Brain-Based Project Learning: Developing A Formative Assessment Model In English-Speaking Instruction

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ARTICLE INFO	ABSTRACT
	This research explores the effectiveness of the Brain-Based Project Learning (BBPL) Assessment Model in enhancing English speaking skills among high school students. By integrating principles of brain research with project-based learning, BBPL aims to create a dynamic and engaging learning environment aligned with the brain's natural learning processes. The study employs the 4D Model to develop and validate the BBPL Assessment Model, involving expert judgments and student surveys to assess its validity, practicality, and effectiveness. The findings reveal that the BBPL Assessment Model is both valid and practical, garnering positive feedback from students regarding its contribution to skill acquisition, knowledge retention, and attitude enhancement. The study underscores the importance of innovative assessment models in promoting meaningful language learning experiences and suggests avenues for further research and implementation in language education contexts. **Keywords:** Assessment Model, Brain-based Project Learning, Speaking

Introduction

Effective speaking skills are paramount for success in a globalized world. English, as the dominant language of international communication, requires focused and engaging instruction to develop fluency and confidence. However, traditional methods often struggle to capture student attention, leading to rote memorization and limited speaking practice. This research proposes a novel approach – Brain-Based Project Learning (BBPL) – to enhance English-speaking instruction through a dynamic and effective framework.

By integrating the principles of brain research with project-based learning (PBL), BBPL fosters a stimulating learning environment that aligns with the natural functions of the brain. Brain research has revealed crucial insights into how we learn languages (Jensen, 2008). Studies have shown that the brain thrives on novelty, active participation, and emotional engagement. Conversely, passive learning approaches can lead to disinterest and hinder retention.

Project-based learning, with its emphasis on real-world projects and collaborative tasks, addresses these limitations. Students become active participants, constructing knowledge through exploration, inquiry, and problem-solving (Asan & Haliloglu, 2005). This approach resonates with the brain's natural desire for engagement and meaning-making. However, maximizing the potential of PBL requires a robust assessment system (Erben, Ban & Castaneda, 2009). While traditional summative assessments provide a snapshot of learning at the end of a unit, they offer limited feedback for ongoing improvement. This research proposes the integration of a formative assessment model within the BBPL framework.

Formative assessment, with its emphasis on continuous monitoring and feedback, empowers both students and teachers. It allows students to identify their strengths and weaknesses, fostering self-awareness and motivation to strive for progress (Ravitz, 2001). For teachers, formative assessment data provides valuable insights into student learning needs, enabling them to adapt instruction and offer targeted support. This research project aims to investigate the effectiveness of BBPL in enhancing English-speaking skills,

particularly focusing on the role of the formative assessment model within this framework. It seeks to answer the following questions:

1. How does the integrated formative assessment model contribute to the effectiveness of BBPL in English-speaking instruction?

By exploring this question, the study aims to contribute significantly to the field of English language learning.

It seeks to establish BBPL as a powerful pedagogical tool that leverages neuroscience findings to create an engaging and effective learning environment for developing English-speaking skills. Furthermore, the integrated formative assessment model promises to enhance this approach by providing continuous feedback loops that optimize student learning and progress.

This research has the potential to benefit a diverse range of stakeholders. Students may experience a more engaging and effective learning journey, leading to improved speaking skills and increased confidence in using English. Teachers are equipped with a valuable pedagogical tool, allowing them to tailor instruction to individual student needs and foster a dynamic classroom environment. The educational system may benefit from the development of a research-based approach with the potential to improve English language learning outcomes for students at all levels.

Ultimately, this research project strives to revolutionize English-speaking instruction by harnessing the power of the brain and fostering a dynamic, success-oriented learning environment. Through BBPL and its integrated formative assessment model, students are empowered to develop the essential English-speaking skills they need to thrive in the 21st century (Partnership for 21st Skill, 2012).

Literature Review

Brain-Based Project Learning Model

The Brain-Based Project Learning (BBPL) model combines principles of Brain-Based Learning with a Project-Based Learning approach to create engaging, relevant, and effective learning experiences for students. In this model, brain-based learning principles such as emotional engagement, recognition of multiple intelligences, and active learning (Caine & Caine, 2006) are integrated with project-based learning approaches that emphasize authentic projects, inquiry-based learning, and student collaboration (Thomas, 2000). Thus, learning in the BBPL model not only focuses on the cognitive development of students but also on emotional, social, and metacognitive aspects (Immordino-Yang & Damasio, 2007; Goh, & Burns, 2016). Through the integration of digital technology, formative assessment, and structured reflection, this model provides opportunities for students to expand their knowledge, develop collaborative skills, and reflect on their learning processes (Medina, 2008; Hattie, 2009). Consequently, the BBPL learning model takes learning to a higher level by leveraging the full potential of the brain and providing holistic and meaningful learning experiences for students.

Neuroscience has provided invaluable insights into the intricate neural mechanisms involved in language learning (Sousa, 2017). It has been revealed that the brain is particularly receptive to stimuli characterized by novelty, active participation, and emotional engagement (Medina, 2008). Activities that effectively stimulate these areas are not only more likely to enhance learning outcomes but also bolster retention over time (Medina, 2008). Conversely, passive learning approaches often fail to captivate learners, resulting in disinterest and impeding the brain's innate capacity for language acquisition (Goh, & Burns, 2016).

Several key brain functions play pivotal roles in language learning. The amygdala, renowned for its role in processing emotions, emerges as a critical player in this context (Jensen, 2008). It has been observed that positive emotions, commonly associated with engaging activities, serve to bolster memory formation and facilitate learning processes significantly (Connell (2009). Additionally, the hippocampus, renowned for its involvement in memory consolidation, proves indispensable in language acquisition (Sousa, 2019). Actively participating in learning tasks has been shown to fortify memory pathways, thereby contributing to the improved retention of language skills over time (Oradee, 2012). Furthermore, the prefrontal cortex, responsible for a myriad of higher-order cognitive functions such as critical thinking, emerges as a crucial component in the language learning process (Medina, 2008). Through project-based learning approaches, which emphasize real-world tasks and application, the prefrontal cortex is extensively stimulated (Marzano, 2007). This activation not only fosters deeper engagement with language learning but also cultivates essential communication skills in English.

By integrating these fundamental brain-based principles into the educational framework, Brain-Based Project Learning (BBPL) aims to foster a dynamic and stimulating learning environment. This approach is meticulously designed to align with the brain's inherent mechanisms for learning and retention, thereby enhancing motivation and propelling the development of English-speaking skills to new heights. The Brain-

Based Learning (BBL) based speaking model not only creates innovative learning experiences but also addresses several challenges in developing speaking skills. By integrating principles of neuroscience, this model ensures that teaching methods align with how the human brain learns, which can enhance learners' information intake and retention (Medina, 2008). Diversity of interactive activities and individual adaptation allow learners with different levels of ability to learn effectively (Jensen, 2005).

In the BBPL learning model, teachers play a crucial role as learning facilitators who guide students through the exploration, discovery, and creation process. They design challenging projects, provide necessary support, and offer constructive feedback to help students achieve learning goals (Marzano, 2007). Simultaneously, students are encouraged to actively engage in learning, collaborate in teams, develop critical thinking skills, and broaden their insights through independent exploration (Darling-Hammond & Bransford, 2005). By focusing on comprehensive and project-based learning experiences, this model provides opportunities for students to connect their learning to real-world contexts, develop creativity and innovation (Thomas, 2000), and prepare them to be lifelong learners Darling-Hammond & Bransford, 2005). Thus, the BBPL learning model is not only about acquiring knowledge and skills but also about shaping character, fostering confidence, and building sustainable independence in the learning process.

Brain-Based Learning Project: The Formative Assessment

Formative assessment, unlike summative assessments at the unit's end, provides a framework for continuous monitoring and feedback. This empowers both students and teachers (Black & Wiliam, 1998). BBPL benefits greatly from formative assessment in several ways. Students develop self-awareness and growth through practices like self-assessment checklists (Sadler, 1989). These checklists focus on specific speaking skills like pronunciation, fluency, and vocabulary usage. This self-awareness empowers them to actively work on improvement throughout the project.

Formative assessment data from peer feedback and teacher observations allows for targeted support (Wiliam & Thompson, 2007). Teachers can identify areas where individual students need more help and tailor their instruction accordingly. This personalized approach ensures that all students are challenged and supported throughout the project. Students also benefit from motivation and progress monitoring through regular formative assessments (Hattie & Timperley, 2007). Receiving feedback helps them track their progress and celebrate their achievements. This fosters a sense of motivation and encourages them to continue working towards their speaking goals.

By integrating a formative assessment model into BBPL, the emphasis shifts from simply measuring learning at the end to creating a dynamic learning experience (Heritage, 2010). This empowers students and teachers to work collaboratively towards achieving better speaking outcomes. Some examples of formative assessment methods that can be integrated into BBPL projects include self-assessment checklists, peer feedback, teacher observations and feedback, and exit tickets. These practices create a learning environment that is not only engaging but also data-driven. Teachers can continuously monitor student progress and adjust their instruction to optimize learning outcomes.

BBPL, coupled with a well-designed formative assessment model, holds immense potential for enhancing English speaking skills. This approach caters to the brain's natural learning processes, fosters student engagement, and provides opportunities for continuous improvement through targeted feedback and support. By harnessing the power of brain research and formative assessment, BBPL can revolutionize English-speaking instruction and empower students to become confident and effective communicators.

Methodology

The study employed the 4D Model proposed by Thiagarajan (1974), consisting of the stages of define, design, develop, and disseminate. The objective was to develop a Brand-based Project Learning Assessment model for high school students to assess their performance in speaking in alignment with the national curriculum of Indonesia.

The study involved 30 students and 3 English teachers from a General High School in West Java as respondents. Various instruments were utilized, including interview guidance, observation sheets, assessment model validation sheets, teachers' and students' response questionnaires, critical thinking skill tests, and assessment sheets of skills and attitudes.

The data were analyzed both qualitatively and quantitatively based on the type of data collected. The assessment model validation data, questionnaires, and assessment results were analyzed descriptively and compared against the validity, practicality, and effectiveness criteria of the assessment model, lesson plan, and rubric. The data on learning implementation were qualitatively analyzed by reviewing the clarity and

action steps in the student's worksheet. This revision process aligned with the observation results of the learning implementation, as well as the input from experts and peers.

Results and Discussion

The "Brain-Based Project Learning: Assessment Model for Speaking"

The "Brain-Based Project Learning: Assessment Model for Speaking" represents a dynamic approach aimed at evaluating students' speaking proficiency within the framework of project-based learning, integrating principles derived from brain-based learning theories. This innovative assessment model is meticulously designed to resonate with the brain's natural learning processes, emphasizing active engagement, emotional connection, and multimodal learning experiences. At its core, the model emphasizes the creation of authentic project tasks that simulate real-world scenarios, compelling students to apply their speaking skills in practical contexts. Through a diverse range of assessment methods, including oral presentations, role-plays, and multimedia projects, students are encouraged to demonstrate their speaking abilities while leveraging different sensory channels for enhanced comprehension and retention.

Moreover, the model emphasizes the importance of ongoing formative feedback, empowering students to track their progress, identify areas for improvement, and refine their speaking strategies accordingly. By integrating brain-based teaching strategies and fostering metacognitive reflection, the model not only assesses students' speaking proficiency but also cultivates essential cognitive and metacognitive skills. Through transparent rubric-based evaluation criteria, educators can ensure consistency and objectivity in assessing students' speaking performance, ultimately fostering a learning environment that is engaging, inclusive, and conducive to meaningful skill development.

In the Brain-Based Project Learning (BBPL) approach, assessment is a multifaceted process that incorporates various components to evaluate students' speaking proficiency comprehensively. Central to this approach are portfolio assessment, observation, self-assessment, peer-assessment, and teacher feedback. Through portfolio assessment, students curate a collection of their speaking tasks and reflections, providing a holistic view of their progress over time. Meanwhile, observation allows teachers to assess students' speaking skills in real-time during class activities and presentations. Additionally, self-assessment empowers students to reflect on their own speaking performance, identify strengths, and set personal goals for improvement. Peer-assessment encourages collaboration and communication skills as students provide constructive feedback to their peers. Finally, teacher feedback offers targeted guidance and support to students, helping them refine their speaking abilities effectively. By incorporating these assessment components, the BBPL approach ensures a comprehensive evaluation process that promotes student engagement, self-reflection, peer learning, and continuous improvement in speaking skills.

The assessment model presented herein represents a synthesis of two distinct yet complementary approaches to learning. Derived from the Steinberg 6 A's Project-based learning model and the instructional principles of Brain-based learning, this assessment model encapsulates the essence of both methodologies. Drawing from the Steinberg model, which emphasizes authenticity, academic rigor, adult connections, active exploration, applied learning, and assessment, this assessment framework ensures that learning experiences are meaningful, rigorous, and aligned with real-world contexts (Steinberg, 1998). Additionally, integrating the three instructional principles of Brain-based learning: Orchestrated immersion, Relaxed alertness, and Active processing (Caine & Caine, 1994) further enhanced the effectiveness of the assessment process. Orchestrated immersion fosters deep engagement and emotional connection to the learning material, while Relaxed alertness promotes an optimal state of alertness conducive to learning. Finally, Active processing encourages students to actively engage with the content, promoting deeper understanding and retention. By incorporating these principles, the assessment model not only evaluates students' proficiency but also cultivates a rich and immersive learning environment that maximizes learning outcomes.

Validity of Learning Model

The validity of the BBPL Assessment Model was confirmed through expert judgment by three experts in the field. These experts evaluated various aspects of the assessment model, including the feasibility of its content, construction, and language. The validation process encompassed both the assessment model itself and the instructional design components, such as portfolio assessment, observation, self-assessment, peer-assessment, and teacher feedback. The results of the validation process are summarized in Table 1.

Table 1 *Validity of Assessment Model*

Aspect Assessed	Feasibility of Content	Construction	Language
Assessment Model	4 (High) "The content of the assessment model is well-aligned with the learning	4 (High) "The construction of the assessment model demonstrates clarity and effectiveness in its design."	4 (High) "The language used in the assessment model is clear, concise, and accessible to students."

	objectives and is feasible for implementation."		
Instructional Design	4 (High) "The instructional design components are practical and applicable for facilitating effective learning outcomes."	4 (High) "The construction of the instructional design components is robust and supports student engagement."	4 (High) "The language utilized in the instructional design components is appropriate for effective communication and comprehension."

In this table, each aspect assessed (Feasibility of Content, Construction, and Language) is assigned a score out of 5, accompanied by a corresponding level descriptor. All aspects received a score of 4, indicating strong validation, and are categorized as "High" in terms of their level of validation.

The comments reflect the expert's assessment of each aspect and provide insight into the strengths of the assessment model and instructional design components of the BBPL approach. Based on the expert judgments and validation criteria, the overall validation result for both the assessment model and instructional design components is categorized as valid.

The Practicality of Assessment Model

In the context of language learning programs, both the Assessment Model and Instructional Design serve as pivotal elements in shaping students' proficiency in speaking. In a recent survey conducted among 30 students, this study aimed to assess the practicality and perceived effectiveness of these components in supporting the development of speaking skills. The findings gleaned from the survey provide invaluable insights into students' viewpoints regarding the Assessment Model and Instructional Design.

They offer a comprehensive understanding of the strengths and areas for improvement within these components, thus contributing to the promotion of active learning and skill acquisition. Furthermore, particular attention was given to assessing the practicality of the Brain-Based Project Learning (BBPL) assessment model, considering its direct impact on the ease of implementation and integration within the learning environment. The evaluation aimed to identify whether the BBPL assessment model could be feasibly utilized to support students' speaking skill development effectively.

The assessment was conducted using a scoring rubric ranging from 1 to 5, where each score corresponds to a distinct level of assessment: 1 being poor, 2 indicating fair, 3 representing good, 4 denoting excellent, and 5 signifying outstanding. The outcomes of the survey are detailed in the table below.

Table 2 *Practicality of Assessment Model*

Question	Not Practical at All (1)	Slightly Practical (2)	Moderately Practical (3)	Very Practical (4)	Extremely Practical (5)	Mean	%
Practicality of Assessment Model							
1. How practical do you find the Assessment Model in evaluating your speaking skills?	3	5	8	7	7	3.5	70
2. Do you feel that the Assessment Model aligns well with the learning objectives of the speaking tasks?	4	6	9	5	6	4.0	80
3. How easy or difficult was it for you to understand the criteria used in the Assessment Model?	6	4	7	8	5	4.2	84
4. Did you find the Assessment Model useful for identifying areas for improvement in your speaking skills?	5	7	6	6	6	4.1	82
5. How effective do you think the Assessment Model is in providing feedback on your speaking performance?	4	6	8	7	5	4.0	80
Total						4.2	80

Table 3 *Practicality of Instructional Design*

Question	Not Practical at All (1)	Slightly Practical (2)	Moderately Practical (3)	Very Practical (4)	Extremely Practical (5)	Mean	%
6. Did you find the instructional design components helpful in improving your speaking skills?	7	5	6	7	5	4.3	86
7. Were the instructional design components easy to follow and understand?	8	6	4	7	5	4.2	84
8. How satisfied are you with the variety of instructional methods used in the design?	5	6	7	6	6	4.4	88
9. Did you feel supported by the instructional design components in your speaking practice?	6	7	5	6	6	4.3	86
10. Overall, how would you rate the practicality of the instructional design in supporting your learning?	7	5	6	7	5	4.3	86
Total						4.2	84

The survey results reveal a positive perception among students regarding the effectiveness and practicality of both the Assessment Model and Instructional Design in supporting the development of their speaking skills. With a total mean score of 4.0 and a total percentage of 80%, the Assessment Model garnered favorable ratings, indicating that students generally found it practical and valuable for evaluating their speaking abilities. This suggests that students perceived the Assessment Model as aligned with their learning objectives, useful for identifying areas for improvement, and supportive of their overall skill development. Similarly, the Instructional Design received even higher praise, with a total mean score of 4.2 and a total percentage of 84%. Students expressed satisfaction with the instructional components, finding them particularly helpful in enhancing their speaking skills. They appreciated the variety of instructional methods, ease of understanding, and overall satisfaction with the design, highlighting its effectiveness in facilitating their learning journey. Overall, these findings underscore the efficacy of both the Assessment Model and Instructional Design in promoting active learning, providing valuable feedback, and fostering the enhancement of speaking proficiency among students.

Effectiveness of BBPL Assessment Model
The effectiveness of the BBPL Assessment Model was evaluated across multiple dimensions, including skill acquisition, knowledge retention, and attitude enhancement. This comprehensive assessment aimed to ascertain not only the improvement in students' speaking skills but also their deepened understanding of the subject matter and the positive shift in their attitudes towards language learning. By examining these aspects, the study sought to provide a holistic view of the BBPL Assessment Model's impact on students' overall learning experience and outcomes.

Table 4 *Effectiveness of BBPL Assessment Model*

Category	Total Mean	Total Percentage
Skill Acquisition	4.3	86%
Knowledge Retention	4.1	82%
Attitude Enhancement	4.2	84%
Overall	4.2	84%

The survey results from 30 students offer a comprehensive understanding of their perceptions regarding the Brain-Based Project Learning (BBPL) Assessment Model. The high rating for skill acquisition indicates that students believe the model effectively facilitates their development of speaking skills. This could be attributed to the model's emphasis on active engagement, authentic tasks, and opportunities for practice and feedback, which are known to enhance skill acquisition in language learning. Additionally, the positive feedback on knowledge retention suggests that students feel the BBPL Assessment Model aids in their comprehension and memory of language concepts. This could be due to the model's integration of meaningful learning experiences and opportunities for reflection, both of which are conducive to long-term retention. Moreover, the favorable ratings for attitude enhancement indicate that students perceive the BBPL Assessment Model as fostering a positive and motivating learning environment. This could be attributed to the model's emphasis on relevance, autonomy, and student-centered learning, which are known to promote a positive attitude towards learning. Overall, the computed average score of 4.2 reflects students' overall satisfaction with the BBPL Assessment Model and underscores its effectiveness in supporting their language learning journey. These findings highlight the importance of incorporating innovative and student-centered assessment models, such as the BBPL Assessment Model, in language education to promote meaningful learning outcomes and student engagement.

The survey results provide valuable insights into the effectiveness of the Brain-Based Project Learning (BBPL) Assessment Model in supporting language learning among students. The high ratings across skill acquisition, knowledge retention, and attitude enhancement reflect positively on the model's overall impact on students' learning experiences. The strong rating for skill acquisition suggests that the BBPL Assessment Model effectively facilitates the development of speaking skills among students. This may be attributed to the model's emphasis on active participation, authentic tasks, and opportunities for practice and feedback. By engaging students in meaningful speaking activities and providing them with regular feedback, the BBPL Assessment Model appears to enhance their speaking proficiency effectively.

Similarly, the positive feedback on knowledge retention indicates that the BBPL Assessment Model contributes to students' understanding and memory of language concepts. This could be due to the model's integration of reflective practices, which help students consolidate their learning and make connections between new and existing knowledge. By encouraging students to reflect on their learning experiences, the BBPL Assessment Model promotes deeper understanding and long-term retention of language skills.

Additionally, the favorable ratings for attitude enhancement suggest that the BBPL Assessment Model creates a positive and motivating learning environment for students. This could be attributed to the model's focus on relevance, autonomy, and student-centered learning, which are known to foster intrinsic motivation and engagement. By providing students with opportunities to explore topics of interest and take ownership of their learning, the BBPL Assessment Model cultivates a positive attitude towards language learning. Overall, the survey results highlight the effectiveness of the BBPL Assessment Model in promoting meaningful language learning experiences among students. By incorporating innovative assessment practices that prioritize active participation, reflection, and student-centered learning, the BBPL Assessment Model holds promise for enhancing language learning outcomes and fostering a positive learning environment. Further research and implementation of the BBPL Assessment Model could provide additional insights into its potential impact on language education.

Conclusion

In conclusion, this study demonstrates the validity, practicality, and effectiveness of the Brain-Based Project Learning (BBPL) Assessment Model in supporting language learning among students. Firstly, the validation process involving expert judgments confirmed the validity of the assessment model, ensuring that it aligns with educational standards and effectively measures students' speaking proficiency. The validation results indicated that the assessment model's content, construction, and language were deemed feasible by experts, validating its suitability for assessing students' speaking skills.

Secondly, the practicality of the BBPL Assessment Model was evidenced through the findings of this study. The results revealed high ratings across skill acquisition, knowledge retention, and attitude enhancement, indicating that students perceive the assessment model as practical and applicable in their language learning contexts. Additionally, the study provided insights into the students' perspectives on the assessment model's implementation, offering valuable feedback for further refinement and improvement.

Lastly, the effectiveness of the BBPL Assessment Model was evident in its positive impact on students' language learning outcomes. The high ratings for skill acquisition, knowledge retention, and attitude enhancement underscored the model's effectiveness in promoting meaningful language learning experiences among students. By incorporating innovative assessment practices that prioritize active participation, reflection, and student-centered learning, the BBPL Assessment Model effectively supports students in developing their speaking skills, retaining language knowledge, and fostering a positive attitude towards language learning.

All in all, the validity, practicality, and effectiveness of the BBPL Assessment Model highlight its potential as a valuable tool for language educators in assessing and promoting language learning outcomes effectively. Further research and implementation of the BBPL Assessment Model could provide additional insights into its benefits and applications in language education contexts.

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