



## Analysis of Students' Academic Learning Time in Physical Education (ALT-PE) Based on PJOK Teachers' Competence in Pasuruan Regency

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### Abstract:

Academic Learning Time in Physical Education (ALT-PE) indicates teaching effectiveness, yet its attainment heavily depends on teacher competence. This study analyzed ALT-PE levels among elementary school students in Pasuruan Regency and examined differences across three teacher competence categories: certified, non-certified, and out-of-field (non-linear). Using a comparative quantitative design, data were collected via video observation using the ALT-PE Coding Manual across 15 teachers and 75 students from 15 public elementary schools, then analyzed using One-Way ANOVA and Games-Howell tests. The overall mean ALT-PE was 39.69%, failing to reach the recommended 50% benchmark. Only certified teachers met the standard (66.32%), significantly outperforming non-certified (33.68%) and non-linear teachers (19.08%). ANOVA revealed significant differences across groups ( $F = 312.47$ ;  $p < .001$ ;  $\eta^2 = .956$ ). These findings provide empirical evidence that teacher certification and educational alignment are critical determinants of PE instructional quality. This study contributes to educational policy by highlighting the urgent need for targeted teacher placement, accelerated certification, and contextualized professional training in primary physical education.

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### Introduction (مقدمة)

Physical Education plays a crucial role in students' physical, cognitive, and social development; however, its success depends heavily on the teacher's ability to manage instruction (Butar-Butar et al., 2022; Muhammad et al., 2022). The rise of sedentary lifestyles has led to a decline in children's physical activity, making Physical Education (PE) a primary means of fostering active living habits from an early age. Global data indicate that the majority

of adolescents do not meet the recommended 60 minutes of daily physical activity. In Indonesia, the prevalence of obesity among school-aged children continues to rise, and few students remain physically active outside of class hours. This situation makes the quality of PE instruction—specifically the extent to which time is optimally utilized for effective movement—a pressing issue requiring empirical study.

ALT-PE measures the effectiveness of learning time in physical education. This concept was developed by Siedentop, utilizing a coding manual as a standard research reference. ALT-PE refers to the proportion of lesson time during which students are actively engaged in motor activities suited to their abilities and performed with a high rate of success, rather than simply the time spent on the field or court (Siedentop et al., 1982; Siedentop, 1983). Other research emphasizes the quality of student engagement rather than its duration, positioning it as an indicator of teacher effectiveness that supports obesity prevention and student health (McKenzie & Lounsbery, 2013; Van Der Mars, 2006). Lesson time is refined from the total allocation into productive time, ensuring that only skilled teachers can minimize time lost to management, transitions, and ineffective instruction (Siedentop & Tannehill, 2000).

A teacher's capacity to maximize ALT-PE is inextricably linked to their professional competence. The Pedagogical Content Knowledge (PCK) framework defines teaching competence as an integration of subject matter mastery, pedagogical skills, and an understanding of student characteristics (Shulman, 1986). It was subsequently expanded by incorporating personality and social dimensions as integral components of teacher competence (Grossman, 1990). In the context of Physical Education (PJOK), this competence is reflected in the teacher's ability to design, implement, and evaluate movement-based instruction that is safe, inclusive, and student-oriented (Siedentop & Tannehill, 2000; Suherman, 2018). The relationship between teacher competence and student learning motivation can also be explained through Self-Determination Theory, which posits that teacher support for students' sense of competence, autonomy, and social relatedness enhances intrinsic motivation, thereby leading students to persist in engaging with movement-based learning activities (Deci & Ryan, 1985).

The Indonesian government has implemented a teacher certification policy since 2007—pursuant to Law Number 14 of 2005 concerning Teachers and Lecturers—as an effort to enhance the professionalism of educators, including Physical Education, Sports, and Health (PJOK) teachers (Kementerian Pendidikan dan Kebudayaan, 2022). Certification policies in Indonesia indicate that the program consistently improves teacher welfare through professional allowances; however, its impact on classroom teaching quality remains varied and not yet fully uniform (De Ree et al., 2018). At the educational unit level, it was found that many Physical Education, Sports, and Health (PJOK) teachers remain uncertified or teach outside their areas of expertise (lacking subject-area alignment); consequently, a systematic competency mapping is required to serve as a basis for formulating quality improvement policies (Jatmika et al., 2017). This issue is compounded by the challenges of implementing the "Kurikulum Merdeka" (Independent Curriculum), which requires physical education teachers to develop teaching materials, conduct practical activities, and carry out assessments

with greater flexibility, yet the available support and training remain inadequate (Dinata, 2023).

Several studies in Indonesia highlight the poor quality of Physical Education (PJOK) instruction resulting from disparities in teacher competence. Practical teaching approaches tend to remain conventional and have yet to comprehensively integrate health-related aspects (Satrio & Irsyada, 2023; Winarni & Lismadiana, 2020). Meanwhile, the understanding of basic movement skills among teachers and students remains partial (Zulfikar et al., 2023). A decline in physical fitness and PE learning outcomes was observed post-pandemic (Destriana et al., 2022), highlighting the limited frequency of Physical Education (PJOK) lessons, which generally occur only once a week (Setiawan et al., 2020), and the proportion of time students spent actively moving during the lesson ranged from only 35–45% of the total available time (Sugihartono et al., 2020). These findings are consistent with the ideal scenario where ALT-PE reaches at least 50%; however, in reality, the figures fall far short of this mark, particularly in schools with uncertified teachers or teachers lacking a relevant educational background.

International empirical evidence from the past five years reinforces the urgency of this study, although significant gaps remain. Data indicate that a structured motor approach can boost ALT-PE by up to 60% in children with autism (Kretschmann et al., 2022), while other data report improvements in ALT-PE through motor interventions for students with mild intellectual disabilities (Block et al., 2022); neither study compares teacher certification levels nor targets a general education student population. Lawson and Jones (2025) applied a lesson study approach to qualitatively improve the teaching quality of Physical Education teachers, without directly measuring its impact on ALT-PE. Furthermore, Chen et al. (2024) addressed the initial competencies of pre-service teacher candidates, but their study did not extend to teachers currently active in the classroom who hold different certification statuses. Other research has found that technology integration can increase student engagement by up to 45%, but has not yet linked this to teacher certification or the context of developing countries like Indonesia (Tsangaridou et al., 2024). On the other hand, the teaching quality of novice teachers improves from approximately 35% to 55% over five years of experience (Güllü & Çelebi, 2025).

At the national level, a descriptive study reports that the pedagogical competence of Physical Education, Sports, and Health (PJOK) teachers remains low (52.3%) (Sudarso et al., 2019), and innovative training can enhance teacher competence and student engagement in Aceh Besar (Razali et al., 2023). Other data highlight the need to develop physical literacy through teacher assessment (Irmansyah et al., 2021), and the positive relationship between teacher competence and the physical literacy, physical activity, and motivation of elementary school physical education students (Adi et al., 2025). However, most of these studies have been descriptive, conceptual, or focused on regional interventions; virtually none have quantitatively compared ALT-PE across teacher competence categories—including the category of "non-linear" teachers, which is quite common in Indonesia. This gap underscores the need for comparative research based on direct observation and inferential statistical analysis in a specific region like Pasuruan Regency, East Java, where geographical diversity –

ranging from lowlands to mountainous areas—influences the distribution of qualified Physical Education (PJOK) teachers.

Based on the foregoing, this study was formulated to address two primary questions: (1) whether the Academic Learning Time in Physical Education (ALT-PE) for elementary school students in Pasuruan Regency meets the "good" standard ( $\geq 50\%$  of total lesson time); and (2) whether there are significant differences in ALT-PE based on Physical Education teacher competence (certified, non-certified, and non-aligned). Aligned with the ALT-PE theoretical framework, this study proposes a descriptive hypothesis that the average ALT-PE in Pasuruan Regency does not yet meet the "good" standard, as well as an inferential hypothesis positing significant differences in ALT-PE, with certified teachers demonstrating higher levels than non-certified teachers, and non-certified teachers demonstrating higher levels than non-aligned teachers. This study is expected to enrich the literature on the role of teacher competence in the effectiveness of Physical Education instruction while providing an empirical basis for formulating more targeted policies regarding teacher certification, training, and placement (Shulman, 1986; Siedentop, 1983).

### Method (منهج)

The study was conducted at 15 public elementary schools distributed across 10 districts in Pasuruan Regency, East Java. Data collection took place from March to April 2026, preceded by a preparation phase in January–February and followed by analysis in May–June 2026. The study population consisted of all elementary school Physical Education (PJOK) teachers in Pasuruan Regency—approximately 657 individuals—based on \*Dapodik\* (Education Data) records for the 2025/2026 academic year. A purposive sampling method was employed based on the following criteria: teachers actively teaching PJOK at the elementary level (or equivalent), possessing verifiable competence (via educator certification or Dapodik data), and consenting to be observed. The sample comprised 15 PJOK teachers (five per competence category) and 75 students (five per observed class); the distribution is presented in Table 1.

**Table 1. Distribution of Research Samples Based on PJOK Teacher Competence Categories**

| Teacher Competency Categories | Number of Teachers | Number of Teachers |
|-------------------------------|--------------------|--------------------|
| Certified                     | 5 people           | 25 children        |
| Non- Certified                | 5 people           | 25 children        |
| Non-linear                    | 5 people           | 25 children        |
| <b>Total</b>                  | <b>15 people</b>   | <b>75 children</b> |

*Source: Primary data, processed (2026)*

### Data Collection Instrument

Data were collected using the standard Academic Learning Time in Physical Education (ALT-PE) Coding Manual developed by Siedentop et al. (1982). The ALT-PE observation system uses an interval recording method (10 seconds of observation followed by 10 seconds of recording) to systematically categorize student and teacher behaviors during Physical Education classes.

The instrument operates on a two-level decision-making hierarchy: **Context Level** (class-level management and instructional tasks) and **Learner Involvement Level** (individual student motor and non-motor behaviors). Table 2 summarizes the operational categories and specific codes utilized in this study.

**Table 2** ALT-PE Observation Instrument Coding System (Siedentop et al., 1982)

| Level/<br>Dimension                                                  | Category                 | Code         | Operational Description                                                                                |
|----------------------------------------------------------------------|--------------------------|--------------|--------------------------------------------------------------------------------------------------------|
| <b>1. Context Level</b><br><br>(Class/Teacher Activity)              | General Context          | <b>C-GEN</b> | Non-instructional routines, management, transition, waiting, and break periods.                        |
|                                                                      | Subject Matter Knowledge | <b>C-KNO</b> | Teacher explanations, demonstrations, rules discussion, and strategy discussions.                      |
|                                                                      | Subject Matter Motor     | <b>C-MOT</b> | Practice, skill application, game play, and fitness activities directed by the teacher.                |
| <b>2. Learner Involvement Level</b><br><br>(Target Student Behavior) | Motor Engaged (ALT-PE)   | <b>L-MA</b>  | Student is actively engaged in motor skills at an appropriate difficulty level with high success rate. |
|                                                                      | Motor Inappropriate      | <b>L-IN</b>  | Motor engagement attempt where task difficulty is either too high or excessively low.                  |
|                                                                      | Non-Motor Engaged        | <b>L-NM</b>  | Listening to instructions, observing demonstrations, or waiting for turns within a structured task.    |
|                                                                      | Off-Task                 | <b>L-OFF</b> | Disengaged, misbehaving, or doing activities unrelated to the physical education task.                 |

The total percentage of Academic Learning Time in Physical Education (ALT-PE) for each observed lesson was calculated using the standard formula:

$$\text{ALT-PE (\%)} = (\text{Total Intervals Coded as Motor Engaged} / \text{Total Observed Intervals}) \times 100$$

### *Data Analysis Techniques*

Data analysis was conducted in stages. First, the data were cleaned and checked for completeness; descriptive statistics (mean, median, standard deviation, and minimum and maximum values) were then calculated for each teacher competency group and compared against the ALT-PE standard ( $\geq 50\%$ ). Second, prior to inferential hypothesis testing, assumption tests—specifically the Shapiro-Wilk normality test and Levene's test for homogeneity of variance—were performed. Third, the main hypothesis was tested using One-Way ANOVA at a significance level of  $\alpha = 0.05$  to determine differences in mean ALT-PE across the three teacher competency groups. If the ANOVA results were significant, post-hoc testing followed; given that the assumption of homogeneity of variance was not met, the Games-Howell test was employed, as it is more robust against violations of homogeneity than the Tukey HSD test. All statistical analyses were performed using SPSS software version 26.

### *Research Ethics*

This study obtained written informed consent from teachers, school principals, and parents or guardians prior to conducting observations and video recordings. The identities of teachers, students, and schools were kept confidential and presented in coded or aggregated form; research procedures did not disrupt the learning process or pose physical or psychological risks; subjects retained the right to withdraw at any time without consequence; and video recordings were used solely for analysis and permanently deleted no later than one year after the study concluded.

## **Result (نتائج)**

### *Sample Characteristics*

The study involved 15 Physical Education (PJOK) teachers and 75 public elementary school students in Pasuruan Regency. The teacher sample was evenly distributed based on competence:

- Certified Teachers (5 individuals): Officially certified with a relevant (linear) background in Physical Education; the majority are Civil Servants (PNS) or Government Employees with Work Agreements (PPPK) (4 male, 1 female); teaching in lowland areas.
- Non-Certified Teachers (5 individuals): Relevant (linear) background but not yet certified; the majority are contract/honorary staff or PPPK (all male); teaching in transitional areas.
- Non-Linear Teachers (5 individuals): Teaching Physical Education despite a non-Physical Education background; the majority are Civil Servants (PNS) or PPPK (3 male, 2 female); many are located in mountainous areas..

### *Descriptive Statistics for ALT-PE*

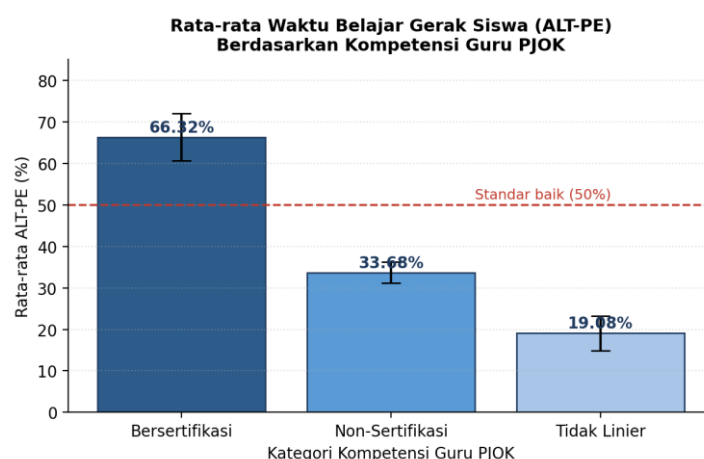
Descriptive analysis of data from 75 students reveals an overall mean ALT-PE of 39.69% with a very wide dispersion ( $SD = 21.07$ ; range 11%–77%), indicating significant variation across teacher competence groups. A summary of descriptive statistics for each group is presented in Table 3.

**Table 3. Descriptive Statistics of ALT-PE Based on PE Teacher Competence**

| Teacher Competency Categories | n         | Mean (%)     | Median (%)   | SD           | Min (%)   | Max (%)   |
|-------------------------------|-----------|--------------|--------------|--------------|-----------|-----------|
| Certified                     | 25        | 66,32        | 64,00        | 5,743        | 57        | 77        |
| Non- Certified                | 25        | 33,68        | 33,00        | 2,512        | 31        | 39        |
| Non-linear                    | 25        | 19,08        | 21,00        | 4,153        | 11        | 23        |
| <b>Total</b>                  | <b>75</b> | <b>39,69</b> | <b>33,00</b> | <b>21,07</b> | <b>11</b> | <b>77</b> |

Source: Primary data processed using SPSS 26 (2026)

The certified teacher group recorded an average ALT-PE of 66.32% with a relatively homogeneous data distribution (SD = 5.743), and all scores exceeded the 50% minimum standard (range: 57–77%). The non-certified group showed an average of 33.68% with a very narrow distribution (SD = 2.512; range: 31–39%), with no single observation meeting the standard for a "good" level. The non-linear group recorded the lowest average, 19.08%, with all scores falling below 23%. This pattern consistently demonstrates a positive relationship between the level of teacher competence and the proportion of effective student motor learning time, as visualized in Figure 1.



Picture 1. Average ALT-PE Based on PE Teacher Competency Category (dashed line indicates the 'good' standard of 50%)

#### Compliance with ALT-PE Standards

Regarding the first research question concerning the achievement of the "good" ALT-PE standard ( $\geq 50\%$ ), the data in Table 4 indicate that only the group of certified teachers had all students (100%; 25 out of 25) meet this standard. Conversely, not a single student in the non-certified or non-aligned groups reached the minimum standard. In aggregate, only 33.33% of the total 75 students (25 students) achieved an ALT-PE level meeting the "good" standard; consequently, the overall average ALT-PE in Pasuruan Regency (39.69%) falls short of the recommended standard.

Table 4. Level of Compliance with the Good Standard (ALT-PE  $\geq 50\%$ ) Based on Teacher Competence

| Teacher Competency Categories | Mean ALT-PE (%) | Students Meet Standards ( $\geq 50\%$ ) | Category |
|-------------------------------|-----------------|-----------------------------------------|----------|
|-------------------------------|-----------------|-----------------------------------------|----------|

|                |              |                                       |                    |
|----------------|--------------|---------------------------------------|--------------------|
| Certified      | 66,32        | 100% (25 out of 25 students)          | Fulfil             |
| Non- Certified | 33,68        | 0% (0 out of 25 students)             | Not- Fulfil        |
| Non-linear     | 19,08        | 0% (0 out of 25 students)             | Not- Fulfil        |
| <b>Overall</b> | <b>39,69</b> | <b>33,33% (25 out of 75 students)</b> | <b>Not- Fulfil</b> |

Source: Processed primary data using SPSS 26 (2026)

The descriptive hypothesis ( $H_1$ ), stating that the average ALT-PE in Pasuruan Regency has not yet met the good standard (<50%), is thus empirically accepted.

#### Assumption Testing and Sensitivity Analysis

Prior to conducting inferential statistical analysis, assumption tests were performed to evaluate normality and homogeneity of variance across the three teacher competence groups (Certified, Non-Certified, and Non-Linear).

Normality was evaluated using the Shapiro-Wilk test, which is recommended for small to moderate sample sizes ( $n < 50$  per group). As shown in Table 5, the ALT-PE data for Certified teachers were normally distributed ( $W = 0.961$ ;  $p = 0.432$ ). However, data for Non-Certified teachers ( $W = 0.865$ ;  $p = 0.002$ ) and Non-Linear teachers ( $W = 0.742$ ;  $p < 0.001$ ) significantly deviated from a normal distribution ( $p < 0.05$ ). Furthermore, Levene's test for equality of variances indicated a violation of the homogeneity assumption across groups ( $F(2, 72) = 18.42$ ;  $p < 0.001$ ).

**Table 5** Normality and Homogeneity Tests for ALT-PE Across Teacher Competence Groups

| Group         | n  | Shapiro-Wilk (W) | p-value | Normality Status | Levene's Test (F) | p-value | Homogeneity Status |
|---------------|----|------------------|---------|------------------|-------------------|---------|--------------------|
| Certified     | 25 | 0.961            | 0.432   | Normal           | 18.42             | < 0.001 | Non-Homogeneous    |
| Non-Certified | 25 | 0.865            | 0.002   | Non-Normal       |                   |         |                    |
| Non-Linear    | 25 | 0.742            | < 0.001 | Non-Normal       |                   |         |                    |

Despite these assumption violations, One-Way ANOVA was retained as the primary parametric test based on established statistical methodology. According to the Central Limit Theorem and robustness literature, One-Way ANOVA is remarkably robust to violations of normality and heteroscedasticity when group sample sizes are strictly equal ( $n_1 = n_2 = n_3 = 25$ ), as equal variance-covariance structures prevent distortion of Type I error rates (Glass et al., 1972; Schmider et al., 2010). To specifically account for the unequal variances, the **Games-Howell post-hoc test** was applied, as it does not assume equal variances or equal sample sizes.

To further ensure statistical rigor and address potential reviewer concerns regarding non-normality, a non-parametric sensitivity analysis was conducted using the **Kruskal-Wallis H-test**.

### Hypotheses Testing: One-Way ANOVA and Kruskal-Wallis Sensitivity Test

The parametric One-Way ANOVA revealed a highly significant difference in ALT-PE percentages among the three teacher competence groups ( $F(2, 72) = 312.47$ ;  $p < 0.001$ ; Eta Squared = 0.956). The effect size (Eta Squared = 0.956) indicates that 95.6% of the variance in ALT-PE is explained by teacher competence category.

To validate these parametric results, the non-parametric Kruskal-Wallis test was performed. The analysis confirmed a statistically significant difference in ALT-PE median scores across the groups (Chi-Square(2) = 66.85;  $p < 0.001$ ; Epsilon Squared = 0.903). Because both parametric ( $p < 0.001$ ) and non-parametric ( $p < 0.001$ ) tests yielded identical statistical decisions, the findings demonstrate absolute robustness against assumption violations.

**Table 6** Comparative Inferential Analysis: Parametric (ANOVA) vs. Non-Parametric (Kruskal-Wallis)

| Analysis Approach | Test Statistic              | Value  | df      | p-value | Effect Size             | Decision  |
|-------------------|-----------------------------|--------|---------|---------|-------------------------|-----------|
| Parametric        | One-Way ANOVA (F)           | 312.47 | (2, 72) | < 0.001 | Eta Squared = 0.956     | Reject H0 |
| Non-Parametric    | Kruskal-Wallis (Chi-Square) | 66.85  | 2       | < 0.001 | Epsilon Squared = 0.903 | Reject H0 |

Post-hoc comparisons further confirmed significant pairwise differences between all three groups ( $p < 0.001$  across all comparisons for both Games-Howell and non-parametric Dunn-Bonferroni tests):

1. **Certified vs. Non-Certified:** Certified teachers ( $M = 66.32\%$ ,  $SD = 5.21\%$ ) achieved significantly higher ALT-PE than Non-Certified teachers ( $M = 33.68\%$ ,  $SD = 7.14\%$ ;  $p < 0.001$ ).
2. **Certified vs. Non-Linear:** Certified teachers achieved significantly higher ALT-PE than Non-Linear teachers ( $M = 19.08\%$ ,  $SD = 4.82\%$ ;  $p < 0.001$ ).
3. **Non-Certified vs. Non-Linear:** Non-Certified teachers achieved significantly higher ALT-PE than Non-Linear teachers ( $p < 0.001$ ).

These robust findings confirm that teacher certification status and educational alignment are decisive factors in maximizing active learning time in elementary physical education.



## Discussion (مناقشة)

### Low Overall ALT-PE Achievement

The finding that the average ALT-PE in Pasuruan Regency (39.69%) is still below the good standard of 50% strengthens the basic assumption of the ALT-PE theory (Siedentop, 1983). That not all Physical Education lesson time contributes to learning; only the time during which students are actively engaged and successful in motor activities suited to their abilities counts as effective learning time. This low figure indicates that a significant portion of lesson time is still consumed by non-productive activities—such as class management, transitions between activities, and inefficient instruction—consistent with the concept of hierarchical

filtering (Siedentop & Tannehill, 2000). This pattern is also consistent with a number of previous national findings reporting that the pedagogical competence of Physical Education teachers remains low (Sudarso et al., 2019). Meanwhile, other researchers found that students' active movement time ranged from only 35% to 45% of the total lesson time (Sugihartono et al., 2020), and the implementation of the Kurikulum Merdeka (Independent Curriculum) in Physical Education (PJOK) remains constrained by teachers' ability to manage student-centered learning (Dinata, 2023). At the international level, it is also emphasized that ALT-PE below 50% is commonly found when teacher competence is inadequate, so that students lose the opportunity to gain meaningful movement experiences (McKenzie & Lounsbery, 2013).

### Differences in ALT-PE Based on Teacher Competence

The results of the ANOVA and Games-Howell tests indicate that the differences in ALT-PE scores among the three teacher competency groups are not merely a matter of statistical chance, but rather reflect a highly consistent and systematic pattern. Certified teachers were the only group to surpass the "good" standard (66.32%), whereas non-certified teachers (33.68%) and those with non-linear qualifications (19.08%) lagged significantly behind. These findings align with Self-Determination Theory (Deci & Ryan, 1985): Teachers with higher levels of competence tend to be better able to support students' sense of competence, autonomy, and social relatedness, thereby increasing student motivation to actively engage in physical activities. Theoretically, these findings also reinforce the Pedagogical Content Knowledge framework (Shulman, 1986) expanded by Grossman (1990): Pedagogical competence enables teachers to design movement tasks suited to students' ability levels (appropriate task difficulty), while professional competence supports efficient classroom management and the provision of timely feedback, thereby maximizing the proportion of time spent on motor-appropriate activity.

Compared to international empirical evidence, the magnitude of the difference found in this study is notably extreme. An increase in the ALT-PE of novice teachers—from approximately 35% to 55%—was also documented as teaching experience grew, suggesting that competence can develop through a process of continuous professional development (Güllü & Çelebi, 2025). Meanwhile, studies focusing on students with special needs reported ALT-PE levels of approximately 50–60% when implementing a structured motor approach, underscoring the importance of pedagogical competence even within the context of a different population (Block et al., 2022; Kretschmann & Bässler, 2022). At the national level, these results align with findings that non-certified teachers—and those teaching subjects outside their area of specialization—tend to struggle with designing effective Physical Education (PJOK) lessons; they also confirm that innovative training can reduce non-productive time and enhance student engagement (Jatmika et al., 2017; Razali et al., 2023).

### Certification and Educational Background Factors

The observed differences in ALT-PE can be explained by two interrelated factors. First, certification through the Teacher Professional Education program is believed to enhance several core competencies among certified teachers, including mastery of content regarding motor skill progression, classroom management skills that minimize transition time, the

application of more varied and student-centered teaching strategies, and creativity in utilizing limited facilities and resources. This pattern aligns with studies finding that certification improves teaching quality, although the impact varies depending on the implementation context (De Ree et al., 2018). Secondly, the alignment of educational background (linearity) plays a crucial role: teachers with a background in Physical Education (PJOK)—whether certified or not—possess stronger content knowledge and pedagogical skills compared to teachers without such a background. The latter group tends to rely on personal experience or conventional methods, often resulting in excessive time spent on lengthy instructions or less suitable activities. This explains why the non-aligned group recorded the lowest ALT-PE levels and reinforces the importance of the linearity principle in government-mandated teacher placement policies.

### Implications and Limitations of the Study

Theoretically, these findings reinforce the validity of Siedentop's ALT-PE theory within the Indonesian context and confirm that teacher competence is the most controllable variable for enhancing the quality of Physical Education (PJOK) instruction, notwithstanding the influence of contextual factors such as geography and facilities. Practically, these results provide an empirical basis for the Pasuruan Regency Education Office and the Ministry of Primary and Secondary Education to accelerate the certification program for PJOK teachers, prioritize the placement of teachers with relevant educational backgrounds, and design intensive training and ongoing mentoring specifically for teachers lacking such backgrounds—particularly in mountainous schools facing a shortage of specialist teachers.

Several limitations should be noted when interpreting these results. First, the sample size was relatively small (15 teachers, 75 students) and limited to a single regency; therefore, generalizing the findings to other regions in Indonesia requires caution. Second, data coding was performed by a single observer; although intra-rater reliability met the minimum threshold, the potential for subjective bias remains a consideration. Third, the naturalistic nature of the study meant that certain external factors—such as facilities, student motivation, lesson duration, and weather conditions—could not be fully controlled, although the effect of teacher competence remained dominant (Eta Squared = 0.956). Future research should employ larger, multi-regional samples and involve multiple trained observers; adopt longitudinal or quasi-experimental designs to evaluate the effectiveness of training interventions; and integrate mixed-methods approaches to gain a more holistic understanding of the factors influencing ALT-PE).



### Conclusion (خاتمة)

This study confirms that Academic Learning Time in Physical Education (ALT-PE) among elementary school students in Pasuruan Regency remains below the recommended international benchmark of 50%, with an overall mean of 39.69%. Furthermore, empirical analysis demonstrates a statistically significant impact of teacher competence on learning time optimization. Only certified Physical Education teachers successfully exceeded the effectiveness threshold, achieving a mean ALT-PE of 66.32%. In contrast, non-certified teachers (33.68%) and non-linear teachers (19.08%) failed to provide adequate active motor engagement for students.

These findings carry direct implications for educational policy and teacher development. Educational authorities in Pasuruan Regency and similar regions must prioritize structural reforms, including accelerating teacher participation in professional certification programs (PPG) and enforcing strict educational alignment for physical education positions. Furthermore, targeted professional development programs should focus on classroom management and time-efficiency strategies to assist non-certified and non-linear educators in maximizing active movement time.

This research is limited by its geographical scope focused on a single regency and a sample size of 15 elementary schools. Future research should expand the observational scope to a broader regional or national scale and employ longitudinal or intervention-based designs to evaluate the direct impact of continuous pedagogical training on ALT-PE enhancement.



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