



Effect of Cognitive Aspect Improvement in Internship Participants on the Performance Index of Broiler Chickens in a Closed-House System

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Abstract | This study was aimed at analyzing the influence of cognitive aspects improvement among apprentices toward the performance index of broiler in closed houses at the Andalas University in Padang, Indonesia. This research used participatory action research (PAR) with a quantitative approach. The data consisted of both primary and secondary data. Primary data were obtained on improving the cognitive aspects of internship participants from pre-test and post-test results. At the same time, PT. Karya Semangat Mandiri (closed house partnership stakeholder) provided secondary data regarding the performance index. Data on improving the cognitive aspects of apprentices and the broiler performance index were analyzed quantitatively. IBM SPSS Statistics 26 was used to conduct regression analysis on the influence of improving apprentices' cognitive aspects on the performance index of broiler chickens. The results showed that internship participants improved their cognitive competencies by 58.4 %. The average performance of broiler chickens at the closed house was 412 (excellent), where the target of good performance is only 400. Then the internship participants' cognitive abilities significantly improved the chickens' performance index at the confidence level of 1%.

Keywords | Broiler, Closed house, Cognitive aspect, Internship, Performance index

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INTRODUCTION

The rapid development of the livestock industry requires the products produced to be competitive from a global perspective (Ilham *et al.*, 2021; Nassyrova *et al.*, 2020; Nurfadillah *et al.*, 2018). Competitive advantage must be based on improvement of human resources quality (Zhang, 2022). In the last decade, human resources have played an

essential role due to the enormous impact on the success of a project (Romo *et al.*, 2023). Therefore companies or the job market require better talent throughout history, considering that humans have been the key determinant to the fate of a company (Wang *et al.*, 2022).

Internships is a way of improving the quality of human resources. Internships were very practical and have a posi-

tional effect on improving the quality and skills of work and attitudes toward future careers (Bawica, 2021). Internships increase opportunities to get a job and adjust to the job market. Graduates could implement the knowledge gained from universities, thus increasing their reputation and visibility (Nicolas *et al.*, 2022; Nunley *et al.*, 2016). Applicants with internship experience have a 12.6% higher chance of being invited to a job interview (Baert *et al.*, 2021).

Another effort to increase the competitiveness of livestock products, especially broiler chickens, was to use cages with a closed-house system (Ilham *et al.*, 2021; Utomo *et al.*, 2019). Closed-house cages are a new form of animal husbandry innovation that prioritizes the use of technology (Stormshak, 2004). A closed house had the principle of providing cage conditions with good air and minimizing contact with humans to provide livestock comfort and increase productivity (Suasta *et al.*, 2019). A closed house was a cage system that must remove excess heat, excess water vapor, and harmful gases such as CO, CO₂, and NH₃ in the cage. On the other hand, closed houses provide various oxygen needs for chickens (Huda *et al.*, 2021; Yani *et al.*, 2014). Thus, raising broiler chickens with a closed-house system could increase the performance index and business competitiveness compared with the open-house system widely used in Indonesia (Farida *et al.*, 2022; Setiadi *et al.*, 2021; Suasta *et al.*, 2019).

However, only a few students or college graduates have completed internships in closed houses. Various underlying causes, such as the strict biosecurity requirements of closed houses and the curricula of higher education institutions in animal husbandry, have not been adequately addressed (Nicolas *et al.*, 2022; Soliman and Abdallah, 2020). This condition makes livestock industry players need help finding prospective skilled workers ready to use (Baert and Verhaest, 2019; Ragkos *et al.*, 2018; Sinclair and Phillips, 2019).

On such perspective, conducting a study on implementing internships in broiler-closed houses was interesting. At the closed-house broiler chickens of Andalas University, internships have been carried out since June 2020; while everyone was at home due to the COVID-19 pandemic (Oyegu *et al.*, 2020). Student groups with their awareness and assignments from campus conducted internships in closed houses in collaborating with PT Karya Semangat Mandiri. Lectures and staff of PT. Karya Semangat Mandiri guided this internship (Urian *et al.*, 2010). The activity continues with other groups; until January 2023; there have been internships for 269 students. These students did not only come from internal Andalas University but also from various campuses in Indonesia, such as Udayana University, IPB University, Sultan Syarif Kasim State Islamic University, Padang State University, private Tuanku Tambusai University and Payakumbuh State Agricultural Polytechnic.

While efforts to achieve broiler production performance we also need to review the implementation of internships in broiler-closed houses (Kleinsorgen *et al.*, 2020). Assessing the internship activities that have been carried out could help identifying related issues for future improvement (Mott *et al.*, 2021; Nicolas *et al.*, 2022). Implementation of this internship were carrying out in conjunction with the broiler chicken production process. Thus, exploring whether there was an effect on broiler chicken production performance due to internship cognitive domain improvement was more interesting. Based on this background, a study was conducted “on Improving Apprentices’ Cognitive Aspects and Its Influence on Broiler Chickens’ Performance Index in Closed Houses”.

MATERIAL AND METHODS

This research was conducted at the closed house of broiler at Animal Science Faculty of the Andalas University from December 2021 to December 2022. We chose this location because it has conducted internship activities, and the necessary data was available (Cañibano *et al.*, 2019). This research used participatory action research (PAR), described as a reflection of the actions carried out among both broiler production and student internship experience (Martin *et al.*, 2019; Yang, 2020). The participants began their activities by planning their internship program, which involved broiler production activities. This process started with the preparation of the housing, the readiness for DOC placement, and the management of broilers during the brooding/starter, grower, and finisher phases. Subsequently, they planned for harvesting and evaluated the activities at the end of the rearing period. The researchers who also a part of internship facilitators presented this research quantitatively (Erro-Garcés and Alfaro-Tanco, 2020).

The study’s respondents were taken by census method (Li and Zhang, 2022), namely all apprentices at the closed house of broiler chickens of Andalas University during the study. There were 113 students of internship participants in seven broiler production periods. Primary data on improving internship’ cognitive aspects obtained from comparing between pre-test and post-test results. Material of both pre-test and post-test consisted of four topics: (a) introduction of closed house, (b) sub-system in closed house, (c) closed house technical management, and (d) closed house administration management. This test’s results filled the form of numbers on a scale of 1-100. At the same time, we obtained secondary data regarding the broiler’s performance index from staff of PT. Karya Semangat Mandiri. The performance index, commonly accepted in the poultry industry, is one of the measuring tools for broiler chicken production performance (Bird, 1955; Sanmorino *et al.*, 2017).

Collected data on improving the cognitive aspects of apprentices and the performance index of broiler chickens in closed houses were analyzed quantitatively (Li and Zhang, 2022). IBM SPSS Statistics 26 was used to conduct a regression analysis between an increased cognitive understanding of apprentices and the broiler performance index in closed houses (Cooksey and McDonald, 2019).

RESULTS AND DISCUSSION

INTERNSHIP AT CLOSED-HOUSE BROILER CHICKEN

The Faculty of Animal Science manages the closed house of broiler chickens at Andalas University, situated at the Edu Farm Limau Manis Campus in Padang City, Indonesia. This closed house was a grant from PT. Charoen Pokhpan and Indonesia Tbk – using corporate social responsibility (CSR) scheme. It has a capacity of 20,000-24,000 broiler chickens. The Faculty of Animal Science formed a unique team of lecturers and internal staff in its management. This enclosed facility engages in a collaborative effort with staff of PT. Karya Semangat Mandiri – member of Charoen Pokhpan groups – for operational purposes. Collaboration between them was set up as part of a partnership agreement on livestock farming endeavors (Republik Indonesia, 2017).

While on the one hand, it aims to generating additional income for Andalas University, the closed houses also have educational functions to improve students and graduates competencies. Educational activities included practicum, field lectures, research, comparative studies, and internships. A joint team of lecturers from the Faculty of Animal Science of Andalas University (the authors), and company staff from PT. Karya Semangat Mandiri was set up to guide the internship activity. This team collaborated to manage internship activities, from compiling guidelines and preparing participants to assist in implementing the internship process and stages to facilitating the achievement of goals (Kensinger and Muller, 2006; Sinclair and Phillips, 2019; Urian *et al.*, 2010).

They interned in a closed house of broiler chickens for at least one production period. Based on local experience, one internship period was about 50 days. This duration could be longer or shorter, depending on the period of chickens in and harvest in the closed house. This duration includes approximately 10 days for house preparation and sanitation, around 35 days from DOC placement to the harvest period, and 5 days for evaluation and planning for the next cycle. Internships were done daily, normally from 08 am to 05 pm or depend on broilers needs.

The design of this internship aimed to enhance the knowledge (cognitive) and skills of participants concerning four aspects. (a) the technical techniques of broiler farming,

(b) seven closed-house systems and business analysis, (c) their management and (d) institutional arrangements and administration support system. Internships also covered teachings on broiler-chicken partnerships and current issues pertinent to the poultry industry. During the internship's daily activities, participants applied and discussed practices of teamwork, discipline, responsibility, critical thinking, and effective communication. That way, therefore students who have graduated from this internship were expected to handle the standard of operating procedure of poultry industrial. Then, the students participants are accustomed to working in teams and strongly motivated to succeed. Within the research period 2021 to 2022, there were seven internship groups at the closed house of Andalas University, as shown in Table 1.

Table 1: Internship periods at the Andalas University's broiler closed house (December 2021 to December 2022).

Apprentices (group)	Number of participants (people)	Time	Home Institution
1	14	December-January	Andalas University
2	15	February-March	Andalas University
3	14	March-April	Andalas University
4	14	April-June	Andalas University
5	21	July-August	Andalas University
6	18	September-October	Padang State University and Udayana University
7	17	November-December	IPB University and Andalas University
Total	113		

Source: Research Results, 2022.

As depicted in Table 1, we categorized 113 internship participants into seven groups during the study period. Each group consists of 14 to 21 participants. All participants were students from both the internal and external University. Faculty of Animal Husbandry, Andalas University, and several other campuses, such as Padang State University, Udayana University, and IPB University.

IMPROVEMENT OF COGNITIVE ASPECTS OF INTERNSHIP PARTICIPANTS

This study measured the cognitive aspects of internship participant's knowledge and thinking skills (Adams, 2015). We tested four things: introducing closed houses, sub-systems within closed houses, technical management, and administration management of closed houses. The test results were shown in Table 2.

The first topic, the introduction to the closed house, discusses general knowledge about closed houses, consisting of

room temperature that could be regulated and controlled. The critical role of electricity and electrical systems is to increase productivity, and this requires more significant investment costs. The internship participant got a score of 65.5 on the pre-test. This figure was quite good because the material on this topic was ubiquitous for animal husbandry students. After the internship, that number increased to 82.5. A considerable increase of 26% occurred because, in the internship process, there was confirmation and an addition to existing knowledge through learning by doing (Weiss *et al.*, 2014).

Table 2: Participants pre-test and post-test result values of internship.

Topics	Achievement of the cognitive aspects			
	Pre-test Scores	Post-test Scores	Increased Value	Percentage of Improvement
Introduction about closed-house	65.5	82.5	15.5	26.0
Sub-system in a closed house	36.8	78.2	41.3	112.2
Closed-house technical management	52.8	78.6	25.9	49.1
Closed-house administration management	47.6	81.9	35.8	71.9
Average	50.7	80.3	29.6	58.4

Source: Research Results, 2022.

In the second topic, sub-systems in closed houses, the discussion was understanding the existence of closed houses and their operationalization. This topic seems to be the least mastered by apprentices during the pre-test. Thus, the score could have been higher, at 36.8. Internship participants generally need to comprehensively understand the sub-systems in closed houses, such as ventilation, evaporation, feeding, lighting and electrical systems, brooding, curtains, and watering system (Utomo *et al.*, 2019; Wilcox *et al.*, 2023). After carrying out the internship, participants gained a significant increase in knowledge about the topics of sub-systems in the closed house. The post-test score showed an increase of 78.2% or 112.2% from the original condition. The significant increase in value occurred because we assigned particular tasks to internship participants in groups related to the sub-system within the closed house (Leary and Sherlock, 2020). This approach, there was an intensive learning process, interaction, and discussion between others. At the end of the internship period, the report was presented in front of team members and internship supervisors (Karji *et al.*, 2020).

The third topic is closed-house technical management, which discusses the technical maintenance of broiler chickens in closed houses, managing biosecurity, and creating

comfortable cage and chicken conditions. The value obtained by participants was 52.8 in the pre-test. This number was also relatively low; internship participants tend to only know in theory. After doing the internship, participants gained a relatively high increase in knowledge. At the time of the post-test, the value obtained was 78.6, an increase of 49.1%. The active involvement of all apprentices in various processes within the closed house, including observing chickens, feeding, maintaining biosecurity, and operating temperature control tools and machinery, contributed significantly to this increase (Cseke, 2023; Kolb and Kolb, 2005). If there was a problem, internship participants discussed it with each other and also with the supervisor and took corrective steps together with the kennel officer.

The fourth topic, closed-house administration management, concerns recording and partnership concepts and practices. The intern scored 47.6 on the pre-test, again a low score. When doing an internship, the participants must be disciplined in recording at least some data, namely depletion, weight growth, feed consumed, water consumed, temperature, and yield when harvesting (Stygar *et al.*, 2022). We recorded daily data on Google Sheets so that all participants and internship supervisors could equally observe it (Egeru *et al.*, 2023). This data was the subject of analysis and discussion related to the conditions in the closed house. In the industrial world, everything revolves around data (Valdez *et al.*, 2019). The participants overflow with data and learn to interpret the data to formulate practical solutions to problems (Chen *et al.*, 2013).

The weakest aspect of this topic was the participants' understanding of partnerships in the livestock business. Most of the internship participants required assistance in comprehending this concept. Additionally, the findings indicated that lectures lacked of extensive coverage of partnership-related material, especially concerning broiler chickens. The internship aimed to bridge this gap by including thorough discussions and partnership-focused assignments, fostering intense dialogues among participants and supervisors. One of the leading cases discussed was about the closed house of broiler chickens of Andalas University itself, which acts as plasm and PT. Karya Semangat Mandiri as core or nucleus (Amam, 2022; Ridwan and Kasim, 2020). Through the process, internship participants improved their ability to answer questions related to recording and partnerships during the post-test. This improvement was proved as evident from the increase in value to 81.9, reflecting a 71.9% increase from the original condition.

The average pre-test score of internship participants on the intricacies of broiler management using the closed-house system was 50.7. This score is considered low, as most participants had not received comprehensive material on closed-house management in their respective lecture class-

es. Today, closed houses have played a vital role in the competition of the global livestock industry (Ilham *et al.*, 2021; Setiadi *et al.*, 2021). The college curriculum should follow and accommodate the needs of the industry (Nazihah *et al.*, 2024; Urian *et al.*, 2010). This condition requires the parties to make a joint formulation (universities and industry) so that a match benefit for all (Ranabahu *et al.*, 2020).

After completing the internship, participants demonstrated an increase in cognitive aspects, as evidenced by achieving a post-test score of 80.3, reflecting a 58.4% increase from the previous condition. This value is calculated using the following formula:

$$Value = \frac{Post\ test\ score - Pre\ test\ score}{Pre\ test\ score} \times 100$$

This increase confirmed that internships were highly practical and positively impact in working knowledge, quality, and skills (Bawica, 2021; Nicolas *et al.*, 2022; Yusuf *et al.*, 2019).

PERFORMANCE INDEX OF BROILER IN CLOSED-HOUSE

Performance Index (PI) is a value that describes the production performance of broiler in one maintenance period (Bird, 1955). The Performance Index (PI) reflects the efficiency of feed utilization, the attainment of high harvest weights, the reduction of mortality rates, and the acceleration of harvesting age (Sanmorino *et al.*, 2017). The Performance Index (PI) can be calculated using the following formula:

$$PI = \frac{\%Survival\ Rate \times Average\ Body\ Weight\ (ABW)}{Feed\ Conversion\ Ratio\ (FCR) \times Harvest\ Age} \times 100$$

PT. Charoen Pokhpand Indonesia, PI valued categorization for closed house broiler chicken performance, as follows: < 300 (not good), 300-360 (good enough), 360-400 (good), and > 400 (very good). Plasm farmers who successfully achieve IP >360 will get a performance bonus from the company. During the study period, there were seven periods of broiler chicken production. In that period, or the entire period for 2022, the PI obtained ranged from 390-423, as shown in Table 3.

Table 3 shows that the average PI score of the Andalas University closed house in 2022 was 412, categorizing it as an outstanding. This PI means that the Andalas University closed house has very good production performance, with effective and efficient business management (Bird, 1955; Febrianto *et al.*, 2023; Sanmorino *et al.*, 2017). PT. Charoen Pokhpand Indonesia classifies the Performance Index (PI) for broiler chickens in closed-house systems into four categories: less than 300 (poor), 300-360 (fair), 360-400

(good), and greater than 400 (excellent). Contract farmers who attain a PI above 360 are eligible for a performance bonus from the company.

Table 3: Performance index (PI) of broiler chickens at Andalas University closed house (December 2021 to December 2022).

Production Period	Performance Index	Information
December-January	405	Very Good
February-March	418	Very Good
March-April	423	Very Good
April-June	411	Very Good
July-August	420	Very Good
September-October	415	Very Good
November-December	390	Good
Average	412	Very Good

Source: Research Results, 2022.

VALIDITY AND RELIABILITY TESTING

VALIDITY TESTING: Validity testing is conducted to determine the extent to which the research instrument is valid. A study is considered valid if it effectively measures the intended constructs and accurately captures data from the examined variables.

In the correlations output, results marked with a star indicate validity. A single star (*) signifies that the instrument is valid based on a one-time test at a 95% significance level (0.05), while a double star (**) denotes validity in two tests at a 99% significance level (0.01).

The validity criterion is determined by comparing the calculated correlation coefficient (rh) with the critical value from the Product Moment table (rt). Given a sample size (n = 113), the degrees of freedom (df = n - 2) is 111. According to the critical values table for the Product Moment correlation, the r table value for df = 111 at a 5% significance level (two-tailed test) is 0.185. A summary of the validity test results for these variables is presented in Table 4.

RELIABILITY TESTING: Reliability testing was conducted using Cronbach's Alpha, indicating that the variables employed to measure the research constructs exhibit an acceptable level of reliability.

A total of 12 valid variables (X1.1, X2.1, X2.2, X2.3, X3.1, X3.2, X3.3, X3.4, X4.1, X4.2, X4.3, and X4.4) were included in the reliability test. Table 5 presents the results of the reliability analysis. The Cronbach's Alpha coefficient in this study is 0.691, which meets the reliability threshold. According to Ghozali (2016), a research instrument is considered reliable if the Cronbach's Alpha value exceeds 0.60.

Table 4: Summary of validity test results.

Variable	r count	r table	signifikansi	Description
X 1.1	0.495	0.185	0.000	valid
X 2.1	0.360	0.185	0.000	valid
X 2.2	0.569	0.185	0.000	valid
X 2.3	0.360	0.185	0.000	valid
X 3.1	0.567	0.185	0.000	valid
X 3.2	0.675	0.185	0.000	valid
X 3.3	0.654	0.185	0.000	valid
X 3.4	0.545	0.185	0.000	valid
X 4.1	0.240	0.185	0.010	valid
X 4.2	0.242	0.185	0.010	valid
X 4.3	0.233	0.185	0.013	valid
X 4.4	0.238	0.185	0.011	valid

Source: Data analysis, 2024.

Table 5: Reliability Statistics.

Cronbach's Alpha	N of Items
.691	13

Table 6: Effect of improving the cognitive aspects of internship participants on the performance index of broiler in closed houses

Correlations			
		ICA	PIB
ICA	Pearson Correlation	1	.276**
	Sig. (2-tailed)		.003
	N	113	113
PIB	Pearson Correlation	.276**	1
	Sig. (2-tailed)	.003	
	N	113	113

** : Correlation is significant at the 0.01 level (2-tailed); ICA: Improving the cognitive aspects; PIB: Performance index of broiler chickens.

THE EFFECT OF IMPROVING THE COGNITIVE ASPECTS OF INTERNSHIP PARTICIPANTS ON THE PERFORMANCE INDEX OF BROILER CHICKENS IN CLOSED HOUSES

The results of SPSS analysis on the effect of improving internship participants' cognitive domain or aspects on broiler chickens' performance index in a closed cage are shown in Table 6.

Table 6 describes the results of linear regression on the effect of improving the cognitive aspects of apprentices on the performance index of broiler chickens in closed houses. The results of linear regression stated that the improvement in the cognitive aspects of apprentices significantly affected the performance index of broiler chickens at a confidence level of 1%. From the results of this statistical test, implementing internships in closed houses in conjunction with

the production process positively affects the performance index. Concerns about the potential disruption of biosecurity in closed houses due to concurrent internships must be proven (Cseke, 2023; Soliman and Abdallah, 2020). These findings confirm and reinforce the view that industry internships could potentially increase the sector's productivity (Skujiņa and Loots, 2020; Tshikororo et al., 2024; Urian et al., 2010).

CONCLUSIONS AND RECOMMENDATIONS

Based on the research findings and analysis we can draw the following conclusions:

- The internship participants' cognitive aspects improved after completing internships in closed houses by 58.4 % comparing pre-test and post-test results.
- The average performance index of broiler chickens in Andalas University's closed house was 412, categorized as excellent, where performance index of 400 was main target.
- The improvement in the internship participants; cognitive aspects significantly impacted the performance index of broiler chickens in closed houses at a 1% confidence level.

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NOVELTY STATEMENTS

This research presents a pioneering quantitative assessment of how the enhancement of cognitive abilities in internship participants influences broiler chicken performance within a closed-house system. Unlike earlier studies that predominantly emphasized the technical and managerial facets of poultry farming, this work integrates educational achievements—specifically cognitive development during internships—with measurable industrial performance outcomes, such as the broiler performance index. Utilizing a participatory action research framework alongside performance analysis, the study introduces an innovative perspective on the role of internships in boosting livestock productivity within technologically advanced and biosecure farming environments.

AUTHOR'S CONTRIBUTIONS

This article was a result of collaboration among the authors, with contributions as follows: conceptualization, Fuad Madarisa, Riza Andesca Putra, and James Hellyward. Methodology, Riza Andesca Putra and Amrizal Anas. Software, Sepri Reski; validation, Sepri Reski and Husmaini. Formal analysis, Fuad Madarisa. Investigation, Sepri Reski and Riza Andesca Putra. Resources, James Hellyward and Amrizal Anas. Data curation, Riza Andesca Putra and Sepri Reski. Initial draft preparation, Fuad Madarisa and writing—initial draft preparation, Fuad Madarisa, and Riza Andesca Putra. Writing—review and editing, Husmaini and James Hellyward. Visualization, Sepri Reski. Supervision, Amrizal Anas. Project administration, Riza Andesca Putra. Funding acquisition, James Hellyward. All authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST

This research was purely for advancing scientific knowledge. There were no conflicts of interest among the authors or any involved stakeholders

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