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# Primary school students' knowledge about animal life cycle material: The survey study

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**Abstract:** Students' knowledge is obtained from studying, and their involvement in science learning is still low, so it is a concern. Our research aims: First, to survey students' knowledge of animal life cycles, and second, to determine differences in students' knowledge of animal life cycles based on gender. This research uses a survey method. Sampling was carried out using convenience sampling. The sample obtained was 286 students willing to answer questions via Google Forms. They are primary school students in Indonesia. Data collection procedure: (1) compiling the instruments, (2) expert validation, (3) instrument testing, (4) validity and reliability analysis, (3) test distribution, (4) analysis of findings, (5) data interpretation, and (6) conclusion. A total of 9 valid and reliable questions were used to collect data. Analysis of differences in student knowledge using the Mann-Whitney test. The findings show that there are still 51.75% of students whose knowledge needs to be improved. Boys and girls students did not show differences in their knowledge regarding animal life cycles. This research concludes that students' knowledge of animal life cycle material has not reached the good category. Boys and girls students have the same level of knowledge but only get the moderate category. Future research can test how innovative learning in science for primary schools can impact student knowledge.

**Keywords:** Animal life cycle, knowledge, learning targets, science learning

**Abstrak:** Pengetahuan siswa diperoleh dari belajar, dan keterlibatannya dalam pembelajaran sains masih rendah sehingga perlu dikhawatirkan. Penelitian kami bertujuan: Pertama, untuk mensurvey pengetahuan siswa tentang siklus hidup hewan, dan kedua, untuk mengetahui perbedaan pengetahuan siswa tentang siklus hidup hewan berdasarkan gender. Penelitian ini menggunakan metode survey. Pengambilan sampel dilakukan dengan menggunakan convenience sampling. Sampel yang diperoleh sebanyak 286 siswa yang bersedia menjawab pertanyaan melalui Google Form. Mereka adalah siswa sekolah dasar di Indonesia. Prosedur pengumpulan data: (1) menyusun instrumen, (2) validasi ahli, (3) uji instrumen, (4) analisis validitas dan reliabilitas, (3) distribusi tes, (4) analisis temuan, (5) interpretasi data, dan (6) kesimpulan. Sebanyak 9 pertanyaan valid dan reliabel digunakan untuk mengumpulkan data. Analisis perbedaan pengetahuan siswa menggunakan uji-t. Temuan menunjukkan bahwa masih ada 51,75% siswa yang pengetahuannya perlu ditingkatkan. Siswa laki-laki dan perempuan tidak menunjukkan perbedaan pengetahuan mengenai daur hidup hewan. Penelitian ini menyimpulkan bahwa pengetahuan siswa pada materi daur hidup hewan belum mencapai kategori baik. Siswa laki-laki dan perempuan mempunyai tingkat pengetahuan yang sama namun hanya mendapat kategori sedang. Penelitian di masa depan dapat menguji bagaimana pembelajaran inovatif dalam sains untuk sekolah dasar dapat berdampak pada pengetahuan siswa.

**Kata kunci:** Daur hidup hewan, pengetahuan, target belajar, pembelajaran sains



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## INTRODUCTION

Societal change requires science education that is attuned to new realities, enabling individuals to access and utilize acquired knowledge for the production of new information (Hodson, 2003; Mateos-Núñez et al., 2020; Nunaki et al., 2019). Student involvement in

science learning is still low and is an international concern (Scholes & Stahl, 2022). High performance in science learning in primary schools requires access to skilled teachers, adequate class time, various materials, accommodating workspace and human resources, and prioritizing a student-centered approach (Alake-Tuenter et al., 2012). Appropriate science instruction is a determinant of increasing student knowledge (Carroll et al., 2019). Teachers contribute to increasing the academic achievement of science students (Bal-Taştan et al., 2018). Students study at school to gain experience and develop knowledge (Stevens & Elen, 2024).

Learning outcomes are students' success in completing learning targets as shown by correct response scores on indicators, which include knowledge, reasoning, and motor skills, as well as showing positive behavior (Acesta, 2014). Dita et al. (2023) said that learning outcomes are often used to measure students' level of mastery of the subjects they have been taught. The results of the teaching and learning process in class are expressed in grades or numbers based on the assessment of learning outcomes. Astiti et al. (2021) explained that there are 2 factors that influence student learning outcomes, namely external factors and internal factors. In accordance with Harefa (2020) opinion, there are two primary components that influence the learning outcomes achieved by students, namely internal factors and external factors originating from the student's environment. There are good learning outcomes because learning has developed students' knowledge optimally (Welerubun et al., 2022).

Student characteristics are related to the skills and knowledge they have (Himmetoglu et al., 2020), which have an impact on their knowledge (Mandasari et al., 2021). Apart from ability issues, other elements that influence students include learning motivation (Damopolii et al., 2018; Sirait et al., 2022), interest (Sidiq et al., 2020), attention, attitude, study habits, perseverance, physical condition and psychology (Bathgate & Schunn, 2017; Carroll et al., 2019). On the other hand, learning quality is the external or environmental aspect that has the greatest influence on learning outcomes (Thenu et al., 2023; Welerubun et al., 2022). Learning outcomes refer to the level of achievement achieved by someone after being involved and following the learning process. Good learning outcomes indicate good student knowledge (Harso et al., 2021). However, students' prior knowledge is a determining factor in their level of understanding (Kaefer, 2020).

Students' knowledge is obtained from their understanding of reading material and learning. In elementary schools, there is material related to science, namely the life cycle of animals (Amelia et al., 2024). Initial findings by Elsani et al. (2019) were that many students had difficulty with this material, so they did not reach the standard. Initial findings by Nastiti et al. (2022) even found that more than 60% of students did not understand the animal life cycle material. Primary school students really like animals because of their uniqueness and beauty (Gavrilakis et al., 2024). Animal knowledge needs to be taught to children aged 6-12 (Barrutia et al., 2024), where this age range includes primary school students. Teaching about animals such as birds must be integrated into learning because this action grows students' understanding of them (Nima et al., 2024). Assessment of students' knowledge in learning related to animal topics is important (Valenciano et al., 2011).

Gender impacts science learning (Velayutham et al., 2012). Oktaviani (2020) found that girls dominate science learning more than boys. However, Nunaki et al. (2019) explained that there should be no gap between boys and girls in science learning. In the science learning process in the classroom, you must pay attention to the characteristics of

boys and girls to improve students' scientific reasoning abilities (Hadi et al., 2021). Our research aims: First, to survey students' knowledge of animal life cycles, and second, to determine differences in students' knowledge of animal life cycles based on gender.

## METHOD

This research uses a survey method. Sampling was carried out using convenience sampling. The sample obtained was 286 students willing to answer questions via Google Forms. They are primary school students in Indonesia (general information and gender of students in Table 1). There were 10 questions prepared, but based on expert assessment, only 9 questions could be used.

Table 1. Age and gender profile of participants

| | Category | Number | % |
|---|---|---|---|
| Age | 0 | 3 | 1.05 |
| | 7 | 1 | 0.35 |
| | 8 | 34 | 11.89 |
| | 9 | 39 | 13.64 |
| | 10 | 56 | 19.58 |
| | 11 | 98 | 34.27 |
| | 12 | 53 | 18.53 |
| | 14 | 2 | 0.70 |
| Total | | 286 | 100 |
| Gender | Boys | 132 | 46.15 |
| | Girls | 154 | 53.85 |
| Total | | 286 | 100 |

The research procedures or stages in this study are as follows: (1) compiling measurement instruments, (2) expert validation, (3) instrument testing, (4) validity and reliability analysis, (3) test distribution, (4) analysis of findings, (5) data interpretation, and (6) conclusions.

1. Arrange the instrument. At this stage the researcher determines the material (animal life cycle material), learning objectives, selecting the form of the test (determined using multiple choice), forming a question grid, composing the questions (the number of questions is 10). Apart from that, at this stage a validation sheet is provided for experts to use for the validation process.
2. Instrument validation. At this stage, the questions that have been prepared are validated by science experts, primary education experts and practitioners. Validation is based on three aspects, namely (1) material, (2) construction, and (3) language. At this stage, questions are revised based on the validator's comments.
3. Test the instrument. The instrument was tested on 165 students via Google Forms. The students involved are primary school students.
4. Validity and reliability analysis; Validity data analysis using product moment correlation with SPSS 20 for Windows. Reliability analysis using KR21 with the help of Microsoft Excel.

5. Test deployment. The test is made in online form, namely in the form of a Google form. The test is distributed via WhatsApp.
6. Analyze the findings. Analysis of the finding data was carried out by calculating the percentage of student achievement, mean, standard deviation and analyzing gender differences using the Mann-Whitney test.
7. Data interpretation. At this stage, the data findings are interpreted based on the presentation in each research results table.
8. Conclusion. At this stage, conclusions are formulated regarding the percentage of student knowledge attainment and differences in student knowledge based on gender.

## RESULTS AND DISCUSSION

Research has surveyed students' knowledge of science material in primary schools. Identifying students' knowledge of learning is very important. The results of the knowledge obtained become the basis for teachers to develop learning. Teachers can find out the level of understanding and needs of students in learning in class. First, research has found that the questions that have been created have met the criteria for expert validity (Table 2), empirical validity and reliability (Table 3). The second finding was that students' knowledge of science material (animal life cycles) was spread across five categories (Table 4). The third finding is about differences in boys' and girls' knowledge of animal cycle material (Table 5).

Table 2. Expert validation results

| Validator | Aspect | | | Mean | Criteria |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | | |
| Science expert | 97.5 | 96.71 | 100 | 98.07 | Very valid |
| Primary education expert | 95.75 | 91.57 | 99 | 95.44 | Very valid |
| Practitioner | 100 | 98.71 | 99 | 99.23 | Very Valid |

Table 2 indicates that the questions that have been created have been declared valid by science experts, primary education experts and practitioners (teachers in primary schools). Based on the scores obtained, the questions that have been created can be continued for empirical testing. There was 1 question item that was removed, because it had two answers. The final questions for the trial were 9 items. The questions given are 9 multiple choice questions in accordance with the learning objectives and grids with cognitive domains C1, C2, and C4 which have been validated by experts including science experts, primary education experts, and practitioners. The results of expert validation are followed by empirical tests. Expert validation results indicate that the instrument can be used (Dita et al., 2023; Iftiah et al., 2023; Nasir et al., 2023; Rumbruren et al., 2022).

Table 3 shows that the ten that have been created meet the valid criteria based on trials with 165 elementary school students. Nine questions that have been tested meet the validity criteria with sig. < 0.05. Testing with the KR-21 shows that the questions meet the reliability criteria. Validity is a concept related to the extent to which the test has measured what it should measure (Sudaryono et al., 2019). The research data shows that the questions that have been measured empirically show valid criteria. Empirical validity or the validity of the criteria of an instrument or test is determined based on the measurement results of

the instrument in question, either through trials or through actual tests or measurements (Kerlinger, 2002).

Table 3. Validity and reliability results

| Item Number | Validity | | | Reliability | |
|---|---|---|---|---|---|
| | r | Sig. | Decision | KR 21 | Decision |
| 1. | 0.615 | 0.000 | Item valid | 0.71 | Reliable |
| 2. | 0.512 | 0.000 | Item valid | | |
| 3. | 0.725 | 0.000 | Item valid | | |
| 4. | 0.270 | 0.000 | Item valid | | |
| 5. | 0.650 | 0.000 | Item valid | | |
| 6. | 0.690 | 0.000 | Item valid | | |
| 7. | 0.208 | 0.000 | Item valid | | |
| 8. | 0.720 | 0.019 | Item valid | | |
| 9. | 0.451 | 0.000 | Item valid | | |

Table 4. Categories of students' knowledge of animal cycle material

| Category | Range | Number | % |
|---|---|---|---|
| Weak | 0–39 | 23 | 8.04 |
| Less | 40–59 | 69 | 24.13 |
| Moderate | 60–69 | 56 | 19.58 |
| Good | 70–85 | 62 | 21.68 |
| Excellent | 86–100 | 76 | 26.57 |
| Total | | 286 | 100 |

Table 4 reveals that around 48.25% of students reach the good-excellent category. In other conditions, as many as 51.75 students still did not reach the good standard category. More than 50% of students know what needs to be improved regarding animal life cycles. This indicates that students' knowledge of animal life cycle material still needs to be improved.

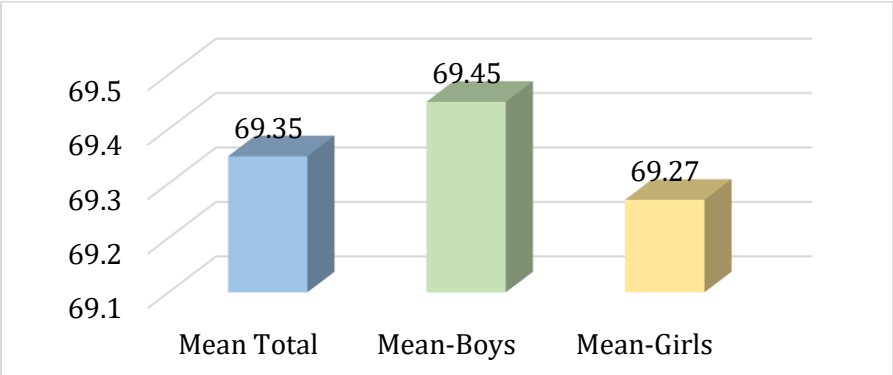


Fig. 1. Mean of student knowledge

Table 5. Results of testing differences in knowledge between boys and girls students

| Gender | Mean | SD | Normality | | Mann-Whitney | | |
|---|---|---|---|---|---|---|---|
| | | | df | Sig. | Mean Rank | Z | Sig. |
| Boys | 69.45 | 19.043 | 132 | 0.000 | 142.44 | -0.204 | 0.838 |
| Girls | 69.27 | 21.477 | 154 | 0.000 | 144.41 | | |

The data in Table 5 indicates that primary school boys and girls do not show differences in knowledge regarding animal life cycles. These findings also indicate that the mean knowledge of boys and girls has not yet reached the good category (Figure 1). The total mean also indicates the same thing.

The results of our study show that students' science knowledge, especially animal life cycle material, has not yet reached optimal levels. Knowledge relates to the amount of what students know (Hattan, 2020). Obtaining a score that is not yet good indicates that what students know is still lacking. Scientific knowledge integrated into science learning supports the creation of meaningful learning (Dwisetiarezi & Fitria, 2021). Students' knowledge of the animal cycle weakens due to their confusion regarding learning (Nurdiana, 2018). Our research indicated that 24.13% of students lacked knowledge, and even 8.04% of them were weak. Students' knowledge is weak because they do not understand the material.

Students' lack of understanding of the content of learning material is related to class settings. Teacher creativity in creating a learning environment supports student involvement (Anderman et al., 2011), thereby improving their knowledge (Yurida et al., 2021). Learning that conditions the sharing of knowledge and ideas fosters diverse and detailed understanding among students, increasing their comprehension and encouraging more comprehensive understanding from various perspectives (Choirunnisa' et al., 2023). Through the use of technological media (Damopolii & Kurniadi, 2019; Erviana et al., 2024), the use of innovative learning strategies (Nasir et al., 2020; Nwankwo et al., 2024; Ramadhani et al., 2024), research This explains that students' knowledge becomes better when they are involved in these conditions.

Students' knowledge in this research has not achieved good results. The mean student knowledge reached 69.35. This achievement is included in the moderate category. Students' knowledge needs to be developed further in the future. These findings are the basis for researchers or teachers in the classroom to design learning that can strengthen students' knowledge of animal cycle material. Boys and girls students in this research also did not show any differences. Previous research explains that female students experience more misconceptions than boys (Saputra et al., 2019). Karmila et al. (2022) found that primary school girls had better knowledge than boys. Our research findings are different from the two previous studies. The absence of differences between the two genders is supported by Nunaki et al. (2019), who explain that student achievement in science should be the same when they are involved in the same learning. Bal-Taştan et al. (2018) also found that gender did not influence student competition achievement. Our research provides information that boys and girls primary school students have the same level of knowledge, but this knowledge needs to be developed in the future.

## CONCLUSION

This research concludes that students' knowledge of animal life cycle material has not reached the good category. There are still 51.75% of students whose knowledge needs to be improved. Primary school students' knowledge of science needs to be improved. There is no difference between boys and girls regarding their knowledge of animal life cycles. Good knowledge indicates the success of learning carried out by the teacher. This research is still limited to survey data. Future research can test how innovative learning in science for primary schools can impact student knowledge.

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