In the Learning Leadership variable (X2), with a total of 18 statement items and a total of 171 respondents, a total score of 10,539 was obtained, so the range of scores for each category was determined as follows:

$$\text{Average Score } = \frac{10.539}{18 \times 171} = 3.42$$

The sum of the response scores from the 18 statements submitted regarding the Learning Leadership variable shows that the respondents' responses regarding learning leadership are included in the "Good" category.

### 3.3. Facility feasibility variable (X3)

The field data results showed that most of the respondents stated that they quite agree with the statements about the feasibility variable of the facility. From 171 respondents who sent questionnaires, they obtained answers regarding the feasibility of the facilities. In the school quality variable (Y), with a total of 34 statement items and a total of 171 respondents, a total score of 19,848 was

obtained, so the range of scores for each category was determined as follows:

$$\text{Average Score} = \frac{19.848}{34 \times 171} = 3.41$$

The sum of the response scores from the 34 statements submitted regarding the facility feasibility variable shows that the respondents' responses regarding facility feasibility are included in the "Good" category.

### 3.4. The school quality variable (Y)

The field data results showed that most respondents agreed with the statements about the variable quality of the school. From 171 respondents who sent questionnaires, they obtained answers regarding the feasibility of the facilities. In the school quality variable (Y), with a total of 34 statement items and a total of 171 respondents, a total score of 19,848 was obtained, so the range of scores for each category was determined as follows:

$$\text{Average Score} = \frac{19.848}{34 \times 171} = 3.41$$

Through the sum of the response scores from the 34 statements submitted regarding the school quality variable, the respondents' responses regarding school quality are included in the "Good" category.

### 3.5. Test of normality

The normality test on the research variables can be seen in Table 1.

**Table 1:** Test for normality on the research variables

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Manajerial ability | .120 | 171 | .000 | .906 | 171 | .000 |
| Learning Leadership | .171 | 171 | .000 | .871 | 171 | .000 |
| Feasibility means | .073 | 171 | .028 | .981 | 171 | .018 |
| The School Quality | .114 | 171 | .000 | .955 | 171 | .000 |

a: Lilliefors Significance Correction

Table 1 uses two test tools: Kolmogorov-Smirnov and Shapiro-Wilk. Because this study used a sample of 171 people, the test used as a decision-making tool was the Kolmogorov-Smirnov test. The value of Sig. for the four research variables is less than 0.05, so it can be concluded that the data on each research variable are taken from populations that are not normally distributed. Therefore, the following data analysis is based on non-parametric statistics: statistical tests that no longer require any parameter assumptions for the population being tested.

### 3.6. The correlation analysis between managerial ability and school quality

The test results determine the relationship between managerial ability and school quality (Y) are shown in Table 2.

**Table 2:** Correlation analysis between managerial ability and school quality

| Correlations | | | | |
|---|---|---|---|---|
| | | | The school quality | Managerial ability |
| Spearman's rho | The school quality | Correlation coefficient | 1.000 | .844** |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |
| | Managerial quality | Correlation coefficient | .844** | 1.000 |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |

**: Correlation is significant at the 0.01 level (2-tailed)

Based on the test results shown in Table 2, it was found that the value of Sig (2-tailed) is 0.000, which is less than 0.05. Furthermore, it is known that the Correlation Coefficient (correlation coefficient) is 0.844. Furthermore, this correlation coefficient value will be used to test the correlation coefficient value in the population. The test result found that:

$$tcount = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}} = \frac{0.844\sqrt{171-2}}{\sqrt{1-0.844^2}} = \frac{10.972}{0.5363} = 20.4587$$

From the calculation, it is found that the t_count value is 20.4587. Then the t-count value is compared with the t_table value. The t-distribution table was used with the parameter v=171-2=169 to get the t-table value, and the significance level is 95%. Based on these parameters, the t-table value is 1.65392 or 1.654. Thus, if you compare the t_count and t_table values, you will get t_count=20.4587> t_table=1.65392 or t_count>t_table, so according to the criteria, H_0 is rejected. If H0 is rejected, it can be concluded that there is a significant relationship between managerial ability and school quality at the population level.

### 3.7. The correlation analysis between learning leadership and school quality

The test results to determine the relationship between learning leadership variables (X2) and school quality (Y) are shown in Table 3. Based on the test results shown in Table 3, it was found that the Sig (2-tailed) is 0.000, where this value is less than 0.05. Furthermore, it is known that the Correlation Coefficient (correlation coefficient) is equal to 0.778.

**Table 3:** The correlation coefficient between learning leadership and school quality

| Correlations | | | | |
|---|---|---|---|---|
| | | | The school quality | Leadership learning |
| Spearman's rho | The school quality | Correlation coefficient | 1 | .778** |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |
| | Leadership learning | Correlation coefficient | .778** | 1 |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |

**: Correlation is significant at the 0.01 level (2-tailed)

### 3.8. The correlation analysis between the feasibility of facilities and school quality

The test results to determine the relationship between the school eligibility variable (X3) and school quality (Y) are shown in Table 4. Based on the test results shown in Table 4, it was found that the Sig (2-tailed) is 0.000, where this value is less than 0.05. Furthermore, it is known that the Correlation Coefficient (correlation coefficient) is 0.608.

### 3.9. The correlation analysis between school quality and the managerial ability, learning leadership, and feasibility of facilities simultaneously

Multiple correlation analysis is closely related to multiple regression analysis. In this case, the appropriate general multiple regression equation is:

$$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + b_3X_3$$

where, $X_1$, $X_2$, and $X_3$ are research variables independent according to what was defined at the beginning of the discussion, $b_0$ and $b_i$that $i = 0,1,2,3$ is the weight for each variable and Y^ the value of the school prediction. The analysis of the correlation coefficient between $Y$ and $\hat{Y}$.

Based upon the findings derived from rigorous data analysis and hypothesis testing, it is discernible that the following conclusions can be drawn. Firstly, there exists a positive correlation between the managerial competencies exhibited by school principals and the overall quality of the educational institution. Secondly, the presence of effective leadership in fostering learning within the school environment is demonstrably linked to an enhancement in school quality. Thirdly, the feasibility and appropriateness of the facilities utilized in the educational process exhibit a positive relationship with the overall quality of the institution. Furthermore, it is evident that the amalgamation of managerial acumen among school principals, the presence of learning-focused leadership, and the appropriateness of facilities all collectively contribute positively to the overall quality of the school.

The first hypothesis states that there is a positive relationship between the managerial abilities of school principals and school quality. In this case, the higher the principal's managerial ability score, the higher the quality of the school. The second hypothesis states a positive relationship between learning leadership and school quality. In this case, the higher the learning leadership score, the higher the quality of the school. The third hypothesis states a positive relationship exists between the feasibility of facilities and school quality. In this case, the higher the suggestiveness score, the higher the quality of the school. The fourth hypothesis states a positive relationship exists between the managerial abilities of school principals, learning leadership, and the adequacy of facilities and school quality. In this case, the higher the score of managerial ability, learning leadership, and the feasibility of the facilities, the higher the quality of the school. Based on the conclusions above, school principals must have managerial skills and learning leadership and provide appropriate learning facilities to achieve school quality. This results in line with Darwansah et al. (2021) which found that there is a significant influence jointly with the managerial competence of school principals and school facilities on the performance of the elementary school. As we know the performance of the teachers is one of the factors which contribute to the school quality.

**Table 4:** The correlation coefficient between the adequacy of facilities and school quality

| **Correlations** | | | | |
|---|---|---|---|---|
| | | | The school quality | The feasibility of school |
| Spearman's rho | The feasibility of the school | Correlation coefficient | 1.000 | .608** |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |
| | Feasibility means | Correlation Coefficient | .608** | 1.000 |
| | | Sig. (2-tailed) | .000 | .000 |
| | | N | 171 | 171 |

**: Correlation is significant at the 0.01 level (2-tailed)

## 4. Conclusion

In light of the rigorous data analysis undertaken in this study, several key conclusions can be drawn, each bearing substantial significance for the overarching discourse on school quality enhancement. First and foremost, the findings resolutely affirm that the managerial acumen exhibited by school principals bears a conspicuous, affirmative relationship with the overall quality of

schools. In essence, this underscores the pivotal role played by effective managerial skills in the cultivation of a high-caliber educational environment. Principals who adeptly navigate the multifaceted responsibilities inherent in school administration contribute significantly to the enhancement of school quality. Secondly, the empirical evidence gleaned from this study firmly establishes that the exercise of learning leadership is inherently and positively linked to the amelioration of school quality. Learning leadership, characterized by a principal's capacity to foster a culture of continuous improvement and knowledge dissemination within the educational institution, emerges as an instrumental determinant in the pursuit of educational excellence. Schools led by principals who prioritize and manifest adept learning leadership consistently exhibit a discernible uptick in overall quality. Furthermore, the research elucidates a compelling correlation between the feasibility of facilities and their alignment with school quality. The verifiable association between facilities' appropriateness and the quality of educational outcomes bolsters the contention that conducive physical infrastructure serves as a foundational underpinning for scholastic excellence. Most notably, the culmination of these interrelated facets underscores the comprehensive nature of their impact on school quality. The principals' proficiency in managerial skills, coupled with their adeptness in fostering learning leadership, and their conscientious attention to the appropriateness of facilities, collectively constitute a formidable triad. Together, they synergistically contribute to elevating the quality of educational institutions, reaffirming the intricate interplay between these determinants and their collective influence on school quality. In sum, this study underscores the imperative for school administrators to prioritize the development of managerial skills and learning leadership competencies, while concurrently ensuring the adequacy of educational facilities. The confluence of these factors emerges as an efficacious strategy for the enhancement of school quality, thereby reinforcing the commitment to fostering excellence within the educational landscape.

## Compliance with ethical standards

## Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## References


Al-Ansi AM and Al-Ansi A (2023). Enhancing student-centered learning through introducing module for STEM development and assessment. International Journal of STEM Education for Sustainability, 3(1): 22-27. https://doi.org/10.53889/ijses.v3i1.114

Alya M, Cahyani A, Erni E, and Mahrawi M (2023). The effectiveness of poster media on senior high school students' communication skills on plant tissue concept. Jurnal Pendidikan Indonesia Gemilang, 3(1): 20-25. https://doi.org/10.53889/jpig.v3i1.149

Awaliyati E, Khastini RO, Rifqiawati I, and Sari IJ (2021). Bacteria magz as an alternative learning resource on bacteria concept for senior high school level. International Journal of Biology Education towards Sustainable Development, 1(1): 10-16. https://doi.org/10.53889/ijbetsd.v1i1.48

Baga S, Hendriyani ME, Suratmi S, and Rosaline MM (2021). Students' interest and cognitive ability through the implementation of comic media. International Journal of Biology Education towards Sustainable Development, 1(1): 17-26. https://doi.org/10.53889/ijbetsd.v1i1.49

Bloomfield J and Fisher MJ (2019). Quantitative research design. Journal of the Australasian Rehabilitation Nurses Association, 22(2): 27-30. https://doi.org/10.33235/jarna.22.2.27-30

Cohen L, Manion L, and Morrison K (2017). Research methods in education. Routledge, Oxfordshire, UK. https://doi.org/10.4324/9781315456539

Darwansah E, Fitria H, and Setiawan AA (2021). The effect of principal managerial competence and school facilities on teacher performance. Journal of Social Work and Science Education, 2(2): 169-180. https://doi.org/10.52690/jswse.v2i2.247

Dewi PR and Ali N (2020). Peningkatan skor akreditasi madrasah melalui lembaga penjaminan mutu. J-MPI (Jurnal Manajemen Pendidikan Islam), 5(1): 44-54. https://doi.org/10.18860/jmpi.v5i1.9046

Dyamayanti L, Fatimah S, Lestari ID, and Kurniawan DD (2023). The effect of discovery learning model on students' learning outcomes on the protists concept. Jurnal Pendidikan Indonesia Gemilang, 3(1): 15-19. https://doi.org/10.53889/jpig.v3i1.152

Ernawati T and Sujatmika S (2021). Development of worksheet based on scientific approach to improve critical thinking skills. International Journal of STEM Education for Sustainability, 1(1): 1-10. https://doi.org/10.53889/ijses.v1i1.1

Fitriana DEN, Yanti DK, Yunus AK, and Aprilya RE (2022). Analysis of learning difficulties of class XII high school students on genetic material. International Journal of Biology Education Towards Sustainable Development, 2(2): 71-78. https://doi.org/10.53889/ijbetsd.v2i2.146

Haryadi R and Pujiastuti H (2022). Enhancing pre-service physics teachers' higher-order thinking skills through STEM-PJBL model. International Journal of STEM Education for Sustainability, 2(2): 156-171. https://doi.org/10.53889/ijses.v2i2.38

Hendriyani ME, Rifqiawati I, and Usman U (2023). Students' creativity profile using project report through the STEM integrated project based learning model. Jurnal Pendidikan Indonesia Gemilang, 3(1): 68-75. https://doi.org/10.53889/jpig.v3i1.182

Ikawati I, Lestari ID, Ratnasari D, and Sari IJ (2022). Development of portfolio assessment instruments based on scientific literacy on the archaebacteria and eubacteria concepts. International Journal of Biology Education towards Sustainable Development, 2(1): 34-43. https://doi.org/10.53889/ijbetsd.v2i1.130

Kartini L (2023). The use of the think-pair-share on senior high school students' mathematics learning achievement on integral concept. Jurnal Pendidikan Indonesia Gemilang, 3(1): 76-86. https://doi.org/10.53889/jpig.v3i1.188

Khastini RO, Rohmah WS, and Putriana T (2022). Development of monopoly digestive media based on educational games as student learning resources on food digestive system concept. International Journal of Biology Education towards

Sustainable Development, 2(2): 53-62. https://doi.org/10.53889/ijbetsd.v2i2.150

Khastini RO, Rohmah WS, and Sahida AN (2023). The effectiveness of the e-student worksheets to improve students' learning outcomes and critical thinking skills on digestive system concepts. International Journal of Biology Education towards Sustainable Development, 3(1): 52-61. https://doi.org/10.53889/ijbetsd.v3i1.160

Lawless HT, Heymann H, Lawless HT, and Heymann H (2010). Descriptive analysis. In: Lawless HT and Heymann H (Eds.), Sensory evaluation of food: Principles and practices: 227-257. Springer, New York, USA. https://doi.org/10.1007/978-1-4419-6488-5_10

Marianingsih P, Mahrawi M, Cahyani A, Octoviani R, Nurrohmah S, Nugraha LS, and Febrio EP (2023). Biology learning content analysis on aves diversity: A case study at Kaduberureum biodiversity park's PT Chandra Asri Petrochemical TBK, Indonesia. International Journal of Biology Education towards Sustainable Development, 3(1): 32-51. https://doi.org/10.53889/ijbetsd.v3i1.201

Mayer RE (2004). Should there be a three-strikes rule against pure discovery learning? American Psychologist, 59(1): 14-19. https://doi.org/10.1037/0003-066X.59.1.14 **PMid:14736316**

Pujiastuti H and Haryadi R (2023). Higher-order thinking skills profile of Islamic boarding school students on geometry through the STEM–based video approach. International Journal of STEM Education for Sustainability, 3(1): 156-174. https://doi.org/10.53889/ijses.v3i1.135

Rafik M, Kamilah AF, Fatmalariasari F, Rosdiana R, Komariah S, Sari IJ, and Promkaew S (2023). Relationship between biology education students' learning period and grade point average (GPA). International Journal of Biology Education towards Sustainable Development, 3(1): 24-31. https://doi.org/10.53889/ijbetsd.v3i1.199

Raharjo SB, Yuliana L, and Yudha YH (2018). Capaian standar nasional pendidikan sebagai prediktor mutu sekolah. Jurnal Pendidikan dan Kebudayaan, 3(2): 129-140. https://doi.org/10.24832/jpnk.v3i2.750

Ratnasari D, Rahmawati M, Khaerunnisa A, and Kamilah AF (2022). The effect of problem based learning (PBL) Model on students' critical thinking ability in class XI digestive system concept. International Journal of Biology Education towards Sustainable Development, 2(2): 79-86. https://doi.org/10.53889/ijbetsd.v2i2.156

Rifqiawati I, Saputri YA, Oktaviani H, Nurrohmah S, and Handayani TA (2021). The students' emotional maturity and learning motivation through distance learning during COVID-19 outbreak. International Journal of Biology Education towards Sustainable Development, 1(1): 27-37. https://doi.org/10.53889/ijbetsd.v1i1.50

Rusmiyati I, Fitri SGS, and Sari IJ (2021). The effect of biotechnology learning using pulau tunda's local potential on students' creative thinking skills. International Journal of Biology Education towards Sustainable Development, 1(1): 38-47. https://doi.org/10.53889/ijbetsd.v1i1.51

Santoso GB, Nuriyanis A, Rahayu ST, and Ruhiat Y (2019). Impact of high vocational education revitalization on the quality of information technology. Journal of Advanced Research in Dynamical and Control Systems, 11(5 Special Issue): 1815-1820.

Sari IJ, El Islami RAZ, and Safkolam R (2022). Implementation of bioinformatics learning in senior high school: A systematic review. International Journal of Biology Education towards Sustainable Development, 2(2): 87-98. https://doi.org/10.53889/ijbetsd.v2i2.164

Sastria E (2023). Indonesian pre-service and in-service science teachers' TPACK level. International Journal of Biology Education towards Sustainable Development, 3(1): 1-15. https://doi.org/10.53889/ijbetsd.v3i1.143

Stonier F and Adarkwah MA (2023). Impact of STEM professional development sessions on Chinese pre-service early childhood teachers. International Journal of STEM Education for Sustainability, 3(1): 68-93. https://doi.org/10.53889/ijses.v3i1.96

Subagja S, Rubini B, and Pursitasari ID (2022). Student needs analysis of the scientific literacy oriented interactive multimedia on living cells matter. International Journal of Biology Education towards Sustainable Development, 2(1): 1-11. https://doi.org/10.53889/ijbetsd.v2i1.116

Sukma O and Hasanah E (2021). Best practice kepemimpinan kepala sekolah dalam meningkatkan nilai akreditasi di SMPN 5 airgegas bangka belitung. Kelola: Jurnal Manajemen Pendidikan, 8(2): 147-158.

Suryana S (2018). Kepemimpinan pembelajaran dan capacity building dalam mutu kinerja mengajar guru sd. Jurnal Administrasi Pendidikan, 15(2): 198-213. https://doi.org/10.17509/jap.v25i2.15651

Syahfitri J and Herlina M (2022). Online learning using Google Classroom for biology education students during COVID-19 outbreak. International Journal of Biology Education towards Sustainable Development, 2(1): 23-33. https://doi.org/10.53889/ijbetsd.v2i1.118

Wahyuni I, Mukrimah M, Hanifah FN, Ariesca JD, and Windayani W (2022a). Question card game to improve senior high school students' higher-order thinking skills in biology learning. International Journal of Biology Education towards Sustainable Development, 2(2): 63-70. https://doi.org/10.53889/ijbetsd.v2i2.147

Wahyuni L, Amelia E, and Wahyuni I (2022b). The effect of guided inquiry learning model through the utilization of school environment towards students' scientific literacy on biodiversity concepts. International Journal of Biology Education towards Sustainable Development, 2(1): 44-52. https://doi.org/10.53889/ijbetsd.v2i1.131

Widyastuti L, Usman U, and Rifqiawati I (2022). The effect of the discovery learning model through the aptitude treatment interaction (ATI) on student learning outcomes on the human motion system concept. Jurnal Pendidikan Indonesia Gemilang, 2(2): 111-122. https://doi.org/10.53889/jpig.v2i2.139

Yuliani Y, Ardianto D, and Retnowati R (2022). Mapping research on multimedia biology: A bibliometric analysis. International Journal of Biology Education towards Sustainable Development, 2(1): 12-22. https://doi.org/10.53889/ijbetsd.v2i1.117

Yuliasari A, Hari DLH, and Marianingsih P (2023). Identification of students' misconceptions on the photosynthetic and plant respiration concepts using a two-tier diagnostic test. International Journal of Biology Education towards Sustainable Development, 3(1): 16-23. https://doi.org/10.53889/ijbetsd.v3i1.155