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The Effectiveness of a Semantic-Web Based Program in Developing Pre-Service EFL Teachers' Performance-Based Assessment

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Abstract

The research investigated the effectiveness of a Semantic Web-Based program in developing pre-service English Language teachers' performance-based assessment skills. The research's instruments included a performance-based assessment checklist and a performance-based assessment test, and the Semantic Web-based program. Thirty-four EFL major students at Hurghada Faculty of Education participated in the research as pre-service teachers. The participants were pre-tested to determine their initial level of targeted skills. Afterward, they studied the Semantic Web-Based program during the second semester of the academic year 2022/2023 at Hurghada Faculty of Education and were post-tested to identify the effectiveness of the proposed program. The results showed statistically significant differences between the mean scores of participants in the pre-post testing favoring the post-testing in planning, implementing and analyzing performance-based assessment. The findings suggest that the Semantic Web is effective in developing pre-service English language teachers' performance-based assessment skills. The diversification of Semantic Web tools and applications allows students to interact with a variety of platforms and activities, which directly affects their target skills.

Key Words: Semantic Web, pre-service teachers, performance-based assessment

المستخلص

هدف هذا البحث إلى التحقيق في فعالية برنامج قائم على الويب الدلالي في تطوير التقييم القائم على الأداء لدى معلمي اللغة الإنجليزية قبل الخدمة. تضمنت أدوات البحث قائمة مهارات التقييم القائم على الأداء واختبار التقييم القائم على الأداء ، والبرنامج الدلالي القائم على الويب. شارك في البحث أربعة وثلاثون طالبًا و طالبة الفرقة الرابعة من طلاب قسم اللغة الإنجليزية بكلية التربية بالغرندقة كمدربين قبل الخدمة. تم اختبار المشاركين مسبقًا لتحديد مستواهم الأولي في المهارات المستهدفة. بعد ذلك، قاموا بدراسة البرنامج الدلالي القائم على الويب خلال الفصل الدراسي الثاني من العام الجامعي ٢٠٢٣/٢٠٢٢ بكلية التربية بالغرندقة، وتم إجراء الاختبار البعدي لهم للتعرف على مدى فاعلية البرنامج المقترح. وأظهرت النتائج وجود فرق ذو دلالة إحصائية بين متوسطات درجات المشاركين في الاختبار القبلي والبعدي لصالح الاختبار البعدي في التخطيط والتنفيذ و التحليل الخاص بالتقييم القائم على الأداء. تشير النتائج إلى أن الويب الدلالي فعال في تطوير مهارات التقييم القائم على الأداء لدى معلمي اللغة الإنجليزية قبل الخدمة. يتيح تنوع أدوات وتطبيقات الويب الدلالي للطلاب التفاعل مع مجموعة متنوعة من المنصات والأنشطة، مما يؤثر بشكل مباشر على مهاراتهم المستهدفة.

الكلمات المفتاحية: الويب الدلالي، معلمو اللغة الإنجليزية قبل الخدمة، التقييم القائم على الأداء

Introduction

The integration of technology into education has expanded significantly, leveraging the power of technological advancements to optimize learning outcomes. The use of a semantic approach in education aligns with the target of integrating technology in education to enhance the whole teaching environment. The Semantic Web has the potential to organize, connect information, and transform English language learning into a personalized, interactive, and collaborative experience. Hence, utilizing a Semantic Web holds a significant promise for developing performance-based assessment of pre-service English language teachers.

Assessment plays a pivotal role in education for enabling instructors to evaluate whether learners have met their learning goals and expectations. Performance-based assessment (PBA) stands out as an effective method that provides a more accurate measure of student learning. According to Andrade and Brookhart (2019, p.11), performance-based assessments require students to demonstrate their knowledge and skills in realistic scenarios, thus offering a more authentic measure of their abilities. However, these assessments can be more time-consuming and challenging to develop and score than traditional methods.

Furthermore, performance-based assessment (PBA) emerged as a crucial element in evaluating students' language proficiency, offering a more holistic and contextually relevant approach compared to traditional methods. Al-Khasawneh and Alzyoud (2018) defined PBA as the evaluation of a student's ability to apply their language skills in authentic, real-world scenarios. This assessment methodology shifts the focus from rote memorization and discrete test-taking to assessing a student's ability to effectively communicate and perform language tasks in meaningful contexts.

Expanding the use of performance-based assessment (PBA) in Egypt is driven by the demand for more authentic and reliable

measures of language proficiency (Hamada & Hassan, 2020). Traditional assessments, often focused on grammar and vocabulary knowledge, often fail to adequately capture the subtleties of real-world language use and the practical demands of communication. In contrast, PBA directly evaluates students' ability to employ language effectively in a range of contexts, such as interacting with native speakers, engaging in discussions, comprehending spoken and written texts and producing meaningful written communication

The Semantic Web is an extension of the World Wide Web that seeks to make online content more accessible and understandable by both humans and machines. It represents a paradigm shift in information organization and retrieval, moving from the traditional web of documents to a web of data. The Semantic Web's inherent ability to organize and connect information in a meaningful manner holds immense potential to revolutionize the creation, access, and utilization of educational resources (Berners-Lee, Hendler, & Lassila, 2001).

The Semantic Web has the potential to revolutionize English language learning by making it more personalized, interactive, and collaborative. These potentials enhance to provide learners with personalized learning can be achieved by providing learners with content and activities that are relevant to their individual needs and interests. Guo (2019) confirmed that the Semantic Web has the potential to revolutionize English language learning by making it more personalized, interactive, and collaborative. However, interactive learning can be supported by providing learners with opportunities to interact with content and with each other.

Context of the problem

Through a literature review and direct observations of student teachers during their practicum, significant deficiencies were identified in their assessment skills, which are crucial for effective education. These observations highlighted numerous areas where student teachers struggled, particularly in performance-based

assessment including planning, implementing and analyzing performance-based assessment.

Statement of the problem

The research problem can be stated in the deficiency of performance-based assessment, specifically in the areas of planning, implementation, and analysis, among pre-service English Language teachers. Therefore, this research investigated the effect of a Semantic Web-based program as a potential means to enhance performance-based assessment. The research is trying to answer the following question: What is the effectiveness of a Semantic Web-based program in developing performance-based assessments for pre-service teachers?

Questions of the Research

1. What are the essential performance-based assessment skills required for EFL pre-service teachers at the Faculty of Education?
2. What are the key characteristics of the Semantic Web-based program for enhancing performance-based assessment skills in EFL pre-service teachers?
3. How effective is the Semantic Web program in developing performance-based assessment skills of EFL pre-service teachers?

The research attempted to verify the following hypotheses

There were statistically significant differences between the mean scores of the research participants in the pre-post-testing of performance-based assessment planning favouring the post-testing.

- There were statistically significant differences between the mean scores of the research participants in the pre-post-testing of performance-based assessment implementation favouring the post-testing.

- There were statistically significant differences between the mean scores of the research participants in the pre-post testing of assessment analysis favouring the post-testing.

Significance of the research

This research might be significant for:

- Exploring the potential of Semantic Web technologies to improve training programs for pre-service English language teachers.
- customizing intelligent tutoring systems for teachers to deliver personalized feedback to students to improve their performance.
- facilitating teachers' tasks in tracking and assessing students' progress through the integration of suitable technological applications.
- Providing course designers with innovative tools for designing personalized and adaptive learning experiences.

Design of the research

The current research followed a quasi-experimental one-group design, which means that there is only one group of participants to be pre-post tested in the research and no control group is used.

Delimitations

The present research was delimited to the following

- a. A group of (34) students in the fourth year of EFL major at Hurghada Faculty of Education
- b. Some performance-based assessment skills (planning, implementation, and analysis)
- c. The second semester of the academic year 2022/2023.

Definition of terms

Semantic Web

The Semantic Web is an extension of the World Wide Web that aims to provide machines with the ability to understand the meaning of information (Berners-Lee, Hendler, & Lassila, 2001). This is achieved through the use of formal languages like Resource Description Framework (RDF) and ontologies, which give data explicit structure and semantics, enabling machines to reason, infer, and make connections between data points, fostering data-driven intelligence and personalized user experiences. It can be inferred from this definition that Semantics is the research of meaning and therefore the Semantic Web implies "a web of meaning". While, The World Wide Web Consortium (W3C) defined it to be; "The Semantic Web is an evolving extension of the World Wide Web that aims to provide machines with the ability to understand the meaning of information, enabling them to reason, infer, and make intelligent connections between data. It achieves this through a suite of technologies, including: Resource Description Framework (RDF), Ontologies and Linked Data" (W3C, 2023).

In the context of the current research , the operational definition of the Semantic Web is: " It is an advanced and interconnected information space that utilizes standardized protocols, ontologies, linked data and semantic technologies. This facilitates the creation of intelligent, personalized learning environments, enabling pre-service teachers to effectively develop and improve their performance-based assessment.)".

Performance-Based assessment

Oberg (2010, p.5) defined performance-based assessment as an approach or many approaches that are used to measure students' progress, skills, and achievements which links instruction to assessment stating that: " It is one or more approaches for measuring student progress, skills, and achievement" and that

performance assessment is “the ultimate form of linking instruction with the assessment”.

The operational definition of performance-based assessment is; Performance-based assessment is an assessment that focuses on measuring pre-service EFL teachers' skills and development by evaluating the quality of their work products by connecting learning objectives to assessment.

Literature Review and Related Studies

1. Performance-Based Assessment Advantages

Performance-based assessment (PBA) is not a new concept in education. In fact, it is one of the oldest methods used to evaluate how well a student has mastered the material that has been presented in class (Colley, 2008; Speers, 2008). Nowadays, teachers who use this kind of assessment believe that students demonstrate their real learning and understanding by performing tasks or creating products. This is because performance-based assessments require students to use higher-order thinking skills like analysis, synthesis, problem solving, and critical thinking to create the responses or perform the tasks (Van Tassel-Baska, 2014).

Many educators also prefer to use performance-based assessments since they include meaningful, challenging, and engaging tasks that simulate real-world contexts, and combine language abilities with knowledge and skills of different content-areas. Besides, PBAs evaluate not only the outcome but also the procedures and strategies used to obtain that outcome. Through performance-based assessments, students' understanding, and reasoning are tested to determine how well they can apply what they know (Herrera et al., 2013). Therefore, these evaluation instruments provide information in depth about students' knowledge and skills. The philosophy behind performance-based assessment is that knowledge is constructed during learning, and that students discover knowledge for themselves rather than receive knowledge from the teacher.

In addition, Hibbard et al., (1996) defined PBAs “represent a set of strategies for the...application of knowledge, skills, and work habits through the performance of tasks that are meaningful and engaging to students” (p.5). Such assessments provide teachers with information about how well a student understands and applies knowledge. It goes beyond the ability to recall information and beyond rote memorization of rules.

Unlike old traditional assessment practices, in which feedback meant returning test scores to students, in performance-based assessment practices, feedback is considered an important tool to improve student learning and teacher instruction. As (William & Thompson, 2007) asserted that performance-based assessments give teachers and students an implicit and explicit recipe to improve future action (p. 12). Therefore, effective teachers commonly use PBA as a formative assessment tool to monitor and examine student progress from various perspectives and under different conditions during instruction.

Performance-based assessment helps to measure complex learning outcomes that cannot be measured by other means and provides tools for assessing the process or procedure as well as the product or result of the performing task. According to Stiggins (2001), PBA involves students directly and deeply in their learning process and increases their confidence and motivation to learn since it emphasizes progress and achievement rather than failure and defeat.

Furthermore, in performance-based assessments, students' work is compared to a set of criteria, not to other students' performance (William & Thompson, 2007). As a result, this kind of assessment promotes learning rather than assigning grades; that is why PBAs look more like teaching and less like testing. Therefore, performance-based assessments can be a learning experience in themselves; in fact, they can motivate EFL students to learn more about the target language.

Performance-based assessment also allows students to construct their own responses instead of choosing them from a list of options as it usually happens in multiple-choice and standardized tests. According to Gardner (2006), cognitive research indicates that most learning occurs in active rather than passive contexts, and that children construct knowledge from their interactions in the classroom. Consequently, this is a suitable and useful assessment tool to evaluate learners effectively. Additionally, according to Stiggins (2001), performance-based assessments represent a set of strategies that asks students to use their knowledge and skills to create a product or perform a task that is authentic and meaningful to them based on certain predetermined criteria.

Moreover, performance assessments offer teachers the opportunity to discover their own strengths and weaknesses. By using PBAs, teachers can reflect on their own teaching practices to identify their own deficiencies or determine if further emphasis is needed in certain areas of instruction (Speers, 2008). Educators are better able to see all their deficiencies at the time they are assessing their students' performances. Performance-based assessments can be used to enhance instruction, determine what curriculum needs to be taught and at what level, identify appropriate strategies for grouping students, and recognize which core concepts should be emphasized or even retaught (Van Tassel-Baska, 2013). Therefore, this kind of evaluation brings many benefits for EFL learners, especially those who are culturally and linguistically diverse.

Accordingly, mastering performance-based assessment involves proficiency in several key areas: designing and planning, implementation, and assessment analysis.

- Designing and Planning: Effective educators design engaging tasks aligned with learning objectives, integrating knowledge of curriculum standards and student needs (Guskey, 2015). They develop clear rubrics that outline expectations and guide constructive feedback, ensuring transparent assessment criteria (Airasian, 2005).

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- Implementation: The administration of assessments requires managing logistics, adapting to various situations, and providing equitable support to maintain fairness and efficiency (Stiggins, 2005). Communicating results effectively to students, parents, and stakeholders is also critical, necessitating clarity and sensitivity (Brookhart, 2011).
 - Assessment Analysis: Educators need to leverage technology to enhance their practice, which involves selecting appropriate tools for streamlining processes and gathering data (Pellegrino & Hilton, 2013). Differentiating tasks to accommodate diverse learners is crucial, as is understanding individual needs and offering various ways to demonstrate mastery (Tomlinson, 2001). Ongoing analysis of student work through formative assessments is essential for making instructional adjustments (Black & Wiliam, 1998). Continual reflection and professional development are key to refining and updating teaching practices (Stiggins, 2007).

2. The Significance of The Semantic Web in Education

The Semantic Web is not merely a technological evolution but a pedagogical revolution in education. Through personalized learning, knowledge graphs, efficient content management, and enhanced collaboration, it empowers educators and learners alike. As the educational landscape continues to evolve, embracing the Semantic Web is not just an option but a necessity to unlock the full potential of education in the digital age.

Berners-Lee, (2001, p.34) identified that the Semantic Web is about enriching the content of documents for the benefit of human users and computers. Embracing this enrichment, education can transcend boundaries and usher in a new era of knowledge dissemination and acquisition. As originally envisioned, the Semantic Web is a system that enables machines to “understand” and respond to complex human requests based on their meaning. Such an “understanding” requires that the relevant information sources be semantically structured. In addition, it represents the

new generation of computer science which enables the computer to process the huge amount of information by understanding it.

In addition, Szeredi and Lukácsy (2014, p.471) underlined that the Semantic Web is a new area of research and development in the field of computer science that aims to make it easier for computers to process the huge amount of information on the Web, and indeed other large databases, by enabling them not only to read, but also to understand the information. The Semantic Web is still in its early stages of development, but it has the potential to revolutionize the way we interact with the web. By making it easier for computers to understand web content, the Semantic Web can enable new and innovative applications that are not possible today.

The Semantic Web is an important movement led by international standards of the World Wide Web Consortium which allows data to be shared and reused across applications. According to the W3C the Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. The main purpose of the Semantic Web is driving the evolution of the current web by enabling users to find, share and combine information more easily.

In the same manner, Ohler (2008) argued that the Semantic Web can be used to develop personalized learning experiences for students by providing them with assessments that are designed to their individual needs and interests. This can help students to learn more effectively and efficiently, and to reach their full potential. The Semantic Web can be used to understand the unique learning needs of each student and to develop assessments that are specifically designed to address those needs. This can be done by using the Semantic Web to understand the student's prior knowledge, learning goals, and preferred learning style. The Semantic Web can also be used to develop adaptive assessments that adjust to the student's performance in real-time.

In addition, the Semantic Web can revolutionize education by making it possible for students to learn at their own pace and in their own way, and for teachers to provide personalized feedback and guidance. The Semantic Web can be used to create personalized learning experiences for students and develop adaptive assessment tools. The Semantic Web can revolutionize education by making it possible for students to learn at their own pace and in their own way, and for teachers to provide personalized feedback and guidance (Chauhan, 2016). Furthermore, Czerkawski, (2012) highlighted that the Semantic Web tools can give each student the ability to process information at their own pace .Overall, the Semantic Web has the potential to make education more personalized, effective, and efficient.

Similarly, Rubens, Kaplan, and Okamoto's statement (2011) pointed out the remarkable potential of the Semantic Web in modern education. The prospect of adaptive assessment tools that offer real-time feedback is revolutionary. Such tools can finely tune learning experiences, ensuring they align precisely with each student's needs. By harnessing semantic technologies, these assessments can dynamically adapt, promoting deeper comprehension and personalized learning journeys. This not only empowers learners to track their progress but also provides educators with invaluable insights for tailored instruction. The Semantic Web can be used to develop adaptive assessment tools that provide students with feedback and guidance on their learning progress in real time (Rubens, Kaplan, & Okamoto, 2011). The Semantic Web's role in shaping education into a more responsive, data-informed, and effective enterprise is a testament to its transformative capacity.

Furthermore, El-Khodary and El-Dakhakhny (2020) identified that the Semantic Web can facilitate the development of intelligent tutoring systems, personalized learning experiences, and adaptive learning environments, empowering machines to understand the relationships between concepts and data.

Additionally, El-Dakhakhny (2019) emphasized that the Semantic Web can enhance the discoverability of educational resources by providing a standardized framework for organizing and indexing information, making it easier for educators and learners to locate the resources they require.

Commentary

The literature review of this research presents a coherent discussion on the integration of Semantic Web-based technology in English Language Teaching (ELT) pre-service programs, highlighting the challenges and potential benefits of such an approach. It begins by emphasizing the importance of preparing pre-service teachers to effectively incorporate technology into their teaching practices, noting that difficulties in understanding and integrating technology can impede the effective execution of performance-based assessments (PBAs). This introduction sets the stage for the argument that pre-service programs must evolve to include modern literacy practices relevant to both the web and the specific needs of ELT educators.

The narrative progresses logically by identifying specific shortcomings in pre-service teachers' abilities to plan, implement, and analyze PBAs. This diagnosis of the problem justifies the proposed solution: the incorporation of advanced technological tools provided by the Semantic Web. The text explains how these technologies can offer personalized, efficient, and interactive learning experiences, suggesting a potential revolution in educational practices.

Further elaborating on the proposed solution, the text outlines the research's objective to examine the effectiveness of Semantic Web-based programs in developing essential PBA skills among pre-service teachers. It posits that significant improvements are expected post-intervention, underscoring the research's significance in offering innovative teaching and assessment solutions.

Eventually, the text describes the research design - a quasi-experimental one-group design intended to evaluate the impact of Semantic Web technologies on pre-service teachers' assessment capabilities. This methodological approach signifies a focused effort to contribute to the ongoing discourse on educational technology integration and teacher preparation. The text maintains coherence by logically connecting the need for technology integration in teacher education with the proposed solution of Semantic Web-based programs, supported by a structured research plan aimed at validating the effectiveness of this approach.

Method and Procedures:

Participants:

A group of 34 EFL pre-service teachers voluntarily participated in the research. These participants were fourth-year students from the English Department of Hurghada faculty of Education during the second semester of the academic year 2022/2023.

Design:

This research adopts a quasi-experimental one-group pre-post-test design to evaluate the effectiveness of a Semantic Web-based program in developing the performance-based assessment skills of EFL pre-service teachers

Variables:

Independent variable: The Semantic Web-based program.

Dependent variable: Performance-based assessment skills of EFL pre-service teachers.

Instruments and Materials:

To achieve the research aims, the following instruments were utilized:

- 1- A performance-based assessment checklist.
- 2- A performance-based assessment test.
- 3- A Semantic Web-based program.

Scoring: The scoring scale ranges from "Excellent" (4 points) to "Weak" (1 point), with total marks ranging from 27 to 108.

Validity: The sheet's validity was ensured through simple and content validity checks, including verification by a panel of TEFL experts.

Reliability of the Observation Sheet:

1. **Inter-rater Method:** Two observers used the same observation sheet to ensure consistency and reduce subjectivity. The Pearson coefficient was found to be .92, indicating high reliability at the 0.01 level.
2. **Split-Half Method:** The Split-Half (Spearman-Brown) method was used, yielding a reliability coefficient of 0.79, indicating strong reliability.

Instructor's Role:

- The instructor (researcher) served as a guide, coordinator, and facilitator rather than a traditional lecturer.
- Demonstrated tasks and activities, supplied necessary information, motivated participants, and supported them in achieving objectives.
- Helped students overcome implementation difficulties and monitored their performance to provide feedback.

Participants' Role:

- Actively engaged with the researcher and performed required tasks.
- Integrated prior knowledge with new information and participated in activities, including peer observation and assessment.

Testing the first hypothesis

Hypothesis 1: There were statistically significant differences between the mean scores of the research participants in the pre-post testing of The planning of PBA favoring the post testing.

The analysis of the data using the t-test showed that the participants demonstrated a higher level of improvement in PBA planning, as their post-test scores were higher than their pre-test scores. Table (1) shows that the post-test mean was higher than the pre-test mean, which indicates an improvement in the participants' performance-based assessment . This improvement may be attributed to the effect of the proposed program on the sample.

Table (1)
The differences between the pre- post-test of
designing and planning (No=34)

Variable	No.	Pre-test		Post-test		DF	Indication Level	T Value	2 η
		Mean	S. D.	Mean	S. D.				
PBA Planning	34	8.00	0.88	10.88	164	33	0.01	10.32	Significant

According to Table (1), it can be inferred that the t-value is statistically significant (as the tabulated t-value at the degree of freedom 33 is 2.02 at the 0.01 level). Therefore, a statistically significant difference was found between the mean scores of pre-service English teachers in the pre- and post-application on the PBA

planning test in favor of the post-measurement as a result of using the Semantic Web-based program. Therefore, the effect size was strong concerning PBA planning.

4.1.3.1. Testing the second hypothesis:

Hypothesis 2: There were statistically significant differences between the mean scores of the research participants in the pre-post testing of assessment implementation favoring the post-testing.

The analysis of the data using the t-test showed that the participants demonstrated a higher level of improvement in PBA implementation, as their post-test scores were higher than their pre-test scores. Table (2) shows that the post-test mean is higher than the pre-test mean, which indicates an improvement in the participants' assessment implementation. This improvement may be attributed to the effect of the proposed program on the sample

Table (2)
The differences between the pre-post-test of the assessment implementation test (No=34)

Variable	No	Pre-test		Post-test		df	Improvement Ratio	T Value	2 η
		Mean	S. D.	Mean	S. D.				
Implementation	34	24.12	1.62	28.88	2.12	33	0.01	16.45	Significant

According to Table (2), it can be inferred that the t-value is statistically significant (as the tabulated t-value at the degree of freedom 33 is 2.02 at the 0.01 level). Therefore, a statistically significant difference was found between the mean scores of pre-service English teachers in the pre and post-test on the PBA implementation in favor of the post-measurement as a result of using Semantic Web tools. Therefore, the effect size was strong regarding the implementation.

Testing the third hypothesis

Hypothesis 3: There were statistically significant differences between the mean scores of the research participants in the pre-post testing of assessment analysis favoring the post-testing.

The analysis of the data using the t-test showed that the participants demonstrated a higher level of improvement in assessment analysis, as their post-test scores were higher than their pre-test scores. Table (3) shows that the post-test mean is higher than the pre-test mean, which indicates an improvement in the participants' assessment analysis. This improvement may be attributed to the effect of the proposed program on the sample.

Table (3)
The differences between the pre- post-test
of PBA analysis (No=34)

Variable	No.	Pre-test		Post-test		df	Indication Level	T Value	2 η
		Mean	S. D.	Mean	S. D.				
PBA analysis	34	8.03	.93	9.38	1.04	33	0.01	10.19	Significant

According to table (3), it can be inferred that the t-value is statistically significant (as the tabulated t-value at the degree of freedom 33 is 2.02 at the 0.01 level). Therefore, a statistically significant difference was found between the mean scores of pre-service English Language teachers in the pre and post-test on the PBA analysis test favouring the post-test as a result of using the Semantic Web-based program. Therefore, the effect size was strong regarding PBA analysis.

Discussion

The study's results emphatically support the effectiveness of a Semantic Web-based program in improving the specific aspects of

performance-based assessment: planning, implementation, and analysis, among pre-service EFL teachers. The notable increase in mean scores from pre- to post-tests in these areas indicates substantial growth in the participants' capabilities following their engagement with the program.

1. **Planning:** The improvement in planning skills, as demonstrated by the higher post-test scores, suggests that the Semantic Web program effectively aided the participants in designing assessment tasks that are both aligned with learning objectives and reflective of real-world scenarios. This aspect is crucial as effective planning is the foundation upon which successful assessment is built.
2. **Implementation:** The significant progress in the implementation phase indicates that the participants were better equipped to administer assessments in a fair and efficient manner. This includes managing logistics, adapting to diverse situations, and providing equitable support to all students. The program likely contributed to enhancing these practical skills, which are essential for conducting assessments in dynamic classroom environments.
3. **Analysis:** The advancement in assessment analysis skills, as reflected in the post-test results, points to an improved ability of the participants to critically evaluate and interpret assessment data. This skill is vital for making informed decisions about student learning and instructional strategies. The Semantic Web program's role in providing tools and frameworks for effective analysis likely facilitated this development.

The overall success of the Semantic Web-based program in enhancing these key aspects of performance-based assessment aligns with the current pedagogical focus on integrating technology into teacher education. This integration is not merely about using digital tools but about fundamentally transforming how future

teachers plan, implement, and analyze assessments to foster a more effective learning environment.

The instructor's role in guiding this process was instrumental, particularly in demonstrating how to effectively integrate technology into these various stages of assessment. The participants' engagement and their ability to apply new knowledge and skills in practical scenarios were pivotal in achieving the observed improvements.

Recommendations :

1. **Wider Implementation:** Based on the research 's findings, it's recommended to integrate Semantic Web-based programs more broadly in teacher education, particularly in courses focused on assessment skills.
2. **Further Research:** Future studies could explore the long-term impact of such programs on pre-service teachers' abilities and their subsequent classroom practices. Investigating how these skills transfer to actual classroom settings would be beneficial.
3. **Customization and Development:** Continuous development and customization of the Semantic Web program are essential to keep it relevant and effective in the rapidly evolving field of education technology.
4. **Training and Support for Instructors:** Instructors should receive adequate training and support in using Semantic Web technologies to ensure they can effectively facilitate and guide students through the program.
5. **Expansion to Other Disciplines:** Exploring the application of Semantic Web-based programs in other teaching disciplines beyond EFL could provide insights into its versatility and adaptability in different educational contexts.
6. **Incorporating Feedback Mechanisms:** Regular feedback mechanisms should be incorporated into the program to

continuously improve its effectiveness based on user experience.

7. **Addressing Technological Challenges:** Efforts should be made to address the technological challenges encountered, such as internet connectivity issues, to ensure smooth program delivery.

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