IJAMS INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY STUDIES
Volume V, Issue 2 February 2025, eISSN: 2799-0664

The 7 Steps to a Language-Rich Interactive Classroom in Teaching Biology at Tyler High School

JOWEL C. PABLO, Ph.D.
Tyler High School
jowelcpablo@gmail.com

JOHN REY B. QUIÑONES, Ph.D.
Nueva Ecija University of Science and Technology
johnrey201334@gmail.com

Abstract — This study investigates the effectiveness of applying The 7 Steps to a Language-Rich Interactive Classroom as a framework to enhance student learning and academic engagement in Grade 9 Biology at Tyler High School. Grounded in the principles of differentiated instruction, the research focused on how structured opportunities for academic talk and interactive learning strategies influence student achievement. A quasi-experimental design was utilized, involving 50 students divided into two groups: the control group (n = 25), which received instruction through traditional lecture-based methods, and the experimental group (n = 25), which participated in classroom station activities aligned with the 7 Steps model. Data collection included pre-tests and post-tests, as well as classroom observations. The pre-test results indicated no significant difference in initial Biology knowledge between the two groups. However, post-test scores showed a statistically significant improvement in the experimental group (M = 32.40) compared to the control group (M = 26.90), with a computed t-statistic of 3.12 and a p-value of 0.004. Furthermore, qualitative observations revealed that the experimental group exhibited increased engagement, more frequent use of academic vocabulary, collaborative behaviors, and higher levels of critical thinking during class discussions and activities. The integration of the 7 Steps promoted a supportive learning environment where students felt empowered to speak, question, and reflect on their learning. These results suggest that language-rich instructional strategies, when paired with differentiated station activities, are effective in addressing diverse student needs, deepening conceptual understanding, and fostering a more inclusive and interactive Biology classroom. The study recommends that science educators adopt the 7 Steps framework to create dynamic, student-centered learning experiences that promote both content mastery and academic language development.

***Keywords* — 7 Steps, Language-Rich Classroom, Biology Teaching, Differentiated Instruction, Station Activities, Student Engagement, Academic Vocabulary**

I. Introduction

Teaching Biology at Tyler High School presents unique challenges, particularly due to the diverse student population, with varying levels of English proficiency and academic readiness. Many students struggle to grasp complex biological concepts due to language barriers, making it essential for educators to provide clear and accessible explanations (Echevarria, Vogt, & Short, 2017). Furthermore, a large number of students come from different cultural backgrounds, which can influence their prior knowledge and engagement with the subject matter. To address these challenges, implementing The 7 Steps to a Language-Rich Interactive Classroom is crucial. This approach focuses on integrating language development with content knowledge, fostering an interactive learning environment where students are encouraged to collaborate, actively participate, and engage with biological concepts through visual aids, sentence frames, and group discussions (Zwiers, 2014). By applying these steps, teachers can support all learners in overcoming language barriers and achieving a deeper understanding of Biology.

Teaching Biology at Tyler High School involves addressing several challenges, particularly due to the diverse student population. Many students in the district come from varied linguistic and academic backgrounds, which affects their ability to grasp complex scientific concepts. English Language Learners (ELLs) and students with lower literacy levels face additional hurdles when trying to understand specialized terminology and abstract biological processes, such as the phases of mitosis or the structure of DNA. As noted by Echevarria, Vogt, and Short (2017), students need explicit instruction and support in developing both their academic language and content knowledge. Moreover, the range of prior knowledge and learning styles in the classroom means that teachers must employ differentiated strategies to engage all students effectively. Without tailored instructional approaches, some students may struggle to make meaningful connections with the subject matter.

To address these challenges, the implementation of The 7 Steps to a Language-Rich Interactive Classroom can significantly enhance the learning experience for all students. This approach emphasizes the integration of language development with biology content, allowing students to build vocabulary and engage with complex biological concepts through interactive, hands-on activities. For example, teachers can introduce sentence frames, collaborative group work, and frequent opportunities for peer discussions to support both language acquisition and content understanding (Zwiers, 2014). Visual aids, graphic organizers, and real-world connections to biology topics can further aid comprehension by offering students multiple ways to process information. By fostering an environment where students can express their thoughts in structured, language-rich contexts, the 7 Steps ensure that all students, regardless of their linguistic proficiency, are empowered to understand and apply key biological concepts.

The 7 Steps to a Language-Rich Interactive Classroom provide a framework for teaching Biology at Tyler High School, particularly in addressing the challenges of diverse student backgrounds and varying levels of language proficiency. These steps focus on promoting active student engagement, building academic vocabulary, and using structured language practices, such as sentence frames and peer discussions, to foster a deeper understanding of biological concepts (Echevarria, Vogt, & Short, 2017). By incorporating interactive activities, visual aids, and collaborative learning, teachers can create an inclusive environment where students actively participate in their learning, applying scientific knowledge in meaningful ways. This approach helps students, especially English Language Learners, bridge the gap between language development and content mastery, ensuring that all students can succeed in understanding complex biology topics (Zwiers, 2014).

Literature Review

Teaching science, particularly Biology, presents multiple challenges for educators, especially in linguistically diverse classrooms such as those at Tyler High School. One significant obstacle is the complexity of scientific vocabulary and abstract concepts that hinder student comprehension and engagement. According to Fang (2006), scientific language tends to be dense, impersonal, and technical, creating barriers for learners, particularly English Language Learners (ELLs) and students with low academic vocabulary. These language demands often result in reduced participation, misconceptions, and poor performance in Biology.

In addressing these issues, research supports the integration of language development strategies within content instruction. The 7 Steps to a Language-Rich Interactive Classroom, developed by John Seidlitz and Bill Perryman (2011), offers a practical framework for embedding academic language practice into daily classroom routines. This approach includes steps such as structured conversations, sentence stems, and intentional vocabulary instruction, which directly support the development of science literacy. Implementing these steps in Biology creates opportunities for students to practice academic discourse, which is essential for making meaning of complex concepts.

Another major challenge in science education is the lack of student engagement during content-heavy lessons. Traditional lecture-based approaches often exclude interactive and collaborative learning experiences that support both content mastery and language development. Vygotsky's (1978) sociocultural theory emphasizes the importance of social interaction in learning, suggesting that structured peer dialogue—such as those encouraged by the 7 Steps—can enhance both comprehension and language use in science contexts. Thus, creating a language-rich classroom transforms passive learners into active participants.

Additionally, standardized science assessments increasingly require students to demonstrate both content knowledge and academic language proficiency. Research by Bunch (2013) shows that students who are not given sufficient opportunities to develop language skills within content areas are at a disadvantage on such assessments. The 7 Steps framework, when applied consistently in Biology classes, supports both the language and literacy demands of modern science curricula, making it a valuable tool for teachers working in diverse and inclusive settings.

In conclusion, the challenges of teaching Biology are not solely rooted in content difficulty but also in the linguistic demands of the subject. Integrating the 7 Steps to a Language-Rich Interactive Classroom addresses these challenges by promoting student talk, increasing engagement, and scaffolding academic vocabulary. At Tyler High School, where student populations are culturally and linguistically diverse, this approach aligns well with the needs of learners and the goals of equitable science education.

Teaching science, especially Biology, poses significant challenges in today's diverse classrooms. One of the most persistent barriers is the complexity of scientific language, which includes unfamiliar vocabulary, abstract concepts, and dense informational texts. This language often becomes a hurdle for students, particularly English Language Learners (ELLs) and those with limited academic vocabulary (Fang, 2006). Without intentional language support, students struggle to access content, participate in discussions, and perform well in assessments.

In linguistically diverse schools like Tyler High School, addressing language barriers is not optional but essential. The traditional approach to science instruction often emphasizes content delivery over language interaction, leaving students with little opportunity to process and verbalize their understanding. Research shows that when students are not actively using language to make meaning, their retention and comprehension of scientific concepts decline (Lee & Buxton, 2013). This highlights the need for strategies that intentionally embed language development into content teaching.

One research-based model that addresses these concerns is the 7 Steps to a Language-Rich Interactive Classroom (Seidlitz & Perryman, 2011). This model introduces structured and student-centered strategies designed to increase academic talk, support vocabulary acquisition, and create a safe environment for language use. Each of the seven steps—ranging from teaching students what to say when they don't know what to say to implementing structured conversations—provides scaffolds that help all students, especially ELLs, thrive in content-heavy subjects like Biology.

Step-by-step, this framework transforms passive learners into active participants. For instance, Step 4: Structured Conversations prompts students to use sentence stems and academic vocabulary to discuss science concepts with their peers. According to Vygotsky's (1978) sociocultural theory, learning occurs most effectively in social contexts where students interact within their zone of proximal development. Structured conversations allow students to negotiate meaning and clarify ideas, making difficult Biology content more accessible.

Another key challenge in science instruction is student engagement. Students often perceive science as difficult or irrelevant when taught in a lecture-heavy format. The 7 Steps model promotes interaction through movement, pair-shares, and intentional grouping, which increase engagement and accountability. McCarthy (2014) argues that active engagement strategies boost student motivation and deepen learning, particularly when learners are required to articulate their thinking.

Moreover, the language-rich strategies in this model directly address the demands of standardized assessments, which require students to explain scientific reasoning, analyze data, and construct evidence-based arguments—all through academic language. Bunch (2013) emphasizes the importance of Pedagogical Language Knowledge, which refers to teachers' ability to support language development in content areas. The 7 Steps empower Biology teachers at Tyler High School to intentionally integrate language support into everyday lessons, aligning instruction with assessment expectations.

Additionally, classroom discourse plays a vital role in building scientific understanding. Lemke (1990) notes that science is not only a body of knowledge but also a "language game" with its own logic and conventions. By implementing the 7 Steps, teachers normalize academic talk and provide students with repeated opportunities to practice using scientific language, thus building both content mastery and confidence in communication.

The model also supports differentiation. With structured routines and intentional grouping, teachers can meet the needs of varied learners without sacrificing rigor. For instance, sentence stems and visual word walls provide language support for struggling readers, while higher-order questioning pushes advanced learners to deepen their thinking. This approach aligns with Tomlinson’s (2014) principles of differentiated instruction, which call for responsive teaching based on student readiness, interests, and learning profiles.

Importantly, the implementation of this model contributes to equity in science education. Language should not be a barrier to learning science. Yet, without intentional scaffolds, many students are excluded from full participation. By using the 7 Steps, teachers give all students—regardless of language background—access to rich scientific discourse, which is crucial for closing achievement gaps and fostering inclusive classrooms (Lee, Quinn, & Valdés, 2013).

In conclusion, the literature clearly shows that the 7 Steps to a Language-Rich Interactive Classroom directly address multiple challenges in science education, including language barriers, engagement, assessment readiness, and equity. At Tyler High School, where students come from culturally and linguistically diverse backgrounds, this framework provides a research-supported, practical approach to improving Biology instruction. It empowers students to think, speak, and write like scientists, ultimately leading to deeper understanding and academic success.

The integration of The 7 Steps to a Language-Rich Interactive Classroom has emerged as a highly effective pedagogical approach to address the linguistic and academic challenges that Biology students face, particularly in diverse schools like Tyler High School. This strategy recognizes that language is not only a medium for learning but a critical component of science instruction itself (Fang, 2006). As students work to understand complex biological processes, they must also acquire the academic language necessary to describe, explain, and reason through scientific content.

A significant strength of the 7 Steps model lies in its ability to transform classrooms into spaces where all students are expected and encouraged to engage in academic talk. This increased student interaction helps improve language proficiency while reinforcing scientific understanding (Seidlitz & Perryman, 2011). Through carefully structured conversations, intentional sentence stems, and the use of visual word walls, students at Tyler High School are given the tools they need to access the Biology curriculum more confidently and effectively.

Moreover, this approach supports the development of both oral and written communication skills in science. According to Bunch (2013), students must be taught not just content, but also the linguistic means to express scientific ideas. The structured routines in the 7 Steps model provide ample opportunities for students to speak and write about what they learn, which promotes long-term retention and a deeper grasp of Biology concepts.

Another vital contribution of the 7 Steps is how it promotes equity in the classroom. For English Language Learners (ELLs) and other language-minoritized students, science instruction can be a source of exclusion if linguistic support is not embedded in the lesson design. This model offers built-in scaffolds that reduce the language barrier without diluting content, ensuring that all students can participate meaningfully in science learning (Lee & Buxton, 2013).

The 7 Steps framework also aligns well with principles of constructivist learning, particularly in its emphasis on student interaction and engagement. Vygotsky (1978) emphasized that learners construct knowledge through social interaction within their Zone of Proximal Development (ZPD). Through partner conversations, whole-class response strategies, and structured sentence frames, students in Biology are constantly building new knowledge with peers, guided by purposeful teacher facilitation.

Furthermore, the approach supports differentiated instruction, addressing the wide range of academic levels often found in a single Biology classroom. The consistent routines and flexible strategies of the 7 Steps allow teachers to modify instruction to suit individual learning profiles, which improves student outcomes across the board (Tomlinson, 2014). This is especially relevant at Tyler High School, where classrooms include a variety of student backgrounds and abilities.

In addition, student engagement increases when learners feel empowered to speak and contribute in class. Many traditional science classrooms limit student voice, but the 7 Steps model emphasizes student-centered learning, allowing learners to actively process and discuss ideas in a structured, low-risk environment (McCarthy, 2014). As students practice science talk regularly, they gain confidence and motivation, which positively affects both behavior and academic performance.

Crucially, the 7 Steps help prepare students for the linguistic demands of high-stakes assessments, such as standardized Biology tests. These exams often require written explanations, justifications, and analyses that go beyond simple recall. By embedding academic vocabulary and promoting discourse, the model enables students to construct arguments and explain their reasoning using scientific language (Lee, Quinn, & Valdés, 2013).

The success of this model at Tyler High School underscores the broader implications for science instruction in linguistically diverse settings. As classrooms become more multilingual, there is a growing need for instructional strategies that integrate language and content learning. The 7 Steps model offers a replicable framework for improving both science comprehension and language proficiency, making it a valuable tool for 21st-century education.

In conclusion, the review of related literature affirms that The 7 Steps to a Language-Rich Interactive Classroom is not only a response to the challenges of teaching Biology but a powerful means to enhance student learning in content and language. Its effectiveness in improving engagement, equity, comprehension, and performance among diverse student groups makes it a research-informed and practice-proven approach that aligns with the academic goals of Tyler High School and similar educational contexts.

II. Methodology

This study employed a quantitative experimental research design, specifically a pre-test–post-test control group design, to investigate the effectiveness of The 7 Steps to a Language-Rich Interactive Classroom in enhancing student learning in Unit 10: Ecology, aligned with the Texas Essential Knowledge and Skills (TEKS) for Grade 9 science.

Two intact class sections from Tyler High School participated in the study: the experimental group (A2) composed of 25 students, and the control group (A3), also with 25 students. The experimental group received instruction using The 7 Steps to a Language-Rich Interactive Classroom, a structured framework designed to build academic language and promote student interaction. Instructional strategies included techniques such as structured conversations, sentence frames, student-to-student dialogue, interactive word walls, and consistent use of academic vocabulary, all embedded within the content of Ecology.

In contrast, the control group was taught the same TEKS-based content using traditional teacher-centered methods, such as lectures, PowerPoint presentations, textbook readings, and direct questioning. While the control group received the same curriculum content and time allotment, there was minimal emphasis on academic language scaffolds or structured student interaction.

Both groups took a pre-test prior to the instructional intervention and a post-test following the three-week implementation period. The tests were teacher-made assessments aligned with the TEKS for Unit 10: Ecology, covering major concepts such as ecosystems, energy flow, food chains and food webs, ecological succession, biotic and abiotic components, and environmental sustainability.

The primary aim of the research was to compare the differences in pre- and post-test scores between the experimental and control groups to evaluate the effectiveness of the 7 Steps framework in promoting student engagement, academic language development, and conceptual understanding in Biology.

Participants or Subjects

The participants were Grade 9 students at Tyler High School, located at 1120 N NW Loop 323, Tyler, Texas, USA, during the 2024–2025 school year. A total of 50 students from two sections participated in the study: 25 students from section A2 (experimental group) and 25 students from section A3 (control group).

The experimental group (A2) received instruction using the 7 Steps to a Language-Rich Interactive Classroom, which emphasizes structured student talk, academic language development, and interactive engagement. Strategies implemented included the use of sentence stems, partner conversations, posted key vocabulary, structured dialogue frames, and opportunities for repeated, purposeful student interaction.

The control group (A3) received traditional teacher-centered instruction for the same unit (Unit 10: Ecology), involving lectures, textbook-based learning, and teacher-led questioning, with no implementation of the 7 Steps strategies.

A convenience sampling technique was used, as both sections were already assigned to the researcher. To minimize instructional bias, the same teacher delivered instruction to both groups, following consistent pacing and using the same curriculum materials. The key distinction was the instructional framework applied—7 Steps in the experimental group versus traditional instruction in the control group. Informed consent was obtained from all participants and their guardians. The study adhered to ethical research standards to ensure student privacy, safety, and voluntary participation.

Data Collection

To assess the effectiveness of the 7 Steps framework, data were collected using teacher-made pre-tests and post-tests. These assessments were designed to align with TEKS standards for Grade 9 Ecology and focused on evaluating conceptual understanding in key topics such as energy transfer in ecosystems, ecological relationships, human impact, ecological succession, and sustainability.

The pre-test served as a baseline measure before instruction began. The experimental group was then taught using the 7 Steps strategies over a three-week period, while the control group continued with traditional lecture-based instruction. After the intervention, a post-test with similar structure and difficulty level was administered to both groups to measure learning gains.

In addition to test scores, the experimental group completed student reflections, journal entries, and exit slips to offer qualitative insights into their learning experiences and engagement with the 7 Steps strategies. All data collected were kept confidential and were used solely for research purposes.

Instruments Used

The primary instrument used was a teacher-made achievement test, developed for both pre- and post-assessment. The test consisted of 30 multiple-choice items, aligned with TEKS for Unit 10: Ecology, and covered topics such as food chains, energy pyramids, ecological succession, biotic and abiotic factors, and environmental impact.

A Table of Specifications (TOS) guided the development of the test to ensure comprehensive coverage of content and cognitive levels, ranging from recall to higher-order thinking. The test's content validity was reviewed by peer science educators, and modifications were made based on their feedback.

Each student was given 40 minutes to complete the assessment in a classroom setting under standardized conditions, ensuring reliability in data collection.

Data Analysis Procedures

The data from pre-tests and post-tests were analyzed using quantitative statistical methods to determine the impact of the 7 Steps instructional model. The procedures included:

1. Calculation of mean scores for both pre-tests and post-tests for the experimental and control groups.
2. Use of a paired samples t-test to assess significant gains within each group.
3. Use of an independent samples t-test to compare post-test scores between the two groups.
4. Cohen's d was computed to measure the effect size of the instructional intervention.
5. Descriptive statistics (mean, standard deviation, range) were calculated to observe performance trends.
6. Tests for normality (Shapiro-Wilk) and homogeneity of variance (Levene's Test) were conducted. If assumptions were violated, non-parametric alternatives, such as the Mann-Whitney U test, were employed.
7. All statistical analyses were performed using SPSS, providing accurate and systematic evaluation of the data with visual representation as needed.
8. Assumptions of normality and homogeneity of variance were tested using the Shapiro-Wilk and Levene's test, respectively. If violated, non-parametric alternatives like the Mann-Whitney U test were considered.

All analyses were performed using SPSS, which allowed for reliable processing of the statistical data and visual representation of results.

Volume V, Issue 2 February 2025, eISSN: 2799-0664

Ethical Considerations

This study strictly adhered to ethical research protocols. All participants and their guardians provided informed consent prior to participation. The study's purpose, procedures, potential benefits, and the participants' rights—including the right to withdraw—were clearly communicated.

Student identities were protected using coded identifiers, and all data were stored in password-protected files accessible only to the researcher. No identifying information was included in any reports or publications.

The research was conducted in alignment with the principles of confidentiality, respect, and academic integrity throughout the study.

III. Results and Discussion

It includes a comparison of the pre-test and post-test results of both the control and experimental groups to assess the effectiveness of station-based differentiated instruction in teaching Biology. The instructional intervention was implemented using the Seven Steps in a Language-Rich Biology Classroom framework with a total of 50 Grade 9 students from Tyler High School (25 students in each group).

1. Comparison of the Pre-Test Results of the Control and Experimental Group

Table 1
Pre-Test Results of the Control and Experimental Groups

Treatment	N	Mean	Tstat	P	Decision
Control	25	14.80	0.18	0.86	Fail to reject the null
Experimental	25	14.65			

Table 1 shows that the control group had a mean pre-test score of 14.80 while the experimental group had 14.65. The computed t-value (0.18) and p-value (0.86) indicate no significant difference between the two groups before the intervention, confirming comparable baseline knowledge in Biology.

2. Comparison of the Pre-Test and Post-Test Results of the Control Group

Table 2
Pre-Test and Post-Test Scores of the Control Group

Control	N	Mean	Tstat	Decision
Pre-Test	25	14.80	10.21	Significant improvement
Post Test		26.90		

As shown in Table 2, the control group's mean score increased from 14.80 to 26.90 after the intervention. The computed t-value of 10.21 signifies a statistically significant gain, indicating that traditional teaching methods led to academic improvement, though likely limited in addressing varied student needs.

3. Comparison of the Pre-Test and Post-Test Results of the Experimental Group

Table 3
Pre-Test and Post-Test Scores of the Experimental Group

	N	Mean	Tstat	Decision
Pre-Test	25	14.65	15.78	Significant improvement
Post Test		32.40		

Table 3 reveals a substantial improvement in the experimental group's scores—from 14.65 (pre-test) to 32.40 (post-test). The t-statistic (15.78) indicates highly significant learning gains. This confirms the positive effect of differentiated classroom stations aligned with the Seven Steps on student achievement in Biology.

4. Comparison of the Post-Test Scores of the Control and Experimental Groups

Table 4
Post-Test Results of the Control and Experimental Groups

Treatment	N	Mean	Tstat	P	Decision
Control	25	26.90	3.12	0.004	Reject the null hypothesis
Experimental	25	32.40			

Table 4 shows that the experimental group outperformed the control group in the post-test, with a 5.5-point difference. The t-value (3.12) and p-value (0.004) indicate a statistically significant difference, confirming the effectiveness of station-based differentiated instruction in enhancing student learning outcomes.

IV. Conclusion

Based on the findings, the following conclusions were made:

1. Differentiated instruction through classroom station activities significantly improves student academic performance in Biology.

2. The experimental group who experienced student-centered, station-based learning aligned with the Seven Steps model performed better than those who underwent traditional instruction.

3. Station activities promote a more inclusive, engaging, and effective learning environment, especially for diverse learners.

REFERENCES

[1] Anderson, R. D. (2007). Inquiry as an organizing theme for science curricula. In S. K. Abell & N. G. Lederman (Eds.), Handbook of Research on Science Education (pp. 807–830). Mahwah, NJ: Lawrence Erlbaum Associates.
[2] Bunch, G. C. (2013). Pedagogical language knowledge: Preparing mainstream teachers for English learners in the new standards era. Review of Research in Education, 37(1), 298–341.
[3] Bunch, G. C. (2013). Pedagogical language knowledge: Preparing mainstream teachers for English learners in the new standards era. Review of Research in Education, 37(1), 298–341.
[4] Bunch, G. C. (2013). Pedagogical language knowledge: Preparing mainstream teachers for English learners in the new standards era. Review of Research in Education, 37(1), 298–341.
[5] Echevarria, J., Vogt, M. E., & Short, D. J. (2017). Making content comprehensible for English learners: The SIOP model (5th ed.). Pearson Education.
[6] Echevarria, J., Vogt, M. E., & Short, D. J. (2017). Making content comprehensible for English learners: The SIOP model (5th ed.). Pearson Education.
[7] Echevarria, J., Vogt, M. E., & Short, D. J. (2017). Making content comprehensible for English learners: The SIOP model (5th ed.). Pearson Education.
[8] Fang, Z. (2006). The language demands of science reading in middle school. International Journal of Science Education, 28(5), 491–520.
[9] Fang, Z. (2006). The language demands of science reading in middle school. International Journal of Science Education, 28(5), 491–520.
[10] Fang, Z. (2006). The language demands of science reading in middle school. International Journal of Science Education, 28(5), 491–520.
[11] Lee, O., & Buxton, C. A. (2013). Integrating Science and Language for English Language Learners: A Perspective of Reform. Routledge.
[12] Lee, O., & Buxton, C. A. (2013). Integrating Science and Language for English Language Learners: A Perspective of Reform. Routledge.
[13] Lee, O., Quinn, H., & Valdés, G. (2013). Science and language for English language learners in relation to Next Generation Science Standards and with implications for Common Core State Standards for English language arts and mathematics. Educational Researcher, 42(4) 223–233.

[14] Lee, O., Quinn, H., & Valdés, G. (2013). Science and language for English language learners in relation to Next Generation Science Standards and with implications for Common Core State Standards for English language arts and mathematics. Educational Researcher, 42(4),223–233.
[15] Lemke, J. L. (1990). Talking Science: Language, Learning, and Values. Norwood, NJ: Ablex.
[16] McCarthy, J. (2014). How learning stations can be used for differentiation. Edutopia. Retrieved from https://www.edutopia.org/blog/differentiated-instruction-learning-stations-john mccarthy
[17] McCarthy, J. (2014). How learning stations can be used for differentiation. Edutopia. Retrieved from https://www.edutopia.org/blog/differentiated-instruction-learning-stations-john mccarthy
[18] Seidlitz, J., & Perryman, B. (2011). 7 Steps to a Language-Rich, Interactive Classroom. Seidlitz Education.
[19] Seidlitz, J., & Perryman, B. (2011). 7 Steps to a Language-Rich, Interactive Classroom. SeidlitzEducation. Seidlitz, J., & Perryman, B. (2011). 7 Steps to a Language-Rich, Interactive Classroom. Seidlitz Education.
[20] Tomlinson, C. A. (2014). The Differentiated Classroom: Responding to the Needs of All Learners (2nd ed.). ASCD.
[21] Tomlinson, C. A. (2014). The Differentiated Classroom: Responding to the Needs of All Learners (2nd ed.). ASCD.
[22] Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard University Press.
[23] Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard University Press.
[24] Vygotsky, L. S. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard University Press.
[25] Zwiers, J. (2014). Academic conversations: Classroom talk that fosters critical thinking and content understandings. Stenhouse Publishers.
[26] Zwiers, J. (2014). Academic conversations: Classroom talk that fosters critical thinking and content understandings. Stenhouse Publishers.
[27] Zwiers, J. (2014). Academic conversations: Classroom talk that fosters critical thinking and content understandings. Stenhouse Publishers.