A Pathway Beyond Conventional Methods: Developing Critical Thinking in EMI Students Through Scenario-Based Learning

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Abstract

The present research explored the efficacy of the Scenario-Based Learning Approach in the development of the critical thinking of 42 randomly selected students of the EMI Master's program of the Computer Science Department of Laghouat University, Algeria. Through its learner-centered pedagogy, SBL is highly aligned with the needs of 21st-century learners. The research followed a descriptive quasi-experimental method to evaluate the effect of SBL on the critical thinking of the targeted subjects. Data analysis was conducted through SPSS Software. The results showed that the SBL approach effectively enhanced students' engagement, motivation, and development of practical skills. The research noted a noteworthy enhancement of students' critical thinking ability, as indicated by significant differences in pre-test and post-test scores. The SBL approach also influenced the learning process positively, rendering retention, reasoning, and attention during video lessons more effectively. Additionally, the use of technology through audio-visual lessons also enhanced the learning process, working to suit the environment of the learners. Finally, the use of SBL encourages students to think critically about learning. Suggestions stemming from this research include integrating SBL into curriculum design across all disciplines, providing teacher professional development in SBL approaches, placing priority on technological integration in the teaching practice, developing rigorous assessment plans in conjunction with SBL, and advocating for further research on the long-term effect of SBL on student learning.

Keywords: Scenario-Based Learning (SBL); descriptive quasi-experimental; critical thinking skills; technology; audio-visual lessons

Introduction

Since the early 1980s, there has been a promotion of a move away from the traditional lecture approach to more engaging, student-centered approach in tertiary education. As Charles C. Bonwell and James A. Eison outline in their publication "Active Learning: Creating Excitement in the Classroom," approaches promoting active learning not only

enable students to achieve content mastery comparable to that achieved through traditional lectures but also acquire higher-level skills, including critical thinking and problem-solving ability (Bonwell & Eison, 1991).

Active learning, according to Brame, is teaching practice in which students actively construct knowledge, think at higher levels, and reflect on their learning processes (Brame, n.d.). Active learning as a teaching practice necessitates students to use their knowledge in different contexts, critically analyze concepts, make sound decisions, and reflect upon their own learning processes—an overarching framework to facilitate critical thinking skills. Among numerous methods embraced in active learning, one of the most popular and prominent methods is Scenario-Based Learning (SBL).

SBL is a learning approach in which students learn by actively participating in complicated, real-world problems and challenges. This method entails having students work in small groups to spot, analyze, and resolve problems, usually under the leadership of a facilitator. It focuses on independent learning, critical thinking development, and enhancing problem-solving capabilities.

In language instruction, SBL can be defined as an instructional methodology that integrates language learning with problem-solving activities, where learners are prompted to use their language skills in authentic and contextually significant situations. The goal of this methodology is to develop language proficiency through learners' engagement in real-life contexts of language use and hence promote a better understanding and usage of linguistic principles. (Hmelo-Silver, 2004).

Literature Review

Critical thinking is defined in many ways; however, its essence is best explained by Facione et al. (2020) as "thinking that serves a purpose such as making a case, interpreting meaning, or solving a problem" (p. 4). In essence, critical thinking demands the application of reason in a particular direction towards the attainment of a definite objective (Butler, 2012). For the scope of this research, critical thinking has been operationalized as "deliberate, self-regulated evaluation that uses interpretation, analysis, evaluation, inference, and explanation on the basis of evidential, conceptual, methodological, criteriological, or contextual considerations" (Facione et al., 2020, p. 27).

Critical thinking is one of the basic aspects of the globalization era, incorporating cognitive processes that enable the examination and evaluation of information or problems (Sa'diyah, 2021). According to Boumediene (2024), teachers should help students develop their critical and creative thinking skills, along with other higher-order cognitive skills, by using diverse teaching approaches. The objective of critical thinking is to decide the most suitable solutions and has always been one of the major

components of education, asking students to solve problems at a young age (Hapsari, 2016). Educating critical thinking skills is one of the primary objectives of social studies education (Karabulut, 2012).

Golden demonstrated in 2018 that the Scenario-Based Learning Approach enhances critical thinking and decision-making in learners to a great extent. The method is highly beneficial for developing critical thinking ability and closing the gap between theory and practice. Parikh (2016) emphasized that educational growth and development depend greatly on the educational system and methods. Norris (2022) advocates for the creation and development of locally produced teaching and learning materials. There is a need to enhance the education system and adopt newer strategies. Further, incorporating learning with audio-visual aids can increase the performance and comprehension of students (Hasan, 2019).

In the current academic setting, critical thinking is as important as language skills. The fast growth of knowledge, technological advancements, and worldwide complexities require students to possess excellent critical thinking skills. Decision-making, analysis, and critical thinking ability become very pertinent in the age of the internet characterized by information overload. Vygotsky's sociocultural theory, which stresses the role of social interaction in cognitive development, underlies the utilization of dilemma situations in which language is used for both cognitive and communicative functions (Vygotsky, 1978).

Bloom's taxonomy recognizes the development from basic knowledge acquisition to critical thinking, and language learners must master six cognition levels to reach higher-order thinking. In the case of EMI, the meeting point of language proficiency and critical thinking is complex. Students must be excellent speakers with cognitive abilities for deeper and critical thinking to meaningfully respond to English.

Nonetheless, conventional pedagogical practice tends to prioritize linguistic correctness over intellectual and analytical growth (Darasawang & Reinders, 2010). Learners might therefore be adept in language but not in articulating sophisticated and critical stances in English. The transition from a simple rote memorization and compliance with grammar rulebook to an interactive, student-centered learning approach is necessary in order to realize a learning environment supportive of enabling students to analyze, evaluate, and create content in their second language (Freire, 1970). The emphasis on exam-oriented education and exacting use of language often neglects the development of fundamental critical abilities (Khamkhien, 2010).

Research indicates that SBL greatly improves critical thinking in students from different areas of study. It has been researched that the use of case scenarios in learning activities can successfully bring about a shift from memorization to critical thinking for students, and in particular assist international students who struggle with expressing

critical analytical skills (Norris, 2022). Further, it has been discovered that scenario-based assessments can influence students' approaches to problem-solving and the transfer of thinking across contexts, highlighting the necessity to offer students chances to engage with ill-structured problems to foster systems thinking skills (Hermoza, 2023). In addition, scenarios serve as tools for self-reflection that allow people to assess their present situation and engage with possible, probable, and speculative future events, making them valuable in developing critical thinking skills and fostering initiative, autonomy, and leadership in a globalized and information-rich world (Hosseinzadeh, 2018).

However, this study comes at a time of worldwide needs, individual complexities, and personal educational outlooks. The main aim is to investigate the application of scenario-based learning in EMI classrooms to improve the critical thinking skills of computer science students. This study also investigates the complex interplay of critical thinking with student engagement, motivation, and skill development for real-life application, with the aim of establishing how scenario-based learning can enhance the above aspects together.

Methodology Design and Data Analysis

This research utilized a descriptive quasi-experimental research design to assess the efficacy of the Scenario-Based Learning (SBL) method in enhancing critical thinking ability in master's students in Computer Science studying English Medium Instruction (EMI). The descriptive element was intended to record learners' views on the SBL approach in actual learning settings, and the quasi-experimental element was intended to establish a causal relationship between the intervention and the shift in cognitive performance. This dual system allowed the researcher to both record perceptual change and observe concrete skill attainment over time (Thomas, 2022).

A random sampling method was employed in choosing a group of 42 students, each with an intermediate level of proficiency, to provide uniformity. Both a pre-test and a post-test to assess the critical thinking ability of the participants before and after exposure to the SBL sessions were administered to them.

Instructional content was tailored with self-designed lesson plans in relation to the educational interests and exposure to technology of the students. Students' perceptions were gauged on four areas of SBL through a standardized questionnaire: Capturing Attention, Clarifying Learning Objectives, Stimulus Presentation, and Knowledge Application and Transfer. The instrument was expert validated by two lecturers in English and pilot tested in another group of 15 students. Its internal consistency was ascertained using Cronbach's alpha to determine the reliability of the tool.

Responses were gathered on a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree) and qualitative categories from "Not Observed" to "Highly Observed."

Concurrently, a critical thinking standardized test measured cognitive skill attainment, scored on a 0 to 10 rubric (with categories from "Did Not Meet Expectations" to "Outstanding").

Data were analyzed using SPSS, including:

- Descriptive statistics (mean and standard deviation) to profile perceptions in motivational, cognitive, and instructional domains (refer to Tables 1 and 2),
- A paired-sample t-test to determine significant differences in pre-test and post-test scores (Table 2),
- And Pearson correlation analysis for examining correlations between perceived SBL components and post-intervention performance in critical thinking skill areas of assumption recognition, argument evaluation, and conclusion formation (Table 3).

The application of these statistical techniques enabled an exhaustive understanding of both the learners' subjective experience and the objective results achieved through the integration of SBL. The employment of various variables permitted analysis from a multi-dimensional perspective of the interaction between perception dynamics and instructional design regarding student performance.

Findings and Discussion

Effectiveness of the Scenario-Based Learning (SBL) Approach

The survey (Table 1) reveals a strong perception of the students regarding the SBL approach along various critical dimensions of instruction. In the dimension of attention engagement, students rated their engagement highly as reflected through a mean value of 3.19 (SD = 0.85). This finding corroborates that the employment of SBL techniques, especially through the incorporation of multimedia content and scenario-based exercises—effectively held learners' attention and interest throughout the instructional sessions. Students consistently showed keen interest in forthcoming material and gave directed attention throughout video presentations, and observations were said to demonstrate widespread enthusiasm for interactive media. The findings endorse the effectiveness of SBL in developing motivation and interest in learner-centred settings.

Clarifying Instructional Purposes

In determining the worth of the SBL framework in explaining instructional objectives, students were in moderate agreement with the relevance and clarity of learning outcomes. The mean for this factor was 2.76 (SD = 0.43). Although a slightly smaller figure than that observed in other aspects, this still indicates that a considerable number of students perceived the objectives to be clear and relevant. It must be noted

that goal setting, as paired with anticipatory guidance, directed students throughout lessons. However, the relatively lower means can indicate the need for more overt goal communication or visual reinforcement strategies to enhance congruence between instructor intent and learner expectations.

Delivery of Educational Stimuli

The delivery of stimuli by organized video lectures, ethically appropriate content, and e-communication provided a high general score of 3.07 (SD = 0.32). Learners were satisfied with the content's clarity, the appropriateness of its organization, and the application of information and communication technology (ICT) tools. Particularly, aspects such as systematic progression, alignment with learners' comprehension, and technology flexibility were determiners of their high evaluation. High scores in this category are congruent with the prevailing educational standards that encourage multimodal presentation of material and infer that students derive advantages from employing visual and auditory teaching aids in combination.

Enhancing Retention and Transfer of Learning

The retention and transfer aspect garnered unanimous support from the student body, achieving a mean rating of 3.04 (SD = 0.35). Learners indicated that scenario-based tasks assisted greatly in applying acquired knowledge to novel situations, facilitated reinforcement of key concepts, and promoted integration of skills into real-world contexts. Top marks for elements such as "applying knowledge to new environments" and "connecting content to personal experiences" are a testament to the SBL model in facilitating both abstract and real-world thinking.

This combined boost in learner response supports the theoretical basis of scenario-based instruction: cognitive activation, when placed within meaningful and authentic learning contexts, leads to greater processing and long-term retention of information.

Comparative Overview Across SBL Dimensions

Of the four main instructional areas assessed:

- Engagement scored the highest with a mean of 3.19,
- Followed closely by Presentation of Stimuli (3.07),
- Then Retention and Transfer of Learning (3.04),
- And finally, Clarifying Objectives (2.76).

These results suggest that students respond best to lively, interactive presentation modes and that while clarity of objectives is still vital, it may have to be enhanced yet again to match the effectiveness of the other factors.

Engagement & Motivation Indicators	Mean	SD
Involve students to take an active part in classroom proceedings	3.19	0.85
Provide simple ways of comprehending lesson concepts.	3.11	0.82
Promote peer interaction and discussion.	3.26	0.79
Promote student interest and use of knowledge	3.05	0.83
Facilitate regular interaction and continuity of learning	2.91	0.90
Promote integration of new knowledge with prior knowledge	3.22	0.81
Stimulate student curiosity and critical questioning	3.34	0.80
Encourage involvement by employing participatory learning strategies.	3.29	0.83
Composite Average	**3.17**	**0.38**

Clarity of Learning Objectives

Learning Objective Perception Criteria	Mean	SD
Assists students to embrace new thematic material	2.65	0.78
Meets contemporary technological demands and requirements.	2.72	0.88
Cultivate a good attitude toward the course material.	2.61	0.91
Describes major results of the lesson	2.93	0.89
Help students to expect significant tasks and expectations	3.09	0.81
States objectives in a clear and organized way.	2.59	0.80
Composite Average	**2.76**	**0.43**

Effectiveness of the Stimuli Presentation

Features of Content Presentation and Delivery	Mean	SD
Organized in a logical and step-by-step format	3.25	0.76
Cultivate favorable perspectives on using digital tools	3.41	0.72
Demonstrate ethical principles in digital media utilization	2.85	0.88
Utilize language familiar to a broad audience	2.92	0.86
Address the informational requirements of the target learners.	2.80	0.83
Make effective use of time and attention	2.70	0.85
Present well-defined frameworks of the topic under discussion.	3.20	0.79
Foster free creativity and versatile interaction.	3.38	0.74
Incorporate interactive Learning technologies	3.27	0.78
Split the content into manageable chunks.	2.96	0.85
Composite Mean	**3.07**	**0.32**

Retention and Transfer Enhancement

Retention & Transfer Indicators	Mean	SD
Include homework that cultivates critical analytical skills.	3.14	0.91
Promote inquiry and conceptual understanding.	2.93	1.01
Encourage creative problem-solving in real contexts	2.84	1.00
Facilitate knowledge flexibility to contemporary contexts	2.82	0.95
Strengthen fundamental material to enhance retention.	2.71	0.92
Promote putting theoretical knowledge into practice	3.12	0.83
Highlight major concepts while facilitating the learning process.	3.16	0.75
Relate concepts to students' personal lives	3.11	0.73
Enable cross-contextual application of learning	3.35	0.66
Provide equal opportunity to exhibit active knowledge	3.23	0.71
Composite Mean	**3.04**	**0.35**

Table 1: Scenario-Based Learning (SBL) Dimensions
Source: Authors

Pretest vs. Posttest Scores: Impact of Scenario-Based Learning on Critical Thinking

Table 2 displays the comparative performance of students on critical thinking tasks prior to and after exposure to the Scenario-Based Learning (SBL) intervention. The results evidently indicate that there is a significant improvement in all areas that were assessed: identification of assumptions, analysis of arguments, and drawing conclusions.

Cognitive Skill	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
Identifying Underlying Assumptions	4.78	1.95	8.12	1.45
Analyzing and Evaluating Arguments	2.38	1.64	7.45	1.57
Drawing Logical Conclusions	1.59	1.36	6.51	1.90

Table2: Pretest vs. Posttest Critical Thinking Tasks Scores
Source: Authors

The statistical test (paired-sample t-test) revealed that all three gains were statistically significant at the $p < .05$ level:

- Identifying Assumptions: $t = -10.03$
- Assessing Arguments: $t = -13.77$
- Drawing Conclusions: $t = -12.98$

These results suggest the efficacy of SBL in developing the key facets of critical thinking. Mean gains of more than 3 to 5 points on all domains reveal a movement from lower-order knowing to higher-order analytical thinking.

Discussion

Pre-test scores indicate that students had difficulty with abstract reasoning, specifically drawing logical conclusions, perhaps due to the fact that there was less prior exposure to critical thinking-based instruction. Yet, after SBL sessions, including real-world economic case situations, graphic storytelling, and facilitated reflection activities, students improved dramatically in cognitive depth and accuracy.

The most improvement was registered in argument analysis, with the students recording almost a three-time increase. This implies that SBL's contextualized and interactive approach—focused on argumentation, discussion, and analysis of evidence—successfully enhances analytical competency.

In addition, gains in drawing conclusions showed that students were not only comprehending concepts but were also synthesizing information and making informed decisions—a fundamental skill in critical thinking.

These results confirm the theoretical underpinnings of scenario-based learning, which are that learning is optimized if students are both cognitively and affectively engaged by problem-solving, contextually rich activities.

In conclusion, empirical evidence in Table 2 validates the fact that SBL is an effective pedagogical instrument in developing critical thinking among EMI students. The students performed better in thinking logically, questioning assumptions, and making sensible conclusions—all crucial skills for learning and workplace environments.

Correlation Between Perceived Use of SBL and Critical Thinking Outcomes

Table 3 shows Pearson correlation coefficients investigating correlations among students' perceptions of Scenario-Based Learning (SBL) dimensions—i.e., Capturing Attention, Clarifying Instructional Objectives, Stimulus Presentation, and Knowledge Transfer—and their post-test critical thinking achievement in areas: Recognizing Assumptions, Evaluating Arguments, and Drawing Conclusions.

Discussion

The results show modest to moderate correlations among students' perceptions of SBL elements and their critical thinking performance:

Capturing Attention was moderately positively related to drawing conclusions ($r = 0.339$), indicating that engaging and attention-grabbing tasks can enable learners to synthesize information and arrive at logical conclusions. It also demonstrated a weak relationship with evaluating arguments ($r = 0.244$), indicating its strength in promoting analytic concentration.

Clarifying Objectives, to our surprise, was weakly negatively correlated with both the identification of assumptions (r = -0.186) and drawing conclusions (r = -0.039), and this could be indicative that objectives were seen, but may not necessarily affect lower-order skills such as identifying implicit assumptions or making independent conclusions.

Stimulus Presentation of the material—presentation of the content—was positively related to evaluating argument (r = 0.281) and drawing conclusions (r = 0.149). These findings lend support to the merits of logically organized, stimulating instructional content in facilitating critical analysis and inference-making.

Knowledge Transfer and Retention correlated very poorly across all three cognitive areas, indicating that students might not see transfer-focused activities as being directly related to performance, even though they gain subconscious benefit through such reinforcement.

Interpretation

Although some SBL features positively correlate with particular cognitive gains, overall correlations are weak to moderate, suggesting that performance outcomes cannot be explained by perception alone. This reaffirms the intricacy of learning—although student perception increases engagement, it will not automatically translate into increased cognitive scores without being supported by effective instructional design and guided practice.

Furthermore, the low correlations indicate that SBL's actual strength likely lies in its formal use and interactive features instead of students' subjective impressions. While perception is not an effective predictor of achievement, across-the-board post-test score gains, (Table 2) affirms the practical efficacy of the SBL approach to the development of critical thinking skills.

SBL Dimension	Assumption Recognition (r)	Argument Evaluation (r)	Conclusion Formulation (r)
Capturing Learner Attention	0.112	0.244	0.339
Clarifying Instructional Objectives	-0.186	0.178	-0.039
Delivering Instructional Stimuli	-0.069	0.281	0.149
Fostering Application and Retention	0.079	0.084	0.029

Table3: Correlation Between Perceived Use of SBL and Critical Thinking Outcomes
Source: Authors

Conclusion, Summary and Implications

This research investigated the influence of the Scenario-Based Learning (SBL) model on the acquisition of critical thinking among Computer Science EMI students. Results of descriptive and inferential analysis show that the SBL model is very effective for enhancing learners' engagement, analytical performance, and the enhancement of students' cognitive reasoning application in academic settings.

Student perceptions of the SBL experience were very positive, particularly regarding provoking instruction, interesting presentation of content, and knowledge retention approaches. Descriptive ratings on these aspects indicate that SBL was seen as both academically challenging and pedagogically effective. Despite this, the correlation between perception and performance was moderately low, which suggests that subjective judgments by themselves may not be an effective way to anticipate measurable gains in cognitive outcomes.

Quantitative differences in the pre- and post-test scores were statistically significant in all areas covered: recognition of assumptions, evaluation of arguments, and drawing conclusions. These gains are supportive evidence for SBL as a method of teaching higher-order thinking. Especially revealing was the increased capacity of the students to draw logical conclusions, which was positively correlated with a moderate degree of class attention and participation.

These findings highlight the promise of SBL not only for enhancing student achievement, but for reframing the learning environment of the classroom by facilitating reflective inquiry, collaborative problem-solving, and conceptual sophistication. At a fundamental level, the SBL method makes students shift from being recipients of passive knowledge to being constructors of active meaning.

Implications and Recommendations

The results of this research have some significant implications for curriculum developers and teachers:

1. Putting Engagement First: Instructional designs focusing on students' attention-capturing—through interactive videos, real-world scenarios, and discussion questions—can greatly increase learners' knowledge synthesis and application.
2. Look Deeper Than Surface Perception: While feedback from students is crucial, pedagogical effectiveness needs to be measured by performance metrics, especially in skill-based areas like critical thinking.
3. Promote Objective Communication: Limited goal setting effect on test performance indicates the need to reinforce instructional objectives via visual scaffolding, task-oriented cues, or clear formative feedback.

4. Extend Disciplinary Scope: Although this research targeted Computer Science students, the SBL model is highly versatile. Its implementation in other fields—such as humanities, law, and health sciences—is an avenue worth pursuing.
5. 5.Design Targeted Assessment Tools: Future studies must include measurement criteria for the other components of critical thinking like inference, explanation, and self-regulation as suggested by Facione (2020).
6. 6. Carry Out Longitudinal Research: Longitudinal research on the impact of SBL exposure, particularly retention and transfer across courses, has the potential to shed more light on its impact on academic growth and lifelong learning.

In conclusion, this study affirms that Scenario-Based Learning is not just another instructional trend but a transformative pedagogical innovation, one that balances theory and practice and cognition and context. By placing learning in authentic situations and inviting active participation, SBL has proven to be an effective bridge for developing critical thinkers who are equipped to manage the uncertainties of a knowledge-driven world.

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Appendix A: Sample Scenario-Based Lesson Plan

Title: Ethical Conflict in Social Media Usage

- **Course**: English for Academic Purposes (Computer Science – EMI)
- **Level**: Master's (Intermediate English Proficiency)

Learning Objectives

- Enhance the learners' critical thinking and ethical decision-making.
- Use academic English for argument and justification.
- Analyze ethical issues based on logical, fact-supported arguments.

Materials

- Brief video of a data privacy scandal.
- Scenario distribution with stakeholder roles.
- Critical Thinking Rubric.
- Chart paper or online collaboration tools (e.g., Jamboard, Padlet).

Scenario Summary

Students are given a hypothetical scenario: an app created by a university is gathering sensitive user information without permission. The main protagonist, a student intern at the tech company, has a quandary: Should they speak up? To whom should they report it? What would be the repercussions?

The situation is developed in three stages, each of which brings new information. Students have to revise their position and explain their choices accordingly.

Activities

Engage (10 mins):

View the introductory video. Think-Pair-Share: 'What would you do?'

Explore (15 mins):

Read scenario handout (Phase 1). Identify stakeholders, ethical issues, and possible outcomes in groups.

Elaborate (20 mins):

Phases 2 and 3 introduce complications (media leak, stakeholder responses). Teams revise responses and create a recommendation.

Explain (15 mins):

Groups provide options with structured explanation (in the form of modals, conditionals, persuasive language). Q&A with peer feedback.

Evaluate (10 mins):

Students respond personally in writing on prompt: 'What did you learn about decision-making and ethics?'

Assessment

- Rubric evaluation of group presentation (clarity, logic, teamwork, use of English).
- Peer feedback form. - Graded individual reflection on relevance and depth.

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