

## Using Ill-structured Problems in Second Language Learning

Muhammad Mukhtar Aliyu

Department of English, Faculty of Arts and Education, Bauchi State University, Gadau, Bauchi  
State Nigeria

Email: aliyumhammadmukhtar39@gmail.com

Tel: +234(0)8032419913; +234(0)7055444523

### **Abstract:**

*This paper reviews the benefits of ill-structured problems in second language learning. It also highlights how to develop students' communication and other learning skills through solving ill-structured problems. Finally, the paper suggests that empirical studies should be conducted to provide better learning approaches through ill-structured problem-solving. It also gives some pedagogical implications for teachers.*

**Key Words:** *communication skills, learning skills, ill-structured problem, second language learning*

### **Introduction**

To cope with the current global challenges and demands of work places, students need not only a bulk of knowledge. They need effective communication skills and other learning skills such as critical thinking skills, problem-solving skills. The skills would enable them to apply the knowledge they acquired into practice and bring about meaningful developments in the professional world. The students would also lean to bridge the gap between theory and real-world practice in many fields of their studies (Tan, 2004). However, many students lack the required skills because the traditional methods of teaching do not encourage the promotion of thought among students. For instance, from the experience of teaching the English language in Nigeria, it is observed that most of the teaching approaches adopted by teachers and lecturers encourage competition among the students. As the results, many students end of memorising concepts and ideas rather than acquiring the essential skills that would help them cope with challenges in their learning and in the work place after graduation. To develop students learning skills, there is need to subject the students to a situation where they would be compelled to use the skills. For instance, Bligh (2000) suggests that to enable students to think, they must be placed in situations where they have to do so. Therefore, this paper proposes that engaging students in solving ill-structured problems may develop their communication and other required skills, and prepare them for the challenges of the work place. The use of ill-structured problem might facilitate second language learning. The process of solving the ill-structured problem might facilitate the students' second language learning, and enrich their critical thinking skills

(Tan, 2000) and cognitive structure, as the problem would trigger the context for engagement, curiosity, inquiry and quest to address real-world issues (Tan, 2003).

The term ‘ill-structured problem’ is defined as an open-ended problem encountered in everyday-life which has multiple solutions paths (Jonassen, 2000). It allows students to make interpretations based on their previous knowledge and experiences because it is related to their real-life situations (Savery & Duffy, 2001). The descriptions of the problem are not clearly defined and the information needed to solve it is not contained in the problem statement (Shin, Jonassen, & McGee, 2003). Therefore, students have to look at many methods and integrate several content domains before deciding on a particular solution (Jonassen, 2000). There may be many alternative solutions to the problem based on students’ perceptions and interpretations of the nature of the problem. To construct ill-structured problems that would engage and stimulate the students’ interest, Gallagher and Gallagher (1994, p. 285) identify some characteristics of ill-structured problems which teachers should focus at while constructing ill-structured problems for students. These include:

- a) Problem must be defined and possibly redefined
- b) Additional information is needed to solve the problem
- c) Focus on the nature of the problem
- d) Many different solutions are possible
- e) Higher motivation to solution

The use of the ill-structured problem in a learning environment is supported by the constructivist theory which encourages interaction among learners in a learning process. The instructional implication of the cognitive constructivist classroom is that students learn best by making discoveries, reflecting on their own previous experiences and discussing them, rather than blindly imitating the teacher or doing things by rote (Schunk, 2012). Savery and Duffy (1995) propose a constructivist framework which supports the ill-structured problem:

- a) Anchor all learning activities to a larger task or problem
- b) Support the learner in developing ownership for the overall problem or task
- c) Design an authentic task
- d) Design the task and the environment to reflect the complexity of the environment the learner should be able to function in at the of the learning
- e) Give a learner ownership of the process used to develop a solution

- f) Design the learner environment to support and challenge the learners' thinking
- g) Encourage testing ideas against alternative views and alternate contexts
- h) Provide an opportunity for, and support reflection on both the content learned and the learning process.

Based on the constructivist theory, a curriculum's content should be organised in such a way that it provides the background knowledge which, in turn, helps learners to construct new knowledge from the previous knowledge set (Aida Azlina, 2011). Therefore, an ill-structured problem can allow discovery learning to occur in a classroom. It provides students with a cognitive structure which serves as the background knowledge that helps them to provide experiences. It also allows them to construct new ideas or concepts that are beyond their current knowledge.

The use of the ill-problem is also supported in language learning environment. For example, according to the interactionist theories, the activities involved in solving the ill-structured problems, such as negotiation and interaction facilitate second language learning (Sarem & Shirzadi, 2014). It is also supported by Nunan's (1989) definition of a task in a language classroom. Nunan defines the task as "a piece of classroom work which involves learners in comprehending, manipulating, producing, or interacting in the target language while their attention is principally focused on meaning rather than form" (p. 10). The task here resembles the ill-structured problem because in solving ill-structured problem learners are encouraged to discuss, interact, and propose possible solutions to the problems, through which they develop their communication skills. This is also supported by Beglar and Hunt (2002) who assert that meaningful communication among learners promotes language learning.

Scholars have identified various steps which students should follow while solving ill-structured problems. For example, Voss and Post (1988) classify three major steps of solving ill-structured problems: 1) problem representation, which determines the solutions to the problem; 2) solution, in which students discuss how to eliminate the causes of the problems and implement solutions; and 3) evaluation, which assess the impact of the solutions on the situation. Tan (2000) also identify other processes of solving ill-structured as shown in Figure 1.

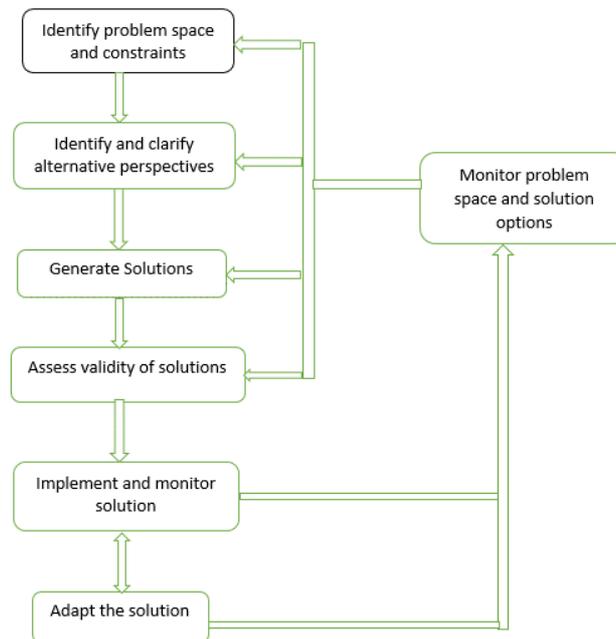


Figure 1: Process for ill-structured problem solving (Tan, 2000 p. 19)

Finally, to enable students to solve ill-structured problems effectively, Swartz, Costa, Beyer, Reagan, and Kallick (2008) propose a series of questions which assist the students' thinking process. Through answering the questions, students may develop their critical thinking and learn to become better problem-solvers:

1. What is the problem?
2. Why is there a problem?
3. What are some possible solutions?
4. What would result from these solutions?
5. What solution is the best and why?

While solving ill-structured problems, students are given the opportunity to interact and discuss the problem with classmates in order to propose viable solutions to the problems. Students are more likely to be motivated while solving the ill-structured problem (Jonassen, 2000). The problem creates cognitive conflict, which promotes the students' higher order thinking skills such as critical thinking (Hmelo-Silver, 2004; Savery & Duffy, 2001). This is because they may encounter the same problems as the ones encountered by the experts in the field. They may also develop their argumentative skills, as they are required to consider alternative perspectives while proposing solutions. They are also required to provide evidence for their solution in order to convince their peers (Jonassen, 2000). Students learn to practise justifying their solution in a

logical way to persuade others that what they propose is correct or workable. They may also develop their metacognitive skills, as the ill-structured problems require them to control and regulate the selection and execution of a solution process (Shin & McGee, 2003). In the ill-structured problem-solving processes, students employ their metacognitive skills, such as planning what to do, changing strategies, modifying plans, evaluating and re-evaluating of goals in order to reach an optimal solution. This could be achieved through metacognitive questioning provided by tutors or peers during the problem-solving activities. Finally, they learn concepts, ideas, techniques and how to apply domain knowledge in a meaningful way instead of storing a bunch of concepts in their memories (White & Frederiksen, 1998).

### Ill-structured Problem in L2 Learning

From the discussions so far, it is evident that ill-structured problem can facilitate second language learning. It could be used in teaching any of the language skills: speaking, listening, writing and reading or any aspect of language. In the area of writing, for example, Flower and Hayes (1981) identify three recursive elements: i) the task environment, ii) the writer's long-term memory and iii) the writing process as shown in Figure 2.

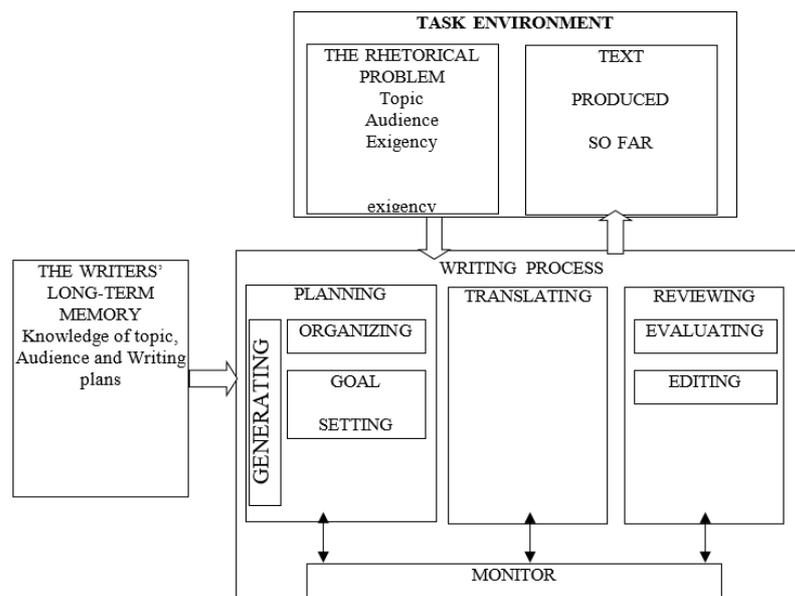


Figure 2: Cognitive process model of writing (Flower & Hayes, 1981, p. 370)

Using ill-structured problem in writing instruction may help students to easily relate the three elements and develop their writing skills. For instance, the task environment is replaced by the ill-structured problem which is constructed based on the learners' real-life situation and complex in order to allow the students' cognitive skills to develop. In the second element, writer's long-term memory, Flower and Hayes (1981) identified two potential problems: a) finding the right cue that would let the writers recall information needed for a particular writing task, and b)

reorganising the information to fit the demands of the rhetorical problem. To relate these issues to ill-structured problems, writers may find it easy to retrieve information from the long-term memory and to organise the information to fit the demands of the rhetorical problem. This is because the ill-structured problems are structured based on students' previous experiences/knowledge. They are also allowed to collaborate and help one another or to consult other resources in retrieving the information.

As for the third element, writing process, the ill-structured problem makes it easier and interesting to the students. It provides a better opportunity for students to brainstorm and generate multiple ideas to achieve their writing goals as it is not straightforward but complex and it leaves possibilities for disagreement or misunderstanding which would stimulate discussions. Students may find it easy to retrieve information from their long-term memory as the ill-structured problem is based on their real-life situations of which they all have first-hand experiences.

### Conclusion and Recommendations

This paper highlights the benefits and some theoretical underpinnings of using ill-structured problem in learning environments. The paper also discusses some benefits of using ill-structured problem in second language learning. The following are some recommendations for teachers and researchers:

- Researchers should conduct empirical studies to investigate the effectiveness of using ill-structured problem in acquiring communication and other learning skills
- Teachers should relate learning to the students' real-lives situations and allow the students to interact with peers in the learning process.

### References:

- Aida Azlina Haji Mohd Bee, (2011). Effects of facilitation on critical thinking of adult ESL learners engaged in solving ill-structured problems in asynchronous online forums. Unpublished Ph.D. thesis, Universiti Putra Malaysia.
- Beglar, D. & Hunt, A. (2002). Implementing task-based language teaching. In J. C. Richards & W. A. Renandya (Eds.), *Methodology in language teaching: An anthology of current practice* (pp. 96-106). Cambridge: Cambridge University Press.
- Bligh, D. (2000). *What's the use of lectures?* San Francisco: Jossey-Bass.
- Candlin, C. N. (1987). Towards task-based language learning. In C. N. Candlin & D. Murphy (Eds.), *Language learning task* (pp. 5-21). Eaglewood Cliffs: Prentice Hall.
- Cho, K. L., & Jonassen, D. H. (2002). The effects of argumentation scaffolds on argumentation and problem solving. *Educational Technology Research and Development*, 50(3), 5-22.
- Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication* 32(4), 365-387.
- Gallagher, J. J., & Gallagher, S. A. (1994). *Teaching the gifted child* (4th ed.). Boston: Allyn and Bacon.

- Hmelo-Silver, C. E. (2004). Problem-based learning: what and how do students learn? *Educational Psychology Review*, 16(3), 235–266.
- Jonassen, D. H. (1997). Instructional design models for well-structured and ill-structured problem-solving learning outcomes. *Educational Technology Research and Development*, 45(1), 65–94.
- Nunan, D. (1989). *Designing task for the communicative classroom*. Cambridge: Cambridge University Press.
- Sarem, S. N. & Shirzadi, Y (2014). A critical review of the interactionist approach to second language acquisition. *Journal of Applied Linguistics and Language Research*, 1(1), 62-74.
- Savery, J. R., & Duffy, T. M. (2001). “Problem Based Learning: An instructional model and its constructivist framework”, CRLT Technical Report No. 16-01, Center for Research on Learning and Technology, Indiana University, June 2001.
- Savery, J. R., & Duffy, T.M. (1995). Problem-based learning: An instructional model and its constructivist framework. In Brent G. Wilson (Ed.) *Constructivist learning environments: Case studies in instructional design*. New Jersey: Educational Technology Publications.
- Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th Ed.). Upper Saddle River, NJ: Merrill.
- Shin, N., & McGee, S. (2003). Identifying questions to investigate: Designers should enhance students’ ill-structured problem-solving skills. Retrieved from <http://www.cotf.edu/vdc/entries/illps.html>
- Shin, N., Jonassen, D. H., & McGee, S. (2003). Predictors of well-structured and ill-structured problem solving in an astronomy simulation. *Journal of Research in Science Teaching*, 40(1), 6-33.
- Swartz, R. J., Costa, A. L., Beyer, B. K., Reagan, R., Kallick, B. (2008). *Thinking –based learning: Activating students’ potential*. Norwood, MA: Christopher-Gordon Publishers Inc.
- Tan, O. S. (2003). *Problem-based learning innovation: Using problems to power learning in the 21st century*. Singapore: Thomson Learning.
- Tan, S. C. (2000). Supporting collaborative problem solving through computer-supported collaborative argument. Unpublished PhD thesis, The Pennsylvania State University.
- Tan, O. S. (2004) Students’ experiences in problem-based learning: Three blind mice episode or educational innovation? *Innovations in Education and Teaching International*, 41(2), 169-184.
- Voss, J. F. & Post, T. A. (1988). On the solving of ill-structured problems. In M. T. H. Chi, R. Glaser & M. J. Farr (Eds.), *The nature of expertise* (pp. 261-285). Hillsdale, NJ: Lawrence Erlbaum Associates.