



CRITICAL THINKING SKILLS AND CREATIVE THINKING SKILLS AS INSTRUCTIONAL CLASSIFICATION OF SPEAKING COMPETENCE LEARNING

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Abstract: This study has been undertaken to investigate the development and improvement of the critical thinking skills and creative thinking skills approach to speaking competence learning activities using problem based speaking activities integrating with Bloom's Taxonomy theory (PBSA with BT). To test the PBSA with BT, the authors described article as a technique in speaking activity learning, especially for experimental groups, while text-book-based speaking activities are for control group students. In that sense, the author of the given article considers critical thinking skills and creative thinking skills as instructional teaching strategies and techniques for communicative competence approaches and means of speaking competence development. The author also describes the estimation system of the given method and its content in the form of a systematic procedure and the theoretical principles of speaking competence learning using critical thinking and creative thinking as instructional teaching strategies. The aim of the given article is to develop a new instructional teaching strategy for better development of critical thinking and creativity thinking skills, especially in competence in speaking, based on unique "thinking outside the box" as a technique in learning. The author of the given article also developed and presented a notion called "problematizing situations" as an instructional strategy and theoretical category in the speaking activities learning process, comprising some theoretical aspects of the given communicative competence learning approach, including its own specifics and conceptual framework described in the given article. Problem-based speaking activities integrated with Blooms' taxonomy are also The notion of "problematizing situations" presents concepts, ideas, and basic principles of critical thinking and creative thinking approaches to developing speaking competence in the form of several instructional strategies and theoretical aspects.

Keywords: "problematizing situations; teaching speaking; instructional strategies; communicative competence; speaking competence.

Abbreviation:

PBSA = problem based speaking activities

BT= Bloom's Taxonomy

I. Introduction

Today, learning how to employ thinking abilities, such as not only just creativity but also critical thinking, is the primary goal of education rather than teaching speaking skills or other subject areas (Feng, Z. 2013; Snyder, L. G., & Snyder, M. J. 2008), but also competent problem-solving abilities (Sotelo, X. 2018), scientific literacy skills (Suryandari, K. C., 2018; Rahayu, S. 2017), and technological literacy skills (Toker, S., & Akbay, T. 2022). This is because these skills, in addition to basic education, are necessary for sustainability and lifelong education. Therefore, educational programs designed for individuals with giftedness and average ability should take these talents into consideration. It is feasible to say that learners experience several real-life challenges during the lifelong process (Augustine, 2011; Maker, 1982; Tortop, 2013). The purpose is to help students become adept at obtaining eligibility.

Since many students still do not fully understand the purpose of thinking in learning and education, questions that call for thought might be difficult. The purpose of education in the modern world is to improve students' capacity for problem-solving, critical thinking, and creative thinking skills (Achilov, O. R. 2017; Birgili, B. 2015; Paul & Elder, 2012). Learning is directly associated with activity, while thinking and verbal communication are indirectly associated with learning (Birgili, 2015). This process may result in the development of thinking. As a result, thinking in broad terms compensates for knowledge, skill, procedure, and attitudes (Lai, 2011).

I. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

3.1 Population and Sample

The population in this research included 18 eleventh-grade students out 196 public secondary school in Gimbi District, Oromia, Ethiopia in the 2023/2024 academic year. There were experimental and control classes chosen as the sample, which consist of one classes as experiment and one others as control class. The first experimental class used PBSA with BT learning activities, while the control class used textbook based speaking activities. Each class applied the learning speaking activities for eight meetings. The difference between experimental class is in the use of the PBSA and the specified sample. It was applied in three levels (high, medium and low categories) according to the results of the sampling technique.

The sampling technique used was stratified cluster random sampling technique. Stratified cluster random sampling technique involves the division of population into homogeneous groups (Cohen et al., 2018). Each group has subjects with the same characteristics. The sample was taken randomly from each group. This technique was used because the researcher wants the division of each experimental class and control class to come from stratified or tiered samples. There are high, medium and low levels. The following are the steps of stratified cluster random sampling technique performed: (1) collecting data on the average scores of the 2023 PET Cambridge University test model; (2) dividing the population based on the average scores into three categories (high, medium and low); (3) grouping ranking results in each category; (4) randomizing the population in each category three times; (5); and repeating the randomization three times to determine the experimental class and the control class.

The study comprised of nine control group students who learned with textbook based speaking activities and nine experimental group students who actively traded with PBSA strategy are selected on the bases of results of speaking test results. And Cambridge University PET speaking test is taken as base year for sample selection.

3.2 Data and Sources of Data

For this study primary and secondary data has been collected. It was a mixed method research in which quantitative and qualitative data collection instruments were used to gather descriptive and numerical data. These instruments were pre-tests and post-tests and questionnaire textual analysis. The combination of more instruments is for the reasons of triangulation, emergence of different overlapping facets of a phenomenon, supplementing the quantitative data with the qualitative data and to add depth to the study (Greene et al 1989).

3.3 Theoretical framework

The Theoretical framework for this study draws up on several theoretical perspectives to provide a comprehensive understanding of its purpose and objectives. The following paragraphs will discuss the theories and concepts underlying the research, and how they relate to the research questions.

Bloom's Taxonomy is the foundation of the theoretical framework. Bloom's Taxonomy is the framework for classifying educational goals and objectives to promote HOTS, which includes six cognitive levels: knowledge, comprehension, applications, evaluation, and creation. The use of Bloom's Taxonomy in problem based speaking activities offers a means of refining and structuring students learning experience, ensuring that they are designed to challenge the student's critical thinking abilities, requiring them to analyse, evaluate, and create in order to construct new knowledge or ideas.

Furthermore, the theoretical framework of this study draws up on constructivist learning theory. Constructivism is based on the belief that learners build knowledge by constructing their own understanding of the world, rather than receiving and memorizing information from teachers or text books. By creating problem based speaking activities with Bloom's Taxonomy, students can engage in constructivist learning, where they actively participate in their own learning process. The use of problem based speaking activities empowered the students to take change of their learning.

The theories of critical thinking and creative thinking also inform the research's theoretical framework, as they are fundamental to the development of the problem solving skill needed for effective communication. Critical thinking and creative thinking are skills help students analysis problems and generate new ideas. The problem based speaking activities with Bloom's Taxonomy in this research provide a perfect platform for developing critical thinking and creative thinking skills, as they require students to synthesize information, analyse problems, and evaluate strategies for solving them.

Lastly, competence in speaking skills is essential to achieve academic, professional, and personal success in today's globalized world. The theoretical framework of this study draws up on the communicative competence theory, which emphasizes how individuals develop and improve their ability to communicate effectively. Through problem based speaking activities with Bloom's Taxonomy, students will learn how to express themselves in a clear, concise, and effective manner.

To conclude, the theoretical framework of the proposed research is based on the interplay between Bloom's Taxonomy, constructivism, critical thinking, creative thinking, and communicative competence theories. The integration of these theories will provide a comprehensive understanding of how problem based speaking activities with Bloom's Taxonomy can be an effective tool in developing students' critical thinking, creative thinking skills, and speaking competence.

3.4 Methodological tools

This section elaborates the proper methodological tools which are being used to forward the study from data towards inferences. The detail of methodology is given as follows.

Before starting this study, the author developed a theoretical basis for the study based on a new instructional teaching strategy. The author called that instructional strategy the strategy of "problematizing the situations". He considers this instructional element to be the conceptual element of his research. According to this instructional strategy, critical thinking skills and creative thinking skills are considered the means and instructional strategies for students' speaking competence development in communicative competence approach.

Critical thinking skills and creative thinking development is the necessary step for speaking competence. This process can be achieved by means of critical thinking and creative thinking speaking activities (Wahyudi, R., et al., 2019; Lau, J. Y. 2011). In that sense, critical thinking and creative thinking skills can be considered both as activities and as the aim of speaking competence learning (Nurhajati, D., et al., 2020). Therefore, the researcher analyse the notion "critical thinking and creative thinking activities" as the creation by a teacher such learning conditions under which critical thinking and creative thinking and speaking competence development can be carried out with the better way of learning process strengthening.

In my opinion, the following parts are included in the learning process critical thinking and creative thinking skills activities:

- forming of critical thinking skills and creative thinking skill; learning conditions and learning objectives;
- using the exercises for creative thinking development (both in the form of problem-based speaking activities, guided practice assessment, and communicative activities);
- utilizing critical and creative thinking techniques in a way that enables students to appreciate communicative task difficulties and foreign language speaking processes throughout the session.

3.4.1 The following fundamentals also serve as the foundation for this principle:

- 1) concentration on students' independent learning; problem solving
- 2) recognition of students' generated new ideas
- 3) Learning with a communicative orientation

The aim of the following principle is to develop students' critical thinking skills and creative thinking as an instructional teaching tool for speaking competence learning with the purpose of intensifying the learning process. In addition to that, the author offer to highlight already known critical and creative process stages that are considered standard in psychology:

In the field of psychology, there are several stages that are often recognized as part of the creative and critical thinking processes. These stages provide a framework for understanding how individuals approach problem-solving, decision-making, and various other cognitive activities (Hasirci, D., & Demirkan, H. 2007). While different psychologists (Litvino and Bukovsky, 2021) may have slightly different models, a commonly accepted approach includes the following stages:

1. Preparation: This stage involves gathering relevant information, facts, and knowledge related to the subject at hand (James, E. A., 2007). It lays the foundation for the subsequent stages and helps to understand the problem more deeply.

2. Incubation: During this stage, the individual takes a break from actively thinking about the problem. This pause allows the mind to process information subconsciously, making connections and associations that may not have been apparent initially (Guilford, J. P., 1967).

3. Insight: Often referred to as the "*aha!*" moment, this stage involves the sudden emergence of a solution, idea, or realization. It is when the individual experiences a breakthrough in understanding or identifies a new perspective that sheds light on the problem (Tsui, L. (2008).

4. Evaluation and Analysis: Once a potential solution or idea is generated, it must be critically assessed. This stage involves analysing the feasibility and effectiveness of the solution, testing it against the available evidence, and considering potential drawbacks or limitations (Combs, L. B., 2009).

5. Elaboration: In this stage, the initial solution or idea is refined, expanded, and developed further. The individual may seek additional information, explore alternative approaches, or integrate feedback from others to enhance the concept (Gervás, P., & León, C. 2016).

6. Verification: The final stage involves testing the solution or idea in practical circumstances to determine its effectiveness. This may include conducting experiments, implementing the idea in real-life situations, or seeking feedback from peers or experts (Setiawan, A., 2018).

It should be noted that these stages are not always linear and might occur in a non-linear manner. Individuals may potentially have distinct cognitive processes (Apperly, I. A. 2012). Nonetheless, these stages provide a general grasp of the psychological creative and critical processes.

3.4.2 Critical thinking and creative thinking assessment criteria and indicators

Critical thinking and creative thinking are essential skills that enable individuals to analyse information, synthesize ideas, and generate innovative solutions (Birgili, B. (2015); Alghafri, A. S. R., & Ismail, H. N. B. 2014). Assessing these skills often involves evaluating specific criteria and assigning corresponding scores.

Here is a detailed explanation of the criteria and assessments used to estimate the proficiency of critical and creative thinking skills:

- 1. Clarity of Thought:** This criterion examines how effectively individuals articulate their ideas, opinions, and arguments. Assessors evaluate if the thoughts are well-organized, logical, and coherent. Proper use of language, precision in expressing concepts, and the ability to convey complex ideas concisely contribute to a higher score (RN, E. S., & RN, M. C. 2002).
- 2. Analysis and Evaluation:** This criterion gauges an individual's ability to assess information objectively, detect biases and assumptions, and evaluate arguments. Competent thinkers critically analyse evidence, identify logical fallacies, and make informed judgments (Gambrill, E. 2006). The assessment measures their proficiency in systematically examining information to form well-reasoned conclusions.
- 3. Problem-Solving:** Assessing problem-solving skills involves evaluating an individual's capacity to identify challenges, analyse their root causes, and develop creative strategies to overcome them. Effective problem-solvers demonstrate a systematic approach, breaking down complex problems into manageable parts, and generating innovative solutions (Vidal, R. V. V. 2009; Mergel, I. 2015). Their ability to think critically and creatively simultaneously contributes to a higher score.
- 4. Originality and Creativity:** This criterion focuses on the ability to generate unique, unconventional, and imaginative ideas or solutions (Tan, S. 2001). Innovative thinkers exhibit flexibility in their thinking, break away from traditional patterns, and propose novel approaches. Assessors evaluate the level of creativity, novelty, and originality demonstrated in an individual's thinking process (Malakate, A, et al.,2007)
- 5. Open-mindedness:** Open-minded thinkers display a willingness to consider diverse perspectives, tolerate ambiguity, and embrace new ideas (Emlen Metz, S.,et al.,2020). They actively listen, respect alternative viewpoints, and integrate multiple perspectives into their thinking. Assessors evaluate an individual's ability to appreciate different viewpoints and adapt their thinking accordingly.
- 6. Curiosity and Inquisitiveness:** This criterion assesses the level of intellectual curiosity and the urge to explore new knowledge. Highly curious individuals ask thoughtful questions, seek out information, and demonstrate a passion for learning (Ostroff, W. L. 2016). The assessment measures their ability to show genuine interest, engage in independent research, and continuously seek new insights.

It's important to note that critical thinking and creative thinking skills are not solely dependent on assessment scores. They are developed over time through practice, exposure to diverse experiences, and a commitment to continuously improve cognitive abilities. Assessments provide valuable feedback for individuals to identify areas of improvement and enhance their thinking skills.

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables

Table 4.1 Critical thinking and creativity thinking estimated criteria

Points	Categories	Example	Assessment score
0 points	Remembering	Recall information	"unsatisfactory"
1 points	Understanding	Restate information	"Poor"
2 points	Name of man, title	Stat the class to drown the objectives	"Satisfactory"
3 points	Simple descriptive titles	Simple describe the topic and drown the specific objectives .The verbs used in the description	"Good";
4.points	Figurative descriptive titles.	Use unusual, poetic, figurative ideas and reflect what they see in the picture.	"Very good"
5 points	Abstract, ideas	The essence of the picture and deep inner meaning beyond the image.	"Excellent"

0 points– assessed as “unsatisfactory”; 1 point is assessed as “poor”; 2 points “satisfactory”; 3 points – “good”; 4 points – “ very Good”; 5 points – “ Excellent”.

5 points—the maximum result of the assessment of creativity. In the process of performing the exercises, control is carried out according to six indicators of creativity (clarity of thought, analysis and evaluation, problem solving, originality and creativity, open-mindedness, and curiosity and inquisitiveness). Each of these components is assessed separately, after which the teacher summarizes the overall result, i.e., clarity of thought: 5 points; analysis and evaluation: 5 points; problem solving: 5 points; originality and creativity: 5 points; open-mindedness: 5 points; and curiosity and inquisitiveness: 5 points in total – 30 points for one lesson.

By the end of the three months, the teacher calculates the total number of student critical and creative points. For example, with a maximum of 60 points for each week and multiplying by 12 weeks in the semester, a student can get 720 points at the end of the three months.

Further, the total number of student creativity points is 720 (maximum), which is divided by three with a result of 120.

120 points are the maximum end result of the student’s critical thinking and creativity at the end of the three months. The table below is a comparative analysis of the pre-experimental and post-experimental sections in the experimental and control groups.

Table 2: Comparative Analysis of Pre-Experimental and Post-Experimental Sections in the Experimental and Control Groups

Group	Experimental criteria	Pre-experimental section, %	Post-experimental section, %
EG	Clarity of thought	35.5	86
CG		29.5	58
EG	Analysis and evaluation	35	70
CG		28.4	45
EG	Problem solving	38	76
CG		33	45.3
EG	Originality and creativity	39	72
CG		35.5	51
EG	Open- mindedness	37.5	69
CG		36	47
EG	Curiosity and inquisitiveness	31.5	78
CG		33	65

Analysis of Pre-Experimental and Post-Experimental Sections in the Experimental and Control Groups

After analysing the results of the pre-experimental and post-experimental sections, the author see a significant increase in all tested indicators of the level of development of speaking competence among Biftu Gimbi Secondary School students. The results are shown in Table 2 below.

Table 3. Experiential learning comparative table

Parameters	Activities	Duration of time and the ideas raised			
		Groups			
		Experimental (EG)		Control (CG)	
Authenticity	the learning experience reflects real-world situations and challenges.	4/5	3 min	2/5	2 min
Active Engagement:	learning by promoting exploration, discovery, and problem-solving.	4/5	2.5 min	3/5	2 min
Reflection:	the integration of new knowledge and insights gained from the experience.	4/5	3 min	2/5	1.5 min
Feedback:	the provision of timely and constructive feedback to learners regarding their performance and progress	3.5/ 5	3 min	3/5	2 min
Collaboration:	communication, teamwork, and the exchange of ideas, enhancing problem-solving and interpersonal skills.	4/5	3 min	2/5	1.5 min
Autonomy:	ownership, accountability, and the development of critical thinking and problem-solving skills.	4/5	2.5 min	2/5	2 min
Supportive Environment:	take risks and learn from failures ;experimentation, creativity, and innovation.	5/5	3 min	3/5	2 min
Total points		28.5/35 20min/ 21min		17/35 13 min/21min	

Experiential learning comparative

The results obtained give grounds to assert that the set research tasks have been generally solved, and the hypothesis put forward has been confirmed. The data of the post-experimental final section confirm the possibility of a phased formation of the skills of speaking competence and communication through a creative approach. As shown above, assessments would consider the level of engagement, feedback received, and overall learner satisfaction.

These parameters were typically considered when designing and implementing experiential learning activities (Wurdinger, S. D., 2005). According to the result obtained in the above table, both the experimental group and control group were given the same number of activities (total of five) and duration of time (total of 3 minutes). Speaking duration test and idea generation were the assessment scales, and the experimental group scored a total score of 28.5 out of 35 questions, and they used 20 of 21 minutes.

In these assessments, the teachers measured the application of knowledge, skills, and attitudes of the students’ in real-life situations, analysing problem-solving abilities, evaluating critical thinking and decision-making processes, assessing teamwork and collaboration, and observing growth in self-reflection and self-awareness (Maudsley, G., 2000).

In the process of assessing critical thinking skills and creative thinking skills, various criteria are analysed and scores assigned to measure a person's abilities in these areas. Criteria for evaluating critical thinking skills may include logical reasoning, problem solving, information processing, and argument evaluation. Specific assessment activities or questions can be devised for each criterion to test the individual's ability. Scoring could be done on a scale, often ranging from 1–5, or "novice" to "expert," correspondingly.

4.6.4.1 Results of critical thinking and creative thinking skills Questionnaire

To find out the effects of PBSA with BT teaching instruction on secondary school students’ critical thinking and creative thinking skills to speaking competence, a 20 items questionnaire was distributed to all subjects before and after the intervention.

Table 4: Mean score of critical thinking and creative thinking before and after the intervention

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair	Mean_Crt & Cre_Pre	5.5089	18	.632106	.19989
	Mean_Crt & Cre_post	6.3378	18	.993816	.314262

Key: Mean- Crt & Cre -Pre= Mean of cri. & cre. before intervention Mean- Crt & Cre -Post= Mean of critical thinking and creative thinking after intervention Whereas: Crt & Cre = critical thinking and creative thinking

The paired sample statistics in **Table14** shows the mean scores of students’ critical thinking and creative thinking to speak English before and after the intervention using PBSA teaching speaking strategy. The mean of critical thinking and creative thinking score before the treatment was recorded **5.50**, whereas the score after the treatment was found to be **6.33**. The higher mean score (**6.33**) indicates that secondary school students were think critically and create knowledge of solving a problem to speak competently after they taken the training; and this shows that the PBSA with BT teaching speaking strategy increased the secondary school students’ speaking proficiency.

Table 5: paired samples test of thinking and creative thinking skills

Paired Samples Test							
		Paired Differences			t	df	Sig.(2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
pair	Pre- Crt & Cre means score & Post- Crt & Cre mean	-0.8688	0.5099	0.1699	-10.048	17	0.000

Whereas, Crt & Cre = critical thinking and creative thinking

The paired samples t-tests show the critical thinking and creative thinking skills of students to develop speaking competence and it was computed (t-10.048, p<0.01). As also clearly illustrated in the table, the p value (.000) is less than .05. Both this result and the result of the mean score indicated in the table above revealed that the students’ critical thinking and creative thinking skills to write has shown a significant progress after the intervention of the PBSA with BT teaching speaking strategy.

Similarly, assessing critical thinking skills and creative thinking skills requires considering criteria like clarity of thought, analysis and evaluation, problem solving, originality and creativity, open-mindedness, and curiosity and inquisitiveness. Besides, the assessment tasks involved brainstorming, ideation exercises, or analysing creative solutions to problems. Again, scoring can be done using a specific scale to determine the individual's level of creativity in each criterion.

It's worth noting that there are a variety of assessment techniques and frameworks available for assessing critical thinking and creative thinking abilities. Standardized tests, rubrics, and even observation-based assessments may be used. The assessment scale and methods chosen are determined by the setting, goal, and intended audience of the evaluation.

Finally, the assessments should try to provide a full and fair assessment of an individual's critical thinking and creative thinking skills, assisting in the identification of strengths and areas for improvement. These abilities are appreciated for their contributions to problem solving, innovation, and decision-making in a variety of sectors.

4. Discussion

According to several scholars, memorizing accounting facts will no longer suffice; global economies have raised the pressure on education to produce curricula that promote higher-order thinking skills. As a result, learning environments can be redesigned to support both the creative and critical thinking abilities required by 21st-century businesses. Similar in meaning, teacher-centred classrooms, which foster passive knowledge reception, may be replaced by this teaching instructional strategy, which promotes active, student-centred

learning. Importantly, a plethora of critical thinking and creative thinking strategies, activities, and examples for building accounting teaching activities in conformity with these viewpoints might be used. (Bonk, C. J., & Smith, G. S. 1998). Iakovos, T. 2011; Kurniawati, Y., et al., 2023).

Different scholars stated that critical thinking skills and creative thinking skills is connected with critical disadvantages comprehension, lack of knowledge, skills, and attitude. V.S. Urkevich also describes the second critical and creativity type that appears by means of primarily high intellectual student's abilities.

Feist, G. J., & Barron, F. X. (2003) revealed that critical abilities and creative abilities exist independently from Intelligence (primary mental abilities, spatial, and number), intellect, potential, and personality. The same idea is shared by Elder, L., & Paul, R. (2020), who believes that critical thinking creative abilities start for taking charge of students' learning and their real life. The significant correlation between critical thinking skills and creative thinking skills on cognitive learning results, it empower critical thinking skills and creative thinking skills that may have a big contribution to cognitive learning results (Siburian, J., et al., 2019).

Also, both creativity thinking and critical thinking involve new perspectives which can be empowered through the implementation of integrated Problem-based Learning by Hidayati, N., et al., 2019). The result of their research reveals that high home problem based learning has makes a positive difference in critical thinking and creative thinking skills.

According to Ferrari, A., Cachia, R., & Punie, Y. (2009), Creativity and innovation are becoming increasingly important for the development of the 21st century knowledge society. The same conception shared by Samani, M., et al., (2019), considering critical thinking and creativity by means of detailed analysis of problem-solving process. Ülger, K. (2016). State that it is necessary to empower the students to think critically and creatively to achieve better academic performance.

From my viewpoint, critical thinking and creativity practical implementation in speaking competence learning can be carried out under certain conditions and demands for learning process itself. These conditions include creation of positive psychological climate at the lesson and the climate of mutual trust and understanding.

5. Conclusion

In that sense, the author can consider that communicative competence development can be connected with critical thinking and creative thinking development, which are means for problem-based speaking activities integrated with Bloom's taxonomy in the lessons of speaking competence. In the situation of speaking competence learning, speaking teaching in Biftu Gimbi secondary school must promote students' critical thinking and creative personality development in the sphere of their future profession with abilities for easier involvement in information research activities in speaking competence and success fully putting into practice their speaking competence in their future professional activity and personal real life.

Moreover, this research seeks to distinguish between creative and critical thinking skills and speaking competence, as well as the reinforcement of problem-based learning in them. It also aimed to examine how speaking activities may be designed to support both skills. Similarly, employing PBL as a means is dependent on the use of examples and everyday issues in which learners can discover new knowledge and apply it to their prior knowledge and abilities to solve the problem. As a result, people engage in an active process of developing inventive solutions to the problem based on their experiences.

In PBL, critical and creative thinking are combined. Multiple thinking skills, the ability to come up with different solutions and suggest potential solutions, and analytical thinking and the ability to consider ideas objectively all point to creativity. The generation of quality inventions, the sustainability of education, and creative and critical thinking are all enhanced by one another.

In conclusion, these talents need to be fostered critically during the instructional design process if the teachers want to raise learners who may become future young scientists. Notably, under the problem-based learning approach, it should not be forgotten that learner and context analysis, organization of instructional objectives, development of instructional strategy, or assessment techniques become distinct in the instructional design step.

V. ACKNOWLEDGMENT

The author would like to thank school principals, teachers, and eleventh-grade students of the BGSS in Gimbi District, Oromia, Ethiopia for allowing me to conduct this research.

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