

Habilidades de pensamiento crítico para la educación física: la influencia de los modelos de aprendizaje y el género

Critical thinking skills to physical education: the influence of learning models and gender

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Abstract. The objective of this research is to determine the influence of the learning model on critical thinking skills from a gender based perspective. This is a quasi-experiment research comprising of Nonequivalent Control Group Design with data collected from 68 class X high school students at SMA N 1 Benai using questionnaires and analyzed using the independent samples test. The result showed that there was a significant influence between Problem-Based Learning (PBL) and the deep Discovery Learning (DL) models with increased critical thinking skills of 0.000. Furthermore, PBL is good in increasing students critical thinking skills compared to DL where the female students perform better at developing these skills than the male.

Keywords: PBL, DL, Critical Thinking, Physical Education, Gender.

Resumen. El objetivo de esta investigación es determinar la influencia del modelo de aprendizaje en las habilidades de pensamiento crítico desde una perspectiva de género. Esta es una investigación cuasi-experimental que consiste en un Diseño de Grupo de Control No Equivalente con datos recopilados de 68 estudiantes de secundaria de clase X en SMA N 1 Benai mediante cuestionarios y analizados mediante la prueba de muestras independientes. Los resultados mostraron que hubo una influencia significativa entre los modelos de aprendizaje basado en problemas (ABP) y aprendizaje por descubrimiento profundo (DL) con un aumento de las habilidades de pensamiento crítico de 0,000. Además, el ABP es bueno para aumentar las habilidades de pensamiento crítico de los estudiantes en comparación con el DL, donde las estudiantes se desempeñan mejor en el desarrollo de estas habilidades que los hombres.

Palabras clave. Aprendizaje Basado en Problemas, Aprendizaje por Descubrimiento, Pensamiento Crítico, Educación Física, Género.

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Introduction

Students are expected to develop high level of thinking skills in accordance with Society 5.0. Agusta et al. (2022) stated that relatively 20% of teachers designed both problem and solution-based learning skills. This includes critical thinking, creativity and innovation, thinking logically, and analytically, as well as solving problems, collaboration, and social skills. Teachers are concerned about the Generation Z experiences, and an inclination towards heightened level of critical thinking is expected to aid in facing these challenges (Seibert, 2021). Meanwhile, critical thinking, communication, collaboration, and creativity have been classified as the most prominent 21st century skills and competences based on making measurable contributions _ in education, relationships, work, health and well-being (Doran & Ryan, 2017). Stenning (2018) stated that students must possess critical thinking skills to solve problems which required proper reasoning.

Education system globally tend to focus on the development of critical thinking skills (Chusni et al., 2020; Nygren et al., 2018). These skills played an essential role by motivating students (de Bie et al., 2015; Nygren et al., 2018). Therefore, it must be incorporated in learning objective, including all fields of knowledge, especially physical education. During the implementation process at schools, critical thinking must be integrated into the learning process, or taught specially, to enable students adopt certain skills (Chusni et al., 2021). The learning process should incite work same practices, critical,

and analytical thinking, as well as excellent communication with capable problem-solving designs (Ozkahraman & Yildirim, 2011).

Considering this perspective, physical education learning focused on health, knowledge, and understanding of physical activity (PA), as well as increased self-efficacy, motivated attitudes, and basic movement skills (Belton et al., 2022). Therefore, schools need to incorporate relevant skills, namely critical thinking, an aspect of psychomotor, environmental, and physical education, to provide support for the study of 21st century skills (John & Source, 2014).

Physical education motivates Problem-Based Learning (PBL), including the development of critical thinking, based on the structured reviewed literature (Pithers & Soden, 2010). Teachers must be perceived as facilitators of the thought process (John & Source, 2014). In addition, teachers must be capable of recognizing situations in which students can apply critical thinking, aid in thought process, and follow up by submitting relevant questions (Dupri et al., 2020a).

Regarding this perspective, difficulty was encountered in incorporating critical thinking into the existing curriculum, including assigning appropriate assignments, using effective learning strategies (Dwyer et al., 2011). PBL is a student-centered method, which focuses on problem-solving learning. This method had been suggested and applied in universities to improve critical thinking skills of students (Liu & Pásztor, 2022a). The scientific model combined PBL and Discovery Learning (DL) through a third method focusing on the

development of creativity, concentration and intelligence (Tarigan, et al., 2018). PBL has a positive influence on students of physical education (Festiawan et al., 2020). Meanwhile, Lee et al., (2016) conducted eight studies from 2001 to 2014, and reported that PBL was ineffective for critical thinking. P. Oh et al., (2015) used 11 articles to prove that PBL was superior to the traditional method of incorporating critical thinking. Furthermore, Cheng et al., (2014) conducted nine studies, which showed PBL was effective for incorporating critical thinking skills in nursing students. The lack of investigation on physical education in terms of developing critical thinking skills using PBL model makes this study interesting.

Several studies have been conducted on the relationships between gender, critical thinking, and creativity (Bart et al., 2015; OECD, 2019; Zetriuslita et al., 2016). These showed the significant role of gender in differentiation potency creativity and critical thinking skills, although some studies did not support the hypothesis (Shubina & Kulakli, 2019; Bart et al., 2015). Ladjar et al., (2018) stated that the combination of PBL and DL models influenced critical thinking skills of a group of female students with low IQ. Recent studies (Bujosa-Quetglas et al., 2023) on gender differences in the implementation of physical education stated that fewer female students participated in moderately heavy physical activity compared to the males. Therefore, another interesting exploration is the analysis of gender segregation in physical education learning.

Teachers should integrate skills assessment as an integral part of the teaching and learning process (Vendrell-Moranchó, 2024). This further motivates the advanced discovery of critical thinking skills through physical education. Currently, the development of critical thinking skills and gender differences had not being explored. Therefore, this study focused on examining the influence of PBL and DL on high school students, through physical education, including the differences based on gender.

Method

This quasi-experimental study adopted a Nonequivalent Control Group Design. The independent variables include PBL and DL, moderated by gender (males and females) while the dependent variable is critical thinking skills. The sample consisted of 33 males and 35 females, totaling 68 students selected using cluster random sampling method. The instrument used to measure critical thinking skills is modified essay questions designed by ennis and facione, comprising the following dimensions, namely 1) basic clarification, 2) bases for decision, 3) inference, 4) advanced clarification, as well as 5) supposition and integration (R. H. Ennis, 1985, 1993, 2011, 2015, Facione, 1990). These five dimensions were further divided and translated into 12 indicators and

questions, respectively (Ennis, 2011), as shown in Table 1.

Table 1.
Indicators Critical thinking

| Study Variables | Dimensions | Indicators | Question | |
|--------------------------|-----------------------------|--|----------|---|
| Critical thinking skills | Basic clarification | Focus on the question | 1 | |
| | | Analyze argument | 2 | |
| | | Ask and clarify challenging questions | 3 | |
| | Bases for decision | Evaluate credibility by observing a specific source, and assessing the results | | 4 |
| | | | | 5 |
| | Inference | Deduction and judgment | 6 | |
| | | Making inferences | 7 | |
| | | Creating and rating assessment | 8 | |
| | Advanced clarification | Defining and evaluating terms | 9 | |
| | | Connecting assumptions | 10 | |
| | Supposition and integration | Predictive thought | 11 | |
| | | Create and maintain decision | 12 | |

The evaluation of critical thinking skills was carried out by assigning a score on each question consisting of six options (Ennis, 1993; Affandy et al., 2019; Meryastiti & Rasyid Ridlo, 2022) as shown in Table 2.

Table 2.
Skill Score Rubric Critical Thinking

| Score | Description |
|-------|--|
| 5 | All drafts are correct, clear, and specific |
| | The thought flow is clear, and the concepts related to each other Improved spelling, good Evidence, clear facts |
| 4 | Some of the concepts are correct |
| | Part of the plot is clear Spelling Partially good (error small) |
| 3 | Fraction _ draft correct and clear |
| | Fraction _ description appropriate, reason inappropriate The thought flow clear Grammar is enough |
| 2 | Draft excessive, not based on data |
| | Description has no supported fact Grammar is enough Only a small aspect is perceived as correct |
| 1 | All draft incorrect |
| | Description incorrect Grammarly does not have a good score There is an answer for the entire question |
| 0 | No answer. |

This instrument was subjected to validity and reliability tests before being used. Additionally, 12 questions were declared valid and reliable with a Cronbach Alpha value of 0.928. The initial analysis requirements included normality and homogeneity tests, followed by t-test.

Results

The results obtained from t-test calculations are shown in Table 3.

Table 3.
Independent Samples Thinking Test Results in Critical Student PBL Model Group and DL model

| F | Sig | T | Df | Sig. (2-tailed) |
|-------|------|-------|----|-----------------|
| 7.168 | .009 | 2.316 | 66 | .024 |

The difference between using PBL and DL models is $0.024 < \alpha = 0.05$. Therefore, there is a significant difference students in PBL and DL groups. The effectiveness of both models are proven by the average results of the N gain test as shown in Table 4.

Table 4.

Average Critical Thinking Skill by Model

| | Model | Mean N Gain | Percentage |
|-------------------|-------|-------------|------------|
| Critical thinking | PBL | 0.64 | 64% |
| | D.L | 0.48 | 48% |

Based on Table 4, PBL and DL had mean N Gain of 0.64 and 0.48, respectively both included in medium category. PBL had an average percentage of 64% categorized as Enough effective. While, DL model had an average percentage of 48% categorized as less effective. The Independent Samples Test and N Gain, showed that PBL had a better impact in terms of motivating critical thinking skills.

Table 5.

Independent Samples Test Results for Male Students from the PBL and DL Model Groups

| F | Sig | T | Df | Sig. (2-tailed) |
|-------|------|--------|----|-----------------|
| 4.344 | .045 | -4.885 | 31 | .000 |

Table 5 shows that the influence of PBL and DL on critical thinking skills of male students differed by (sig.) $0.000 < \alpha = 0.05$. Therefore, both models had a significant influence on critical thinking skills of male students.

Table 6.

Independent Samples Test Results for Female Students from the PBL and DL Model Group

| F | Sig | T | Df | Sig. (2-tailed) |
|--------|------|--------|----|-----------------|
| 24.667 | .000 | 12.427 | 33 | .000 |

Table 6 showed that the influence of PBL and DL on critical thinking skills of female students differed by (sig.) $0.000 < \alpha = 0.05$. Therefore, both models have a significant influence on critical thinking skills of female students.

Table 7.

Average Critical Thinking Skills by Gender

| Gender | Learning Model | |
|--------|----------------|------|
| | PBL | DL |
| Male | 0.34 | 0.63 |
| Women | 0.91 | 0.33 |

Based on Table 7, male students in DL group had better critical thinking skills than those in PBL. Similarly, the reverse was the case for female students.

Discussion

The results showed that PBL was better in terms of instilling the relevant skills during physical education classes. In addition, students in PBL showed significant improvement in

the Search for Truth, Analysis, Systematicity, and critical thinking skills at different occasions _ compared to those in DL (Tiwari et al., 2006). PBL also impacted students with FI/FD cognitive style (Evendi et al., 2022). Critical thinking skills was also impacted through DL. However, the average finding showed that PBL had better impact compared to DL. Nurcahyo et al., (2018) stated that DL scientifically motivated students to actively adopt relevant skills. This enabled engagement in making observations, inquires, reasoning, and networking. The use of DL in impacting critical thinking skills is better compared to conventional learning (Martaida et al., 2017).

The students were motivated to participate in the following game pak ba apo kalua kawan awak togak dokek ring lai bulia? while adopting relevant strategies. This momentary game was frequently played and any opponent who did not adhere to the established rules of pak lai bulimia model itu nye, pak? meaning can it be played in that manner sir? was disqualified. This showed that the critical-thinking skills of students were already developed.

Based on the learning results, it was reported that Physical Education helped to develop thinking skills through PBL (Dupri et al., 2020b). Intervention learning through PBL was extremely effectively (Liu & Pásztor, 2022b). PBL is perceived as a pedagogy that integrates problems in a systematic manner (eg unstructured problem), while motivating participation in diverse activities aimed at developing critical thinking skills (Santos-Meneses et al., 2023).

Male students taught using PBL performed better than those who learnt with DL. Both male and female participants had high scores in assignments concerning memorized works including evaluating planning/flexibility cognitive and deep task inhibition (Singh et al., 2022a). According to Lighthall et al., (2012), speedy or quick decision were also taken. Reiter, (2013) stated that when faced with familiar situation, a male child is bound to make decisions more rapidly compared to female. There is a visible difference in the environment, for example, males believe in themselves when making decisions, than females who are sensitive and receptive (Minasyan et al., 2020). In general, males tend to make more decisions compared to females (Singh et al., 2022b).

Female students slightly differ from males in liveliness and enthusiastic learning. These students also engaged in games associated with physical education learning which aided in the development of critical thinking skills. Hidayat et al., (2023) stated that female students tend to trust self and _ are firm, while carrying out evaluation processes instantly (Liu & Pásztor, 2023). Female participants also had higher scores than males (Demirbag et al., 2016; Kilic et al., 2017; Koyunlu Unlu & Dokme, 2017; Liu & Pásztor, 2023; Özyurt, 2015). According to Bravo et al., (2020b), women have strong disposition and self efficacy as well as instant evaluation. Females are generally characterized by dedication, and

prudence.

Teachers need to consider certain factors such as gender in designing and implementing effective sports learning activities (Martono et al., 2024). Physical education motivates cooperation to realize better results (García-Taibo et al., 2024). It helps to support the interests of gender equality by adapting the rules of the game. Similarly, Rodríguez and Gómez (2018) modified certain soccer rules, in a way that supports this sport to be more inclusive. Gender stereotypes in the cognitive aspect show lower values, implying differing thinking skills (Díaz Frígola et al., 2024).

Future studies including larger samples big and students from diverse disciplines as well as sports needs to be conducted. This would enable students to independently resolve certain problems and challenges.

Conclusion

In conclusion, the results showed that both PBL and DL models were used to impact these skills in students. Male students in DL group showed better critical thinking skills than their counterparts in PBL. Similarly, female students in PBL group were better compared to those in DL. Physical education lessons were purposely carried out to motivate the development of these skills. This was realized by using PBL and DL through activity physique games.

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