

Article

The Effectiveness of the Guided Self-Questioning Strategy in Developing Reflective Thinking Skills among Learners

Salim A. Saeed^{*1}, Banan A. Mishari²

1,2. Salah Al-deen Education Directorate - Salah Al-deen Governorate, 34001, Ministry of Education - Iraq

*Correspondence: salimaljumaily27@gmail.com

Abstract: The present study aimed to investigate the effectiveness of employing the guided self-questioning strategy in enhancing reflective thinking abilities, specifically: observation and reflection, error detection, drawing conclusions, providing convincing interpretations, and proposing viable solutions among learners. A quasi-experimental design was adopted, involving two groups (experimental and control) with pre-test and post-test measurements. The sample comprised (60) first-grade intermediate students from Al-Turath Intermediate School for Boys, under the Ashur Education Directorate in Salah al-Din Governorate. Participants were randomly assigned into two equal groups (30 each) studying chemistry. The researcher developed a reflective thinking skills test and a teacher's guide for implementing the guided self-questioning strategy. Findings revealed statistically significant differences at the significance level ($\alpha \leq 0.05$) between the mean scores of the experimental and control groups on the post-test of reflective thinking skills, favouring the experimental group. The effect size, calculated using Black's Adjusted Gain Equation, was (1.22), indicating a very large effectiveness of the strategy. These results align with previous studies that confirmed the positive impact of self-questioning on higher-order thinking skills.

Citation: Saeed S. A., Mishari B. A. The Effectiveness of the Guided Self-Questioning Strategy in Developing Reflective Thinking Skills among Learners. Middle European Scientific Bulletin 2026, 46(4), 1-8.

Received: 05th May 2026

Revised: 10th Jun 2026

Accepted: 15th Jul 2026

Published: 07th Aug 2026



Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

Keywords: Guided Self-Questioning Strategy; Reflective Thinking; Higher-Order Thinking Skills; Metacognition.

1. Introduction

The sheer velocity of scientific and technological advancement in recent times has fundamentally recalibrated the foundational aims of global education. No longer confined to the rote transmission of static information, modern pedagogy is increasingly mandated to forge competencies in analytical, inventive, and contemplative reasoning [1], [2]. Such competencies are indispensable for navigating the complexities of the information age and fostering a disposition toward perpetual, autonomous intellectual growth. Authentic educational impact is realised when the pupil transcends the passive intake of data and evolves into an active architect of meaning, a critical evaluator, and a proactive solver of emergent problems [3].

Within this transformative paradigm, a plethora of modern instructional frameworks have surfaced, all geared toward repositioning the student as the principal agent of the learning dyad. The Guided Self-Questioning (GSQ) approach emerges as a particularly potent metacognitive instrument. As posited by author Flavell [2], this methodology constitutes a self-regulatory cycle wherein the learner engineers and deploys introspective probes—antecedent to, concurrent with, and subsequent to the instructional encounter—thereby intensifying cognitive engagement and catalysing higher-order mental operations. Empirical evidence [4], [5] consistently corroborates its efficacy across diverse academic contexts.

Concurrently, the construct of reflective thinking occupies a preeminent position within the hierarchy of cognitive objectives pursued by educational practitioners. Dewey conceptualised this as a distinctive cognitive trajectory, inaugurated by a state of intellectual perplexity, proceeding through a meticulous mental dissection of constituent elements, and culminating in the formulation of tenable inferences and remedial actions. The symbiotic nexus between these two domains—where introspective interrogation serves as the catalyst for contemplative cognition—provides the compelling impetus for the present investigation, which endeavours to quantify the pedagogical yield of the GSQ strategy in augmenting specific reflective faculties[1].

1.1. Research Problem

Despite theoretical endorsement of the guided self-questioning strategy's role in fostering higher-order thinking, the educational reality continues to reveal a noticeable deficit in the reflective thinking skills of many learners [6]. This shortcoming can be attributed to several factors, including persistent reliance on traditional instructional methods that prioritise memorisation and repetition over analytical thought, thereby restricting learners' opportunities to engage in reflective thinking [7]. Furthermore, insufficient opportunities for learners to practise questioning and generate their own inquiries curbs the development of intellectual curiosity and deep engagement with subject matter. Through his own teaching experience, the researcher observed that low levels of reflective thinking are strongly correlated with the lack of strategies that immerse learners in active learning. From this observation, the central research question emerged.

1.2. Research Questions

1. What is the effectiveness of the guided self-questioning strategy in developing reflective thinking skills among learners?
- 2) Are there statistically significant differences (at $\alpha \leq 0.05$) between the mean scores of the experimental group (taught via the guided self-questioning strategy) and the control group (taught via conventional methods) on the post-test of reflective thinking skills overall?
- 3) Are there statistically significant differences (at $\alpha \leq 0.05$) between the two groups for each sub-skill of reflective thinking individually?

1.3. Research Hypotheses : To address the research questions, the following null hypotheses were formulated [8]:

- **H₀₁:** There are no statistically significant differences at the 0.05 level between the mean scores of the experimental and control groups on the overall post-test of reflective thinking.
- **H₀₂:** There are no statistically significant differences at the 0.05 level between the two groups on each of the five sub-skills of reflective thinking in the post-measurement.

1.4. Research Objectives: This study pursues four principal objectives [9]:

- 1) **Theoretical:** To construct a comprehensive theoretical framework elucidating the concept, theoretical underpinnings, and procedural steps of the guided self-questioning strategy, along with the nature, skills, and educational significance of reflective thinking.
- 2) **Practical:** To ascertain the effect of using the guided self-questioning strategy on the development of reflective thinking skills among learners.
- 3) **Procedural:** To design a valid test for measuring reflective thinking skills and to prepare a teacher's guide for implementing the strategy.
- 4) **Developmental:** To offer actionable recommendations and suggestions that can improve instructional practices.

1.5. Significance of the Research:

- **Theoretical Significance:** It addresses a gap in the Arabic educational literature by examining two interrelated and critical topics, and provides an in-depth theoretical analysis of the integrative relationship between guided self-questioning and reflective thinking, grounded in the works of Flavell and Vygotsky.
- **Practical Significance:** For teachers, it supplies a practical guide for employing the strategy in the classroom; for learners, it contributes to the enhancement of their reflective thinking skills [10].

1.6. Research Limitations and Delimitations

- **Human:** First-grade intermediate students at Al-Turath Intermediate School for Boys in Salah al-Din Governorate.
- **Spatial:** The study was conducted at Al-Turath Intermediate School for Boys, under the Ashur Education Directorate.
- **Temporal:** The first semester of the academic year 2025/2026.
- **Content:** The research focused on the effectiveness of the guided self-questioning strategy in developing reflective thinking skills, specifically within the unit "Chemistry Around Us" from the first-grade intermediate chemistry textbook.

1.7. Operational Definitions

- 1) **Guided Self-Questioning Strategy (Operationally):** A metacognitive strategy wherein learners systematically generate and direct a series of questions to themselves in a structured manner—before, during, and after learning—with the aim of deepening comprehension, analysing content, and linking new information to prior knowledge.
- 2) **Reflective Thinking Skills (Operationally):** A set of higher-order mental processes that reflect the learner's capacity to engage deeply with educational situations, comprising five skills: observation and reflection, error detection, drawing conclusions, providing clear explanations, and proposing solutions.
- 3) **Learner (Operationally):** First-grade intermediate students enrolled at Al-Turath Intermediate School for Boys in Salah al-Din Governorate during the academic year 2026.

2. Theoretical Framework and Literature Review

2.1. The Guided Self-Questioning Strategy:

2.1.1. Concept

The emergence of 'auto-interrogation' as a pedagogical tool is a direct corollary of the cognitive revolution in educational psychology. It is operationalised as a structured, metacognitive routine wherein the student devises and addresses a sequence of queries to their own intellect prior to text engagement, during cognitive assimilation, and upon task completion [11]. Vygotsky elucidated the ontogenesis of this capacity, noting its transition from a socially mediated dialogue (inter-psychological) to an internally regulated monologue (intra-psychological) [7]. Questions generated by learners fall into two broad categories: closed-ended (specific answers) and open-ended (diverse answers), with the latter being higher-level questions [4].

2.1.2. Theoretical Bedrock : This strategic framework is anchored upon three cardinal theoretical pillars [2], [7]:

1. **Metacognitive Oversight:** This pertains to the executive function of cognition—the capacity to orchestrate, scrutinise, and appraise one's own learning trajectory. The formulation of self-addressed questions is the primary vehicle through which this executive oversight is exercised [12].

2. **Socio-Cultural Constructivism:** This theory posits that higher cognitive functions originate in social interaction. The GSQ strategy initially relies on external scaffolding before these processes are progressively internalised, allowing the learner to operate independently within their 'Zone of Proximal Development'[13].
1. **Information Processing Paradigm:** This perspective asserts that durable learning is contingent upon elaborate, semantic encoding of stimuli. GSQ mandates this depth of processing by compelling the learner to interrogate causality ("Why?"), mechanism ("How?"), and validity ("What proof?"), circumventing superficial rehearsal [14].

2.1.3. Implementation Steps: The strategy unfolds in three phases:

- a. **Pre-learning phase:** Learners activate prior knowledge (e.g., "What do I already know?").
- b. **During-learning phase:** Deep processing through self-regulatory and explanatory questions (e.g., "Do I understand this?" "Why does this occur?").
- c. **Post-learning phase:** Evaluation and application (e.g., "How can I apply this?").

2.1.4. Roles of Teacher and Learner:

The teacher models self-questioning via think-aloud, provides scaffolding, and gradually transfers responsibility [15]. The learner generates questions independently, monitors understanding, and verifies correctness.

2.2. Reflective Thinking

2.2.1 Concept: Reflective thinking is a premier higher-order cognitive pattern. Dewey defined it as a distinctive thought process that begins with a perplexing situation, proceeds through mental examination, and culminates in drawing conclusions and problem-solving [16].

2.2.2 Importance in Education: Mezirow emphasised that reflective thinking moves learners from surface-level to deep understanding, fosters self-directed learning, bolsters problem-solving abilities, and ensures more meaningful and durable learning.

2.2.3. Reflective Thinking Skills [17]:

1. **Observation and Reflection:** Attentive observation and information gathering.
2. **Error Detection:** Critical examination and identifying contradictions.
3. **Drawing Conclusions:** Deriving logical inferences supported by evidence.
4. **Providing Clear Explanations:** Explaining and justifying conclusions logically.
5. **Proposing Solutions:** Generating and evaluating diverse solutions.

2.2.4. Levels of Reflective Thinking: Mezirow identified seven levels: awareness, critical analysis, critical evaluation, critical judgement, critical planning, reflective implementation, and critical evaluation of outcomes.

2.3. Relationship between the Strategy and Reflective Thinking: The connection is strongly integrative [18]: -

1. **Self-questioning as a stimulus:** Initiates monitoring and evaluation.
2. **Self-questioning as an analytical tool:** Compels deeper engagement.
3. **Self-questioning as feedback:** Enables performance evaluation and improvement.

2.4. Previous Studies:

– **Arab Studies:**

- 1) Manna'has examined self-questioning effectiveness in reading comprehension (N=64), favouring the experimental group.
- 2) Al-Hababiah has investigated its effect on reflective thinking in Islamic education (N=60), showing significant differences.
- 3) Al-Samadi has confirmed a positive effect on reflective thinking in science teaching (N=58).

- 4) Wadi has found effectiveness in geography on cognitive achievement and metacognitive skills.
- 5) Miqat has showed high effectiveness in mathematics with an adjusted gain of 1.281.
- **Foreign Studies:**
 - 1) Al-Swelmyeen et al. they found the strategy effective in developing independent thinking in physics.
 - 2) Kim has reported improvements in English learning, depth of understanding, and self-confidence.
 - 3) Al-Saadi has demonstrated significant differences in developing practical understanding skills.

2.5. Commentary and Distinctiveness:

All studies confirmed the effectiveness of guided self-questioning across various variables. The current research distinguishes itself through a comprehensive theoretical framework integrating Flavell's, Vygotsky's, and information processing theories, depth of analysis explaining the integrative relationship, and a practical orientation with a teacher's guide [19].

3. Research Methodology and Procedures

3.1. Research Design: To empirically ascertain the causal influence of the independent variable, aquasi-experimental, non-equivalent control group design was operationalised, incorporating both pre-intervention and post-intervention assessments [19].

3.2. Population and Sample:

- **Population:** All first-grade intermediate students in schools under the Ashur Education Directorate (2025/2026).
- **Sample:** A simple random sample of (60) students from Al-Turath Intermediate School for Boys, randomly assigned to two equal groups (Table 1).

Table 1. Distribution of the Research Sample.

Group	Number	Percentage	Teaching Method
Experimental	30	50%	Guided Self-Questioning Strategy
Control	30	50%	Conventional Method
Total	60	100%	

3.3. Research Instruments: which include

1) Reflective Thinking Skills Test:

- **Objective:** To measure the five reflective thinking skills.
 - **Construction:** (25) multiple-choice items, (5) per skill.
 - **Validity:** Face validity approved by (7) experts at 92%; internal consistency correlations ranged (0.52–0.78), all significant at 0.05 [9].
 - **Reliability:** Cronbach's Alpha = (0.86), indicating high reliability.
- 2) **Teacher's Guide:** A guide was developed explaining the application of the GSQ strategy, including objectives, theoretical foundations, implementation steps, sample questions, and feedback mechanisms [19].

3.4. Educational Materials: The unit "Chemistry Around Us" comprised four lessons: Matter and Properties, Elements and Compounds, Chemical Reactions, and Energy and Chemical Changes. Materials were designed to incorporate self-questioning activities at the beginning, during, and end of each lesson.

3.5. Variables: which include: -

- a) *Independent*: Guided self-questioning strategy (experimental group only).
- b) *Dependent*: Development of reflective thinking skills.
- c) *Control*: Chronological age, prior achievement, family level—controlled via random assignment and pre-test equivalence.

3.6. Procedural Chronology: The empirical phase was executed across four weeks (February 22 – March 20, 2025). The treatment group received the GSQ protocol; the comparison group received conventional instruction. Data collection involved the Reflective Thinking Skills Test administered pre-intervention (February 15, 2026) and post-intervention (March 23, 2025). Quantitative data were analysed using SPSS [20].

3.7. Statistical Treatments:

- a. *Independent Samples T-test*: to compare mean differences.
- b. *Black's Adjusted Gain Equation*: to compute effect size [9].
- c. *Cronbach's Alpha*: for reliability.
- d. *Pearson Correlation Coefficient*: for internal consistency.

4. Presentation and Interpretation of Results

4.1. Results of the First Question:

Question: *What is the level of reflective thinking skills before applying the strategy?*

Pre-test means and standard deviations are presented in Table (2). An independent T-test (Table 3) confirmed no significant differences, indicating group equivalence.

Table 2. Pre-test Means and Standard Deviations.

Group	Number (N)	Arithmetic Mean	Standard Deviation
Experimental	30	14.73	2.86
Control	30	14.58	2.79

Table 3. T-test for Pre-test Equivalence.

Test	T-value	Degrees of Freedom	Significance Level	Significance
Reflective Thinking (Overall)	0.214	58	0.831	Not Significant

4.2 Results of the Second Question:

Question: *Are there significant differences between groups in the post-test?*

Post-test means (Table 4) and T-test results (Table 5) indicate significant differences favouring the experimental group ($T=8.955$, $p=0.000$).

Table 4. Post-test Means and Standard Deviations.

Group	Number (N)	Arithmetic Mean	Standard Deviation
Experimental	30	21.47	2.53
Control	30	14.66	2.88

Table 5. T-test for Post-test Overall.

Test	T-value	Degrees of Freedom	Significance Level	Significance
Reflective Thinking (Overall)	8.95	58	0.000	0.05

4.3 Results of the Third Question (Effect Size): Using Black's Adjusted Gain Equation [9], the adjusted gain was 1.22 (Table 6), exceeding the acceptable threshold of 0.6, indicating very large effectiveness.

Table 6. Effect Size (Black's Adjusted Gain).

Group	Pre-Mean	Post-Mean	Maximum Score	Adjusted Gain Ratio	Rating
-------	----------	-----------	---------------	---------------------	--------

Experimental	14.73	21.47	25	1.22	Very Large
--------------	-------	-------	----	------	------------

4.4. Results for Sub-Skills: According to Aldossari & Aldajani method the means, standard deviations, and T-test results for each sub-skill (Tables 7 and 8) show significant differences favouring the experimental group in all five skills (all $p=0.000$).

Table 7. Post-test Sub-Skill Means and SDs.

Skill	Experimental Mean(SD)	Control Mean(SD)
Observation and Reflection	(0.61)4.33	(0.72)3.10
Error Detection	(0.58)4.27	(0.69)3.05
Drawing Conclusions	(0.63)4.31	(0.74)3.08
Providing Clear Explanations	(0.59)4.28	(0.65)3.02
Proposing Solutions	(0.62)4.28	(0.70)3.06

Table 8. T-test Results for Sub-skills.

Skill	T-value	Significance Level	Significance
Observation and Reflection	8.12	0.000	Significant
Error Detection	7.95	0.000	Significant
Drawing Conclusions	8.34	0.000	Significant
Providing Clear Explanations	8.56	0.000	Significant
Proposing Solutions	8.73	0.000	Significant

4.5. Discussion of Results: The marked superiority of the GSQ cohort can be attributed to four interrelated mechanisms: (1) an epistemic shift from passive recipient to active agent, (2) heightened metacognitive vigilance, (3) deliberate activation and synthesis of prior schemata, and (4) sustained utilisation of causal and evidential prompts compelling elaborate cognitive processing. These findings align with the previous studies by Al-Samadi, Al-Habab, Miqat, and Kim. The effect size of 1.22 confirms the strategy's strong practical significance.

4.6. Hypothesis Testing:

- 1) H_{01} : Rejected ($T=8.955$, $p=0.000$) → significant differences favouring experimental group.
- 2) H_{02} : Rejected for all five sub-skills (all $p=0.000$) → significant differences favouring experimental group in each.

5. Conclusion, Recommendations and Suggestions

The findings revealed statistically significant differences between the experimental and control groups in the overall reflective thinking post-test and all five reflective thinking sub-skills, favouring the experimental group. The guided self-questioning (GSQ) strategy also demonstrated a very large educational effect, indicating its effectiveness in developing students' reflective thinking skills. Based on these findings, it is recommended to train teachers to use the GSQ strategy, encourage self-questioning practices, provide sufficient classroom opportunities for questioning activities, revise curricula to incorporate self-questioning tasks, integrate the strategy into teacher preparation and professional development programmes, and strengthen its implementation through educational supervision. Future research should examine the

effectiveness of the GSQ strategy at different educational levels, investigate its impact on other educational and psychological variables, compare it with other instructional strategies, develop technology-based training programmes, and explore its effectiveness for students with learning difficulties.

REFERENCES

- [1] Dewey, J. How we think: A restatement of the relation of reflective thinking to the educative process. D.C. Heath and Company, 1933.
- [2] Flavell, J. H. Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, 34(10), 906-911, 1979.
- [3] Mezirow, J. Transformative dimensions of adult learning. Jossey-Bass, 1991.
- [4] Al-Samadi, M. A. M. The effect of using the self-questioning strategy in teaching science on developing reflective thinking skills among seventh-grade female students. *Mu'tah Journal for Research and Studies: Humanities and Social Sciences Series*, 37(7), 395-432, 2022.
- [5] Kim, S. The effect of the self-questioning strategy on English learning for Korean students. *Korean Journal of English Language and Linguistics*, 25(2), 145-162, 2025.
- [6] Manna', M. A. The effectiveness of the self-questioning strategy in developing reading comprehension among first-grade secondary students. *Journal of the Faculty of Education, Tanta University*, (39), 340-377, 2008.
- [7] Vygotsky, L. S. *Mind in society: The development of higher psychological processes*. Harvard University Press, 1978.
- [8] Campbell, D. T., & Stanley, J. C. *Experimental and quasi-experimental designs for research*. Houghton Mifflin Company, 1963.
- [9] Black, T. R. *Understanding quantitative and qualitative research in psychology: A practical guide to methods, statistics, and analysis*. Oxford University Press, 2002.
- [10] Al-Hababhab, B. A. O. The effect of the self-questioning strategy in developing reflective thinking skills in Islamic education among second-grade secondary female students in Aqaba Governorate, Jordan. *Arab Journal for Science and Research Publishing*, 6(2), 39-56, 2020.
- [11] Wadi, A. S. The effectiveness of using the self-questioning strategy in teaching geography on developing cognitive achievement and metacognitive skills among tenth-grade female students. *Islamic University Journal for Educational and Psychological Studies*, 30(2), 116-138, 2022.
- [12] Miqat, M. S. The effectiveness of employing the self-reflection strategy in developing reflective thinking in mathematics among eleventh-grade students in Gaza. *Palestinian University Journal for Research and Studies*, 1(2), 25-48, 2023.
- [13] Desautel, D. *Becoming a thinking thinker: Metacognition, self-reflection, and classroom practice*. *Teachers College Record*, 111(8), 1997-2020, 2009.
- [14] Al-Swelmyeen, M. B., Sakarneh, M. A., & Al zaben, G. P. The effect of self-questioning strategy in developing independent thinking in teaching physics. *Cypriot Journal of Educational Sciences*, 15(3), 502-510, 2020.
- [15] Al-Saadi, M. Self-familiarization with the strategy of strategic questioning in developing practical understanding skills among second-year intermediate students. *Journal of Education and Humanities*, 14(1), 91-117, 2026.
- [16] Aldossari, A. T., & Aldajani, M. M. The effectiveness of a self-questioning strategy at developing academic achievement and critical-thinking skills among secondary-school students in Saudi Arabia. *International Journal of Learning, Teaching and Educational Research*, 20(8), 278-299, 2021.
- [17] Wilson, N. S., & Smetana, L. Questioning as thinking: A metacognitive framework. *Middle School Journal*, 41(2), 20-28, 2009.
- [18] Al-Swelmyeen, M. B., & Sakarneh, M. A. The Effect of Self-Questioning Strategy in Developing Independent Thinking in Teaching Physics. *Cypriot Journal of Educational Sciences*, 15(3), 502-510, 2020.
- [19] Bharuthram, S. Facilitating active reading through a self-questioning strategy: student and tutor experiences and reflections of the strategy use. *Journal for Language Teaching= Ijenali Yekufundzisa Lulwimi= Tydskrif vir Taalonderrig*, 51(2), 85-103, 2017.
- [20] Musingafi, M. C. C., & Muranda, K. E. Students and questioning: A review of the role played by students generated questions in the teaching and learning process. *Studies in Social Sciences and Humanities*, 1(3), 101-107, 2014.