

PATH ANALYSIS OF HEALTHY COGNITIVE LIFE SKILLS EFFECT ON CHILDREN'S SELF-ESTEEM, KNOWLEDGE, CRITICAL THINKING, AND DECISION-MAKING SKILLS

Ratih Indraswari^{1*}, Bagoes Widjanarko¹, Riza Hayati Ifroh²

1. Faculty of Public Health, Universitas Diponegoro, Indonesia
2. School of Psychology, Northeast Normal University, Changchun, China

Article Information

Received: 14 February 2025
Revised: 16 September 2025
Accepted: 14 June 2026

*Corresponding Author

Ratih Indraswari
ratih.indraswari@gmail.com

DOI

10.20884/1.jks.2026.21.2.15020

ABSTRACT

Early engagement in risky sexual behavior among Indonesian adolescents is often associated with limited reproductive health knowledge and environmental factors. This study evaluated the effectiveness of a Healthy Cognitive Life Skills (HCLS) educational model using interactive games to improve children's reproductive health knowledge, self-esteem, critical thinking skills, decision-making skills, and attitude toward reproductive health. A quasi-experimental study with a non-equivalent control group pretest-posttest design was conducted among 254 children aged 9-10 years from two elementary schools in Semarang City, Indonesia. Data were collected using validated questionnaires and analyzed using partial least squares structural equation modeling (PLS-SEM). The HCLS educational model did not demonstrate a significant direct effect on cognitive life skills. However, it significantly improved self-esteem, which subsequently mediated improvements in reproductive health knowledge, critical thinking skills, and decision-making skills. The intervention did not directly improve attitudes toward reproductive health, although cognitive life skills and self-esteem were positively associated with attitudes. These findings suggest that game-based HCLS education primarily enhances children's cognitive skills through strengthening self-esteem rather than through direct educational effects. Incorporating strategies that specifically target the affective domain may further improve attitudes toward reproductive health.

Keywords: *Cognitive life skill; critical thinking skill; decision-making skill; health education; path analysis; reproductive health*



ISSN : 1907-6637

e-ISSN : 2579-9320

BACKGROUND

Unwanted pregnancies among early adolescents often result from risky sexual behaviors initiated at an early age of puberty. The Centers for Disease Control and Prevention (CDC) reported that 1.44% of adolescents in Indonesia had experienced sexual intercourse before the age of 14 years (Ministry of Health Indonesia, 2016). Similarly, the National Population and Family Planning Board reported that approximately 6% of Indonesian adolescents initiated sexual intercourse during early puberty (12.5 years) (National Population and Family Planning Board, 2018a). This situation is particularly concerning, given that the average age of menarche among Indonesian girls has continued to decrease over time (Wahab et al., 2018).

During early adolescence, the social environment becomes an external factor that can strongly influence behavioral development. Exposure to pornography has been associated with premarital sexual practices among early adolescents (Adarsh & Sahoo, 2023). In fact, 1.2% of adolescents in Indonesia reported being exposed to pornography as early as 5-8 years of age, primarily within their own homes (Gayatri et al., 2020). This finding indicates insufficient parental presence and supervision. The limited role of parents, who should serve as primary protectors and educators, may increase early adolescents' vulnerability to peer influence in decision-making processes (Indraswari et al., 2022).

Consequently, early adolescents often prefer discussing reproductive health issues with peers whom they perceive as

close and trustworthy, followed by their mothers and school teachers (Pihahay & Soripet, 2023; Tampubolon et al., 2026). Approximately 50% of parents reported that they did not monitor their adolescents' activities, while 63% provided unrestricted internet access without knowing the websites or content accessed by their children (Gayatri et al., 2020). This issue is particularly relevant in Indonesian society, where the cultural concept of *ewuh pekewuh* (a tendency to feel embarrassed, hesitant, or reluctant to discuss sensitive topics openly) influences communication patterns. Many parents avoid discussing reproductive health because they perceive these topics as taboo, believe that children will eventually understand reproductive issues independently, or assume that reproductive health education is primarily the responsibility of schools (Indraswari et al., 2022). Similarly, teachers may also experience discomfort and embarrassment when addressing reproductive health issues with students (Motlagh et al., 2016).

This condition is concerning because early adolescents in the early stages of puberty often lack adequate knowledge, positive attitudes, and essential life skills required to make healthy decisions (Shaluhiah et al., 2020). These internal factors contribute to the development of adolescent characteristics and decision-making patterns. Previous studies have demonstrated that adolescents engaging in risky sexual behaviors tend to have limited knowledge (National Population and Family Planning Board, 2018b), low self-esteem (Du et al., 2023), low self-efficacy (Indarwati et al., 2019), and an external locus of control (Amorin, 2020). These factors represent cognitive-behavioral domains that contribute to the formation of individual life skills (Hoque, 2016). Therefore, adolescents with inadequate life skills may have a higher likelihood of engaging in risky sexual behaviors.

The World Health Organization (WHO) emphasizes the importance of equipping adolescents with cognitive life skills to enable them to consider the long-term consequences of their decisions (Loureiro, 2020). Adolescents with well-developed life skills are more likely to make healthy decisions because they possess adequate knowledge, positive attitudes, healthy self-concepts, higher self-esteem, stronger self-efficacy, and an internal locus of control (Sa et al., 2021). Cognitive life skills involve complex processes within the human brain, including critical thinking and decision-making abilities. Developing these skills is essential to prepare early adolescents for puberty and support their ability to maintain abstinence during adolescence (Murphy-Graham & Cohen, 2019). Adolescents with strong cognitive life skills are more capable of delaying sexual initiation because they can critically evaluate situations and make appropriate decisions when facing peer pressure (Alegre, 2024).

Conventional educational approaches may have limited effectiveness because they are often less interactive, participatory, and adaptive to adolescents' learning needs. Game-based learning represents an alternative approach that can reduce reluctance, fear, and embarrassment while encouraging adolescents to discuss sensitive issues and express their opinions in a more enjoyable environment. Various educational games have been developed to increase engagement among learners and educators while improving understanding of reproductive health concepts. Game-based interventions have been recognized as engaging strategies for delivering health information and have demonstrated effectiveness in improving early adolescents' sexual health knowledge and decision-making abilities in dating relationships. Furthermore, play-based approaches have

been shown to improve children's knowledge, attitudes, and motivation compared with conventional lecture and discussion methods (Haruna, Hu, Kai, et al., 2018).

This study aims to evaluate the effectiveness of the Healthy Cognitive Life Skills (HCLS) education model using a game-based approach. Path analysis will be employed to examine causal relationships and identify direct and indirect effects among variables involved in adolescents' cognitive processes.

METHOD

Study design

This study employed a quasi-experimental design using a non-equivalent control group with pretest and posttest assessment.

Sample

The study participants were children aged 9-10 years recruited from two elementary schools in Semarang City, Indonesia. This age group was selected because it represents the prepubertal period, whereas the average age of pubertal in Indonesia ranges from 12.5 to 14.5 years (Wahab et al., 2018). Therefore, Healthy Cognitive Life Skills (HCLS) education should be provided during the prepubertal period (9-11 years) to equip children with healthy cognitive life skills before entering puberty.

Participants are all children enrolled in grades 4 and 5 from 2 schools, residing in Semarang City, and willing to participate, with written informed consent provided by their parents. Participants were selected using total population sampling.

To minimize contamination resulting from information sharing between participants, students from one school served as the intervention group and the other served as the control group.

The minimum required sample size was calculated using the Lemeshow formula, yielding a minimum of 123 participants. Based on the eligibility criteria, 129 children were enrolled in the intervention group and 125 children in the control group.

Instrument

The independent variable was the Healthy Cognitive Life Skills (HCLS) educational intervention. The primary outcome variables were reproductive health knowledge, attitudes towards reproductive health, self-esteem, critical thinking skills, and decision-making skills. Self-esteem was subsequently modeled as a mediating variable in the PLS-SEM analysis.

All study variables were measured using structured questionnaires. The questionnaires assessing reproductive health knowledge and attitudes were developed based on the Rutgers module (Rutgers WPF Indonesia, 2018). The questionnaires measuring self-esteem, critical thinking, and decision-making skills were adapted from the Life Skills Teacher's Manual published by the Ministry of Health of India (Life Skills - Teacher's Manual, 2024). Only questionnaire items demonstrating acceptable validity ($R > 0.05$) and reliability (Cronbach's $\alpha > 0.7$) were retained for analysis.

The knowledge questionnaire consisted of 25 items assessing knowledge of pubertal changes in boys and girls and the basic process of conception. Each correct response received 1 point, whereas incorrect responses received 0 points. Knowledge was categorized as good (score ≥ 10) or poor (score < 10).

The attitude questionnaire consisted of 7 items assessing attitudes toward dating behavior and peer relationships. Responses consistent with the expected attitude received 1 point, whereas inconsistent responses received 0 points. Attitudes were categorized as permissive (score ≥ 2) or less permissive (score < 2).

The self-esteem questionnaire consisted of 9 items. Each appropriate response received 1 point, whereas incorrect responses received 0 points. Self-esteem was categorized as high (score ≥ 6) or low (score < 6).

The critical thinking questionnaire consisted of 20 items. Each correct response received 1 point, whereas incorrect responses received 0 points. Critical thinking skills were categorized as skilled (score ≥ 15) or less skilled (score < 15).

The decision-making questionnaire consisted of 20 items. Each correct response received 1 point, whereas incorrect responses received 0 points. Decision-making skills were categorized as skilled (score ≥ 16) or less skilled (score < 16).

Based on the proposed conceptual framework, self-esteem was hypothesized to mediate the relationship between the HCLS educational intervention and the latent construct of children's cognitive life skills. The structural relationships among these constructs were subsequently evaluated using PLS-SEM.

Intervention

The intervention group received Healthy Cognitive Life Skills (HCLS) education through group-based educational games conducted with their classmates, whereas the control group received no intervention during the study period. Outcome measures were collected at baseline (pretest) and four months after the intervention (posttest).

The HCLS program consisted of 14 educational game activities designed to enhance children's cognitive life skills. The activities were adapted from the Rutgers reproductive health module (Rutgers WPF Indonesia, 2018) and the Life Skills Teacher's Manual published by the Ministry of Health of India (Life Skills - Teacher's Manual, 2024), with modification to suit the sociocultural characteristics of Javanese children. Each activity was conducted once a week for approximately 45 minutes (Figure 1).

Each educational game was designed with specific learning objectives targeting both cognitive and affective domains. The cognitive domains included reproductive health knowledge, critical thinking skills, and decision-making skills, whereas the affective domain focused on self-esteem. The intervention aimed to strengthen children's self-esteem by promoting a positive sense of self-worth while enhancing their reproductive health knowledge and developing critical thinking and decision-making skills to enable informed decisions regarding reproductive health issues.



Figure 1. Flowchart of the study intervention

Data collection

Data were collected using self-administered questionnaires under the supervision of enumerators. Baseline data were obtained before the intervention, and follow-up assessments were conducted four months after completion of the intervention using the same instruments

Data analysis

Partial least squares structural equation modelling (PLS-SEM) was employed to evaluate both the direct and indirect effects of the HCLS educational model on children's cognitive life skills. PLS-SEM was selected because of the dependent

variables to this study, which are numerical data types and are not normally distributed.

The analysis consisted of two stages. First, the measurement (outer) model was evaluated by assessing indicator reliability, convergent validity, discriminant validity, average variance extracted (AVE), and composite reliability. Indicators that failed to meet the recommended validity criteria were excluded from subsequent analyses. Second, the structural (inner) model was evaluated by examining path coefficients, coefficient of determination (R^2), effect size (f^2), t-statistics, and p-values obtained through bootstrapping. Statistical significance was established at $p < 0.05$.

Ethical considerations

This study received ethical approval from the Health Research Ethics Commission, Faculty of Public Health, Diponegoro University (Approval No. 609/EA/KEPK-FKM/2023), issued on November 24, 2023.

RESULT

Partial least squares structural equation modelling (PLS-SEM) was performed to evaluate the direct and indirect relationships among the HCLS educational model, self-esteem, and cognitive life skills. The analysis consisted of two stages: evaluation of the measurement (outer) model and evaluation of the structural (inner) model.

Measurement Model (Formative Reflective)

The measurement model was first evaluated to assess construct validity and reliability. The two main parameters built are construct validity testing (convergent and discriminant validity) and construct internal consistency testing (reliability). The measurement model stage is a step to test the validity of the construct by looking at the outer loading and average variance extracted (AVE) parameters (Sarstedt et al., 2021).

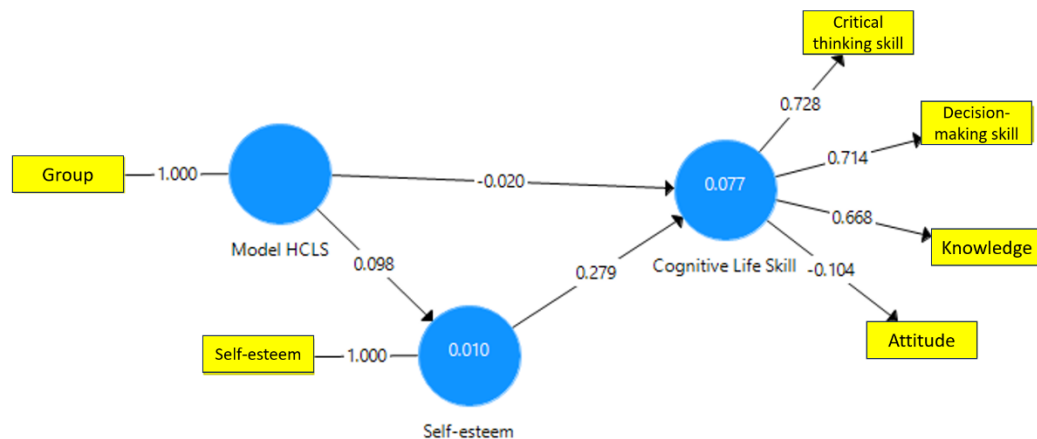


Figure 2. Construct validity assessment

Table 1. Measurement model assessment of the constructs using PLS-SEM

Variable construct	Indicator variable	Outer loading	AVE	Composite reliability
Cognitive life skill	Knowledge	0.722	0.514	0.760
	Critical thinking skills	0.731		
	Decision-making skills	0.697		
Attitude	Attitude	1.000	1.000	1.000
Model	HCLS Model	1.000	1.000	1.000
Self-esteem	Self-esteem	1.000	1.000	1000

AVE: Average Variance Extracted

The initial stage of the analysis involved evaluating the validity of the construct variable. The exogenous latent variables were group variables, whereas the endogenous latent variable was cognitive life skills, represented by the indicators of reproductive health knowledge, attitudes, critical thinking skills, and decision-making skills. Self-esteem was

specified as a mediating variable.

The initial measurement model showed that the attitude indicator had an outer loading of -0.104. Therefore, attitude was excluded from the cognitive life skills construct before re-estimating the final model (Figure 2). Following removal of the attitude indicator, the revised model demonstrated satisfactory construct validity and reliability.

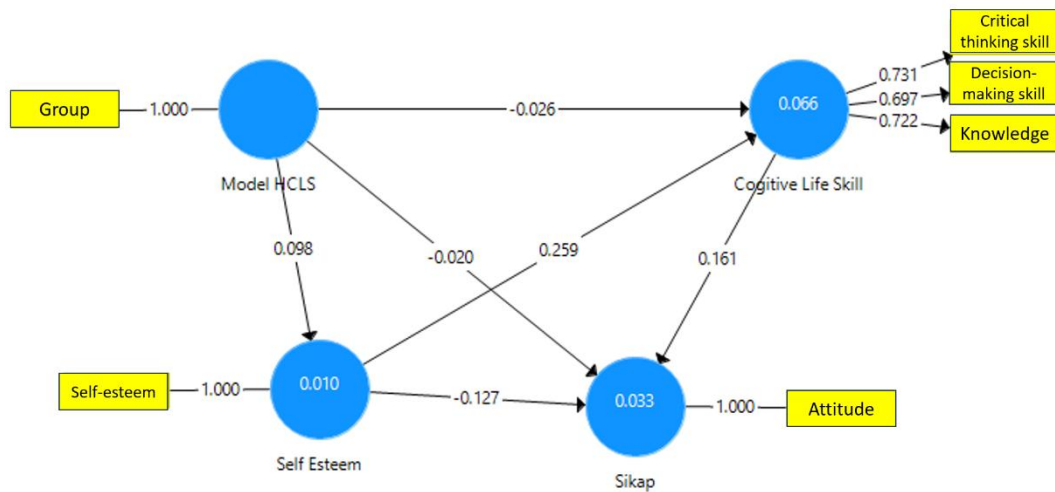


Figure 3. Measurement model

Table 2. Coefficient of determination (R2) of the structural model

Factor	R-square	R-square adjusted
Cognitive life skill	0.066	0.063
Self-esteem	0.010	0.008
Attitude	0.033	0.027

As presented in Table 1 and Figure 3, all remaining indicators demonstrated acceptable convergent validity, with outer loadings > 0.4 and AVE values > 0.5. Composite reliability values also exceeded the recommended threshold of 0.60, indicating satisfactory internal consistency and supporting the adequacy of the measurement model (Sarstedt et al., 2021).

Evaluation of Measurement Models (Structural Model)

The structural model explained 6.3% of the variance in cognitive life skills ($R^2 = 0.063 < 0.19$), as presented in Table 2, indicating weak explanatory power according to the criteria proposed by Sarstedt et al. (2021).

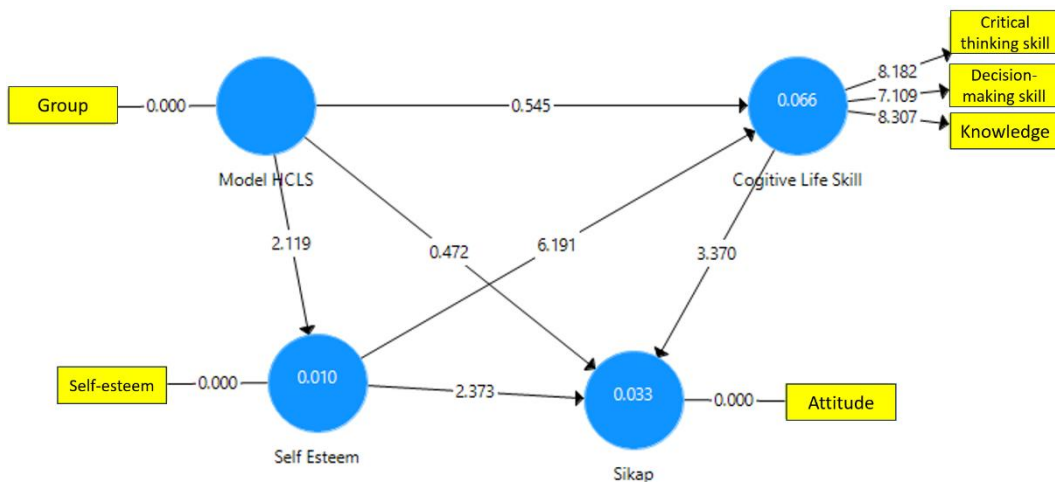


Figure 4. Path coefficient model of the HCLS education

Table 3. Path coefficient of the structural model

Path	F-square	Original sample	Sample mean	SD	T-stat	P-values
Cognitive life skill → attitude	0.025	0.161	0.161	0.048	3.370	0.001*
HCLS model → cognitive life skill	0.001	-0.026	-0.024	0.048	0.545	0.586
HCLS model → self-esteem	0.010	0.098	0.099	0.046	2.119	0.035*
HCLS model → attitude	0.000	-0.020	-0.018	0.043	0.472	0.637
Self-esteem → cognitive life skill	0.071	0.259	0.258	0.042	6.191	0.000*
Self-esteem → attitude	0.015	-0.127	-0.130	0.053	2.373	0.018*
HCLS model → self-esteem → cognitive life skill	-	0.025	0.025	0.013	2.019	0.044*
HCLS model → cognitive life skill → attitude	-	-0.004	-0.004	0.008	0.515	0.607
Self-esteem → cognitive life skill → attitude	-	0.042	0.041	0.014	3.039	0.002*

Path	F-square	Original sample	Sample mean	SD	T-stat	P-values
HCLS model → self-esteem → cognitive life skill → attitude	-	0.004	0.004	0.003	1.629	0.104
HCLS model → self-esteem → attitude	-	-0.012	-0.013	0.009	1.357	0.175

Description: PLS-SEM test, *95% significance

Based on Figure 4 and Table 3, the following findings were obtained:

1. The HCLS educational intervention had no significant direct effect on cognitive life skills ($t = 0.545 < 1.96$ or $p\text{-value} = 0.586 > 0.05$).
2. The HCLS educational intervention had a significant indirect effect on cognitive life skills through self-esteem ($t = 2.019 \geq 1.96$ or $p\text{-value} = 0.044 < 0.05$), indicating that self-esteem acted as a mediator.
3. The effect sizes (F-square) of the exogenous variables on the endogenous variables were weak, as none of the direct effects exceeded the threshold for a large effect size ($f^2 > 0.35$).

Collectively, these findings indicate that self-esteem functions as the principal mechanism through which the HCLS educational model influences children's cognitive life skills. Although the intervention did not directly improve cognitive life skills, strengthening children's self-esteem significantly enhanced the overall cognitive life skills construct.

DISCUSSION

The most important finding of this study is that the HCLS educational model did not directly improve children's cognitive life skills. Instead, its effects were mediated through self-esteem, highlighting self-esteem as a key psychological mechanism linking game-based education to cognitive development.

The Effect of the HCLS Education Model on Children's Critical Thinking Skills

The present study found that the HCLS education model did not have a significant direct effect on children's cognitive life skills, including critical thinking. However, the structural model demonstrated a significant indirect effect through self-esteem, suggesting that improvements in critical thinking occurred by first strengthening children's self-esteem. These findings indicate that self-esteem serves as an important psychological mechanism linking educational interventions to higher-order cognitive development.

Critical thinking refers to the ability to objectively analyze information and experiences (Rosen et al., 2025). It is influenced by the quality and depth of children's experiences within a particular domain of knowledge or problem-solving context (Hariati et al., 2023). Critical thinking skills enable individuals to recognize and evaluate factors that influence attitudes and behaviors, such as personal values, peer pressure, and information from various media sources (Rosen et al., 2025).

Although the HCLS educational model did not directly improve critical thinking, children in the intervention group demonstrated higher mean critical thinking scores than those in the control group. This finding is consistent with previous studies reporting that educational activities promoting active participation can enhance critical thinking among school-aged children (Changwong et al., 2018). Similarly, Vong & Kaewurai (2017) emphasized that effective critical thinking instruction should involve identifying problems, gathering relevant information, discussing evidence, evaluating alternative solutions, and reflecting on outcomes. These

components were incorporated into the game-based activities implemented in the present study. Consequently, the intervention group showed higher mean critical thinking scores, indicating that children who participated in the HCLS educational games developed stronger critical thinking skills than those who did not receive the intervention.

The mediating role of self-esteem observed in this study is also supported by Social Learning Theory, which proposes that cognitive development is shaped by the interaction between personal beliefs, environmental experiences, and behavioral engagement (Firmansyah & Saepuloh, 2022). Children who perceive themselves as competent are more likely to participate actively in learning activities, persist when encountering challenges, and regulate their own learning behaviors. Previous studies have similarly demonstrated positive relationships between self-esteem, self-regulation, and critical thinking skills (Arslan, 2018; Arslan & Demirtas, 2016). Furthermore, Widat et al. (2023) argued that providing children with opportunities to explore, reflect on, and evaluate their own actions independently is essential for developing critical thinking skills.

Overall, these findings suggest that the HCLS educational model enhances children's critical thinking primarily by strengthening self-esteem rather than by directly influencing cognitive processes. Therefore, educational programs designed to improve higher-order thinking skills should incorporate activities that foster children's confidence, autonomy, and positive self-perception alongside cognitive learning.

The Effect of the HCLS Education Model on Children's Decision-Making Skills

Similar to the findings for critical thinking, the HCLS educational model did not demonstrate a significant direct effect on children's decision-making skills. Instead, the intervention exerted an indirect effect through self-esteem, suggesting that strengthening children's confidence and self-worth may be necessary before improvements in decision-making can occur.

Decision-making is a fundamental life skill that enables individuals to evaluate available alternatives, anticipate potential consequences, and select appropriate actions (Indraswari et al., 2022). To improve their overall quality of life, individuals need to make decisions in a systematic and well-informed manner. This is particularly important for health-related behaviors, as children and adolescents are frequently required to make decisions that may have significant implications for their health. Effective decision-making involves evaluating different options and considering their potential consequences before choosing the most appropriate action (Indraswari et al., 2022). In the context of reproductive health, effective decision-making enables children to prepare for adolescence by encouraging thoughtful and responsible choices regarding health-related behaviors.

Although the direct effect of the intervention was not statistically significant, children who participated in the HCLS educational games demonstrated higher decision-making

scores than those in the control group. The games encouraged participants to identify problems, gather relevant information, evaluate alternative options, and consider the consequences of different decisions before selecting appropriate solutions. These learning experiences are consistent with previous evidence suggesting that structured educational activities can strengthen rational and systematic decision-making processes (Ersoy & Sever, 2019).

Several factors may influence the way individuals make decisions. Personality characteristics, including emotional regulation, self-confidence, maturity, and attitudes toward risk, can shape and individual's decision-making approach. Previous studies have shown that individuals with a strong internal locus of control are more likely to adopt rational decision-making strategies because they believe they can influence the outcomes of their actions. In contrast, individuals with an external locus of control tend to rely more heavily on others when making decisions, resulting in a more dependent decision-making style. Likewise, extroverts are generally more willing to seek advice from others because their greater self-confidence and social competence facilitate the exchange of information and support during the decision-making process (Ersoy & Sever, 2019).

In practice, decision-making rarely relies on a single approach. Individuals often combine intuitive judgments with rational reasoning. For example, they may initially favor a particular option based on intuition but subsequently confirm their choice through a more systematic evaluation of available evidence. Conversely, because decision making often occurs in situations characterized by abundant information and considerable complexity, decisions can rarely be entirely rational and inevitably involve an intuitive component (Ersoy & Sever, 2019). This highlights the importance of knowledge and critical thinking in supporting effective decision-making. Children who possess adequate knowledge and strong critical thinking skills are generally better equipped to make appropriate decisions (McDermott et al., 2017). Consistent with this perspective, Widat et al. (2023) defined critical thinking as a reflective reasoning process that underpins both decision-making and problem-solving regarding what to believe and how to act (Widat et al., 2023).

The Effect of the HCLS Education Model on Children's Reproductive Health Knowledge

Although the HCLS educational model did not directly improve reproductive health knowledge, the indirect pathway through self-esteem was statistically significant. These findings suggest that reproductive health knowledge, as a component of the cognitive domain, can be enhanced through the HCLS intervention by first strengthening children's self-esteem. Although no significant direct effect was observed, the increase in knowledge scores was greater than the observed for the other outcome variables, including attitudes, critical thinking skills, and decision-making skills. Furthermore, knowledge emerged as a significant construct within the cognitive life skills model, indicating that it represents a fundamental component that should be strengthened to achieve broader improvements in cognitive life skills.

The findings of the present study are consistent with previous research demonstrating that game-based reproductive health education effectively improves children's knowledge (Damayanti et al., 2018; Edwards et al., 2016; Fiellin et al., 2017; Haruna, Hu, & Samuel, 2018). For example, Haruna, Hu, Kai, et al. (2018) reported that sexual health knowledge

among 12-year-old children increased by 48% following a game-based educational intervention. The same also found an improvement in participants' ability to make appropriate decisions in dating relationships, with the mean score increasing by 0.12.

Game-based learning is widely recognized by children as an engaging and enjoyable method of acquiring new knowledge. Compared with conventional lecture- and discussion-based approaches, educational games have been shown to produce greater improvements in children's knowledge, attitudes, and learning motivation (Haruna, Hu, Kai, et al., 2018). Furthermore, games create an interactive and enjoyable learning environment that increases both student engagement and teacher participation, thereby enhancing children's understanding of reproductive health concepts (Rubio & Besoain, 2025).

Effect of the HCLS Education Model on Attitudes Regarding Reproductive Health

Attitude refers to an individual's positive or negative evaluation of a particular subject, object, or issue that tends to remain relatively stable over time (Brinol et al., 2019). Previous studies have identified attitude as one of the strong predictors of risky sexual behaviors among adolescents (Indraswari & Shaluhayah, 2022; Rusady et al., 2017; Shaluhayah et al., 2020). This relationship exists because attitudes involve evaluating the potential benefits and consequences of a particular behavior. The HCLS education model integrates knowledge, attitudes, critical thinking, and decision-making skills to promote positive developmental outcomes and prepare children to adopt abstinence-related behaviors as they enter adolescence.

Initially, attitude was incorporated into the endogenous latent construct together with knowledge, knowledge, critical thinking, and decision-making skills under the higher-order construct of cognitive life skills in the PLS-SEM analysis. However, the measurement model indicated that attitude did not load significantly on the cognitive life skills construct. This finding is theoretically consistent because attitude belongs primarily to the affective domain rather than the cognitive domain. According to Hoque (2016), learning outcomes are classified into three domains: cognitive, affective and psychomotor. The cognitive and affective domains are both relevant to the development of decision-making skills, whereas the psychomotor domain, which focuses on physical movement and motor skills, was beyond the scope of the present study.

The effectiveness analysis demonstrated no significant direct effect of the HCLS education model on attitudes toward reproductive health. However, attitudes improved indirectly through self-esteem, suggesting that strengthening children's self-esteem may facilitate positive changes in affective outcomes. Increased self-esteem may subsequently contribute to improvements in knowledge, critical thinking, and decision-making, which together may promote more positive attitudes toward reproductive health (Wardani et al., 2025).

Although the direct effect was not statistically significant, children who received the HCLS intervention demonstrated improved attitude scores, whereas the control group experienced a slight decline. These findings suggest that the HCLS education model may help maintain or enhance positive attitudes towards reproductive health among aged 9-11 years. In contrast, without such educational interventions, children's attitudes may become less favorable due to

external influences encountered in their daily environment.

The relatively modest changes in attitudes observed in this study are consistent with the view that attitudes generally develop gradually and are shaped by broader sociohistorical influences, including cultural background, social norms, and generational experiences (Albarracin & Shavitt, 2018). These factors influence how individuals process information, interpret experiences, and form emotional evaluations, which subsequently affect their attitudes and behavioral decisions.

From a nursing perspective, the findings of this study have important practical implications. Nurses play a key role in promoting adolescent reproductive health by providing education that strengthens healthy cognitive life skills. Such interventions can improve children's understanding of reproductive health, support informed decision-making, and encourage healthy behaviors related to sexuality and pregnancy. Ultimately, these efforts may contribute to reducing the risk of sexually transmitted infections and unintended pregnancies during adolescence.

This study has a limitation. It focused exclusively on the cognitive aspects of life skills and did not examine emotional and social life skills, which are also essential components of adolescent development. Consequently, the findings provide only a partial understanding of life skills as an integrated construct that encompasses cognitive, emotional, and social competencies.

CONCLUSION AND RECOMMENDATION

The Healthy Cognitive Life Skills (HCLS) educational model did not directly improve children's cognitive life skills. Instead, its effects were primarily mediated through self-esteem, which subsequently enhanced reproductive health knowledge, critical thinking skills, and decision-making skills. Although the intervention did not have a significant direct effect on attitudes toward reproductive health, improvements in attitudes occurred indirectly through self-esteem, suggesting that changes in the affective domain may require additional or longer-term educational strategies.

These findings highlight self-esteem as a key psychological mechanism through which the HCLS education model promotes children's cognitive development. Therefore, educational interventions aimed at strengthening cognitive life skills should incorporate strategies that enhance children's self-esteem alongside cognitive learning activities. Future research should develop and evaluate interventions that integrate cognitive, affective, and social learning approaches to achieve more comprehensive improvements in children's reproductive health outcomes.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to all participants who contributed to this study. The authors also gratefully acknowledge the financial support provided by Diponegoro University under Grant No. 609-51/UN7.D2/PP/VIII/2024.

REFERENCES

- Adarsh, H., & Sahoo, S. (2023). Pornography and its impact on adolescent/ teenage sexuality. *Journal of Psychosexual Health*, 5(1), 35–39. <https://doi.org/10.1177/26318318231153984>
- Albarracin, D., & Shavitt, S. (2018). Attitudes and attitude change. *Annual Review of Psychology*, 69(August

2017), 299–327. <https://doi.org/https://doi.org/10.1146/annurev-psych-122216-011911>

- Alegre, H. (2024). Navigating risk situations faced by Filipino youth: learning to say “No” through theater for development on HIV. *Education Review*, 12(1), 1–19. <https://doi.org/10.70922/4wq10n53>
- Amorin, M. J. (2020). Locus of control and vulnerability to peer pressure: a study of adolescent behavior in urban Ghanaian context. *Scholarly Journal of Psychology and Behavioral Sciences*, 4(1). <https://doi.org/10.32474/SJPBS.2020.04.000177>
- Arslan, S. (2018). Social emotional learning and self-regulation: The mediating role of critical thinking. *International Journal of Learning and Change*, 10(2), 101. <https://doi.org/10.1504/IJLC.2018.090935>
- Arslan, S., & Demirtas, Z. (2016). Social emotional learning and critical thinking disposition. *Studia Psychologica*, 58(4), 276–285. <https://doi.org/https://doi.org/10.21909/sp.2016.04.723>
- Brinol, P., Petty, R. E., & Guyer, J. (2019). A historical view on attitudes and persuasion. Oxford University Press. <https://doi.org/http://dx.doi.org/10.1093/acrefore/9780190236557.013.510>
- Changwong, K., Sukkamart, A., & Sisan, B. (2018). Critical thinking skill development: analysis of a new learning management model for Thai high schools. *Journal of International Studies*, 11(2), 37–48. <https://doi.org/10.14254/2071-8330.2018/11-2/3>
- Damayanti, M., Wirakusumah, F. F., & Anwar, R. (2018). Reproductive health game (KEPO Game) to the self-concept and adolescent reproductive health motivation. *Global Medical and Health Communication*, 6(1), 162–168. <https://doi.org/10.29313/gmhmc.v6i3.2897>
- Du, H., Götz, F. M., Chen, A., & Rentfrow, P. J. (2023). Revisiting values and self-esteem: a large-scale study in the United States. *European Journal of Personality*, 37(1), 3–19. <https://doi.org/10.1177/08902070211038805>
- Edwards, E. A., Lumsden, J., Rivas, C., Steed, L., Edwards, L. A., Thiyagarajan, A., Sohanpal, R., Caton, H., Griffiths, C. J., Munafò, M. R., Taylor, S., & Walton, R. T. (2016). Gamification for health promotion: systematic review of behaviour change techniques in smartphone apps. *BMJ Open*, 6(e012447), 1–9. <https://doi.org/10.1136/bmjopen-2016-012447>
- Ersoy, A., & Sever, I. (2019). Investigation of decision-making skills of fourth grade students according to student and teacher opinions. *International Electronic Journal of Elementary Education*, 12(2), 167–182. <https://doi.org/10.26822/iejee.2019257664>
- Fiellin, L. E., Hieftje, K. D., Pendergrass, T. M., Kyriakides, T. C., Duncan, L. R., Dziura, J. D., Sawyer, B. G., Mayes, L., Crusto, C. A., Forsyth, B. W. C., & Fiellin, D. A. (2017). Video game intervention for sexual risk reduction in minority adolescents: randomized controlled trial. *Journal of Medical Internet Research*, 19(9), 1–13. <https://doi.org/10.2196/jmir.8148>
- Firmansyah, D., & Saepuloh, D. (2022). Social learning theory: cognitive and behavioral approaches. *Jurnal Ilmiah Pendidikan Holistik*, 1(3), 297–324. <https://doi.org/10.55927/jiph.v1i3.2317>

- Gayatri, S., Shaluhayah, Z., & Indraswari, R. (2020). Faktor-faktor yang berhubungan dengan frekuensi akses pornografi dan dampaknya terhadap perilaku seksual pada remaja di Kota Bogor (Factors related to the frequency of access to pornography and its impact on sexual behavior in adolescents in Bogor City). *Jurnal Kesehatan Masyarakat*, 8(3), 410–419. <https://doi.org/10.14710/jkm.v8i3.26456>
- Hariati, S., Andriani, Nurmaulid, Erfina, & Kadar, K. S. (2023). Preparedness of elementary school parents for offline learning decisions during the COVID-19 pandemic. *Jurnal Keperawatan Soedirman*, 18(3), 116–121. <https://doi.org/https://doi.org/10.20884/1.jks.2023.18.3.7332>
- Haruna, H., Hu, X., Kai, S., Chu, W., Mellecker, R. R., Gabriel, G., & Ndekao, P. S. (2018). Improving sexual health education programs for adolescent students through game-based learning and gamification. *International Journal of Environmental Research and Public Health*, 15(2027), 1–26. <https://doi.org/10.3390/ijerph15092027>
- Haruna, H., Hu, X., & Samuel, K. (2018). Adolescent school-based sexual health education and training: a literature review on teaching and learning strategies. *Global Journal of Health Science*, 10(3), 172–183. <https://doi.org/10.5539/gjhs.v10n3p172>
- Hoque, M. E. (2016). Three domains of learning: cognitive, affective and psychomotor. *JEFLER*, 2(2), 45–52. https://www.researchgate.net/publication/330811334_Three_Domains_of_Learning_Cognitive_Affective_and_Psychomotor
- Indarwati, R., Wahyuni, H. M., & Purwaningsih. (2019). Dampak efikasi diri dalam mencegah perilaku seks bebas pada remaja (Impact of self-efficacy in preventing promiscuous sex behavior in adolescents). *Indonesian Journal of Community Health Nursing*, 8(1), 17–22. <https://doi.org/10.20473/ijchn.v4i1.12354>
- Indraswari, R., & Shaluhayah, Z. (2022). Analisis karakteristik remaja terhadap perilaku-perilaku berisiko kesehatan (Analysis of adolescent characteristics of health-risk behaviors). *Higeia*, 6(2), 144–151. <https://doi.org/10.15294/higeia.v6i2.44420>
- Indraswari, R., Shaluhayah, Z., Widjanarko, B., & Suryoputro, A. (2022). Health Risk Behaviors and Life Skills of Indonesian Children: a Qualitative Analysis Using Social Cognitive Theory. *Southeast Asian Journal of Tropical Medicine and Public Health*, 53, 29–51. <https://doi.org/https://journal.seameotropednetwork.org/index.php/jtropmed/article/view/743>
- Life skills - teacher's manual. (2024). Central Board of Secondary Education, Government of India. https://www.cbse.gov.in/cbsenew/teacher_manual.html
- Loureiro, R. J. (2020). Decision making in adolescents: a multifaceted construct. *Journal of Human Growth and Development*, 30(2), 160–163. <https://doi.org/10.7322/jhgd.v30.10362>
- McDermott, F., Henderson, A., & Quayle, C. (2017). Health social workers sources of knowledge for decision making in practice. *Social Work in Health Care*. <https://doi.org/https://doi.org/10.1080/00981389.2017.1340391>
- Ministry of Health Indonesia. (2016). Perilaku berisiko kesehatan pada pelajar SMP dan SMA di Indonesia (Health risk behavior among junior and high school students). https://www.who.int/ncds/surveillance/gshs/GSHS_2015_Indonesia_Report_Bahasa.pdf?ua=1
- Motlagh, M., Rejaei, L., & Jonidi, A. (2016). Priorities in health education needs of youth based on needs assessment and stakeholder involvement, in areas covered by the health departments of Iran University of Medical Sciences. *Journal of Education and Community Health*, 3(1), 51–57. <https://doi.org/10.21859/jech-03017>
- Murphy-Graham, E., & Cohen, A. K. (2019). Executive summary: life skills education for adolescents in developing countries: what are they and why do they matter? https://www.salzburgglobal.org/fileadmin/user_upload/Documents/2010-2019/2018/Session_603/3_LifeSkillsWhydotheyMatter_IEFGmeeting.pdf
- National Population and Family Planning Board. (2018a). Survei demografi dan kesehatan Indonesia 2017 (Demographic and health surveys of Indonesia 2017). <https://archive.org/details/LaporanSDKI2017Remaja>
- National Population and Family Planning Board. (2018b). Survei kinerja dan akuntabilitas program 2018 (Program performance and accountability survey 2018). BKKBN. <https://archive.org/details/2018SKAPKELUARGA2018>
- Pihahey, P. J., & Soripet, M. (2023). Parental role, social media, peer support, and their associations on attitude toward reproductive health in female students in junior high schools, Manokwari, West Papua. *Journal of Health Promotion and Behavior*, 8(1), 34–43. <https://doi.org/10.26911/thejhp.2023.08.01.05>
- Rosen, J., Kartik, P., & Vella-Baldacchino, M. (2025). From classroom to clinic: a scoping review of critical thinking and decision-making in orthopaedic education for medical students and residents. *Current Reviews in Musculoskeletal Medicine*, 19(9), 1–12. <https://doi.org/10.1007/s12178-025-10002-x>
- Rubio, C., & Besoain, F. (2025). Pervasive games for sexual health promotion: scoping literature review. *JMIR Serious Games*, 13, e58912. <https://doi.org/10.2196/58912>
- Rusady, I. K., Shaluhayah, Z., & Husodo, B. T. (2017). Analysis of needs for reproductive health education in junior High school students in Pedurungan District, Semarang. *Jurnal Kesehatan Masyarakat (e-Journal)*, 5(5), 1010–1020. <https://doi.org/10.14710/jkm.v5i5.19229>
- Rutgers WPF Indonesia. (2018). SETARA semangat dunia remaja: buku jurnal siswa kelas 7. <https://rumahcemara.or.id/wp-content/uploads/2022/10/Semangat-Dunia-Remaja.pdf>
- Sa, Z., Tian, L., & Wang, X. (2021). Evidence for a comprehensive sexuality education intervention that enhances Chinese adolescents' sexual knowledge and gender awareness and empowers young women. *Sex Roles*, 85(5–6), 357–370. <https://doi.org/10.1007/s11199-021-01223-8>
- Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In *Handbook of Market Research* (pp. 1–47). Springer International Publishing. https://doi.org/10.1007/978-3-319-05542-8_15-2

- Shaluhayah, Z., Musthofa, S. B., Indraswari, R., & Kusumawati, A. (2020). Health risk behaviors: smoking, alcohol, drugs, and dating among youths in rural Central Java. *Kesmas: National Public Health Journal*, 15(1), 17. <https://doi.org/10.21109/kesmas.v15i1.2864>
- Tampubolon, M. M., Tampubolon, N. R., & Sari, N. Y. (2026). Exploring adolescents' needs in sexual and reproductive health literacy with cultural sensitivity: a mixed-methods study. *Jurnal Keperawatan Soedirman*, 21(1), 15–20. <https://doi.org/https://doi.org/10.20884/1.jks.2026.21.1.18589>
- Vong, S. A., & Kaewurai, W. (2017). Instructional model development to enhance critical thinking and critical thinking teaching ability of trainee students at regional teaching training centre in Takeo Province, Cambodia. *Kasetsart Journal of Social Science*, 38(1), 88–95. <https://doi.org/https://doi.org/10.1016/j.kjss.2016.05.002>
- Wahab, A., Mada, U. G., Wilopo, S., Mada, U. G., Hakimi, M., & Mada, U. G. (2018). Declining age at menarche in Indonesia: a systematic review and meta-analysis. *International Journal of Adolescent Medicine and Health*, September, 1–9. <https://doi.org/10.1515/ijamh-2018-0021>
- Wardani, D. A., Sharoni, S. K. A., & Triyanto, E. (2025). Factors associated with sexual intention among students East Kalimantan in preventing premarital sexual behavior. *Jurnal Keperawatan Soedirman*, 20(3), 165–170. <https://doi.org/https://doi.org/10.20884/1.jks.2025.20.3.15612>
- Widat, F., Zilatul Hikmah, D. M., Hasanah, Z., & Baharun, H. (2023). Strategies to improve critical thinking skills for children through the beyond center and circle time (BCCT) method. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(4), 5072–5083. <https://doi.org/10.31004/obsesi.v7i4.4206>