Ubiquitous Scaffolding Environment For Problem-Solving And Context Awareness

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ABSTRACT

The goals of this study are to construct a model for a problem-based learning environment that makes use of ubiquitous scaffolding and to assess that model. There are two distinct parts to the research process. The first step is to create a model for a problem-based learning environment in a ubiquitous scaffold, and the second is to assess the efficiency of that model. In this investigation, five professionals were chosen at random using a purposive sampling technique. Measures of central tendency and dispersion (mean and standard deviation) were used to analyze the data. What we found in our study is as follows: Principles of Ubiquitous Learning Environment (ULE), problem-based learning with scaffolding in ULE, problem-solving ability, and context awareness are the three pillars of the created paradigm. The model's second goal is to improve problem-solving abilities and sensitivity to context. Third, how the instructional model works Ubiquitous Scaffold Learning Environment Model-based Problem-based Learning is considered to be very acceptable by the experts.

KEYWORDS Problem-based Learning, Ubiquitous Learning, Scaffolding, Problem-solving Skills, Context Awareness.

INTRODUCTION


"Universal learning environment" (ULE) is an educational setting where students can access electronic learning materials from anywhere using a mobile device. Constructivism and modern schooling. Permanent, accessible, up-to-date, interactive, context-aware, and flexible. Students may learn anywhere, anytime by incorporating the aforementioned. Mobile problem-based learning helps students solve real-world problems and collaborate. Students' productivity isn't affected by time or place.

The researcher included problem-based learning and scaffolding in ULE. This simplifies education. If they have the right tools and resources, students may learn anywhere on their mobile devices. The model will recognize learning scenarios, helping students achieve goals. Anytime, anyplace, teachers may track student development. This simplifies classroom administration, progress tracking, and knowledge testing.

PURPOSE OF THE STUDY

This project aims to develop a universal learning scaffold. Problem-based learning improves critical thinking and situational comprehension. This research evaluates the Problem-based Learning Ubiquitous Scaffold Learning Environment.

SCOPE OF STUDY

Population and Sampling Group

This research sample consists of professionals with advanced knowledge in the following areas: instructional design; problem-based learning; scaffolding; ubiquitous learning; ICT; and problem-solving. Purposive sampling was used to pick five subject-matter experts from the fields of instructional design, problem-based learning, scaffolding, ubiquitous learning, ICT, and problem-solving.

Research Variables

The Ubiquitous Scaffolding Learning Environment is the independent variable. Applying the principles of the Problem-based Learning framework to better one's capacity for critical thinking and situational understanding. The model's effectiveness is the dependent variable.

CONCEPTUAL FRAMEWORK

The ADDIE Model of Instructional Design for Learning, together with Ubiquitous Learning Environments, Scaffolding, and Problem-Based Learning, are the conceptual foundation of this study (see Figure 1).
Figure 1. Conceptual Framework

**METHODOLOGY**

**The First Phase**

The creation of a problem-based learning environment on a ubiquitous scaffold.

- Review the literature on problem-based learning, the pervasive learning environment, scaffolding, problem-solving abilities, and context awareness, and conclude.
- Conduct research on the educational process by conducting in-depth interviews with both teachers and students to compile a comprehensive picture of instructional methods and student performance.
- Create a Learning Environment Based on Pervasive Scaffolding Applying the principles of the Problem-based Learning framework to better one's capacity for critical thinking and situational understanding.
- It's time to show the advisers the model and get their feedback.
- Submit the model for review by consulting with experts through in-depth interviews.
- Develop metrics through which the model's usefulness may be assessed.

**The Second Phase**

The purpose of this test was to assess the Problem-based Learning Ubiquitous Scaffold.

- Give a presentation to five specialists in the fields of problem-based learning, ubiquitous learning environments, scaffolding, problem-solving, and contextual awareness of the model you've developed.
- The changes made to the model are based on the advice of specialists.
- After making necessary adjustments, the model will be presented as a diagram alongside a report.
- Examine the results of a Likert-scaled evaluation of the model's efficacy, using a mean (x) and standard deviation (S.D.) of five evaluation criteria.

**Ubiquitous Scaffolding Algorithm**
RESULTS

Ubiquitous Scaffold Learning Environment Using Problem-based Learning Model

There are three primary parts to the instructional model: The instructional model's
1) building blocks and guiding principles
2) The learning model’s aims
3) The steps of the educational approach, including examples presented in Figure 2.

Elements and principles of the instructional model include:

Ubiquitous Learning Environment (ULE)

Anytime, anywhere This research explores environmental management in PBL. Tablets and smartphones are key learning tools. Students may study and access information wirelessly. WiFi provides mobile internet. Third, U-LMS lets teachers save course materials, student information, and other data. Context-aware recognizes a learner's circumstance. It may also identify learning trends and personalize information and training.

Problem-based learning (PBL)

Students complete a system-generated task in u-learning. Students can study whenever. They'll get context-specific scaffolding to boost their success. The system will present a problem scenario. They could work everywhere. PBL contains 7 steps. First, introduce the issue; then, describe it and your working hypotheses; then, develop learning goals; last, synthesize and test
what you've learned. Context awareness in the Ubiquitous Learning Environment provides scenario-appropriate scaffolding.

![Ubiquitous Learning Environment Diagram](image)

Figure 2. Ubiquitous Scaffold Learning Environment Using Problem-based Learning Model

**Roles of instructors**

Instructors are responsible for managing and dividing students into groups, introducing u-learning, demonstrating how to use mobile devices, managing learning and media contents corresponding to the subjects, setting up instructional activities including both learning and activity schedules, evaluating learning results, and sending feedback to the students so they can see their progress, following up with and facilitating the students.

**Roles of learners**

Teachers assign students duties. Mobile gadgets let students learn anywhere, anytime. Students will receive a push notification before the activity. Learners will benefit from context-aware module features. Extra resources and peer/teacher guidance are examples. Helpful peers and professors are always available.

**Problem-Solving Skill.**

Creative problem-solving entails thinking carefully about an issue and gathering, analyzing, and evaluating information to discover a solution that removes or diminishes the problem's impact. Weir outlines four specialized skills: Identify the problem, then study its cause, then propose and assess a solution.
Context awareness

"Context awareness" refers to educational technology's ability to recognize and respond to learner contexts. This encourages kids to finish their homework. Contextual awareness includes the following.

1) Taking into account unique aspects of each learner, such as their background, passions, and skill sets.
2) Learning trends are managed and students' instructional actions are monitored.
3) Learners' locations may be utilized to assess their actions while they are learning, thus it's important to be aware of where they are.
4) Time: being in the know about when activities are happening in the classroom so that students may be alerted promptly
5) Conscious of the connections among students, whether through informal student activities or formal teacher-student interactions.

The objective of the instructional model.

This pedagogical approach aims to improve students' problem-solving and awareness of their surroundings.

Process of the instructional model.

The three-stage process of the instructional model is as follows:

Preparation stage

1) Orientation. Throughout the world, students may find teachers who will guide them and supply them with information on the ever-present education.
2) Workshop signups and information. Teachers provide each student with a tablet PC and lead a lesson on its fundamental functions. Students sign up for an account, try out system access, and get comfortable with the LMS's discussion boards, assignment submissions, and other features.
3) Learner grouping. Five-person groups are created voluntarily, and each member's responsibilities are specified. The data about the classes are then published using the u-LMS interface.
4) Check for Problem-Solving Abilities. This process is carried out just before students begin their course of study.

Learning stage

Ubiquitous learning allows kids to perform homework from home, libraries, and coffee shops with an internet connection. Problem-based learning is scaffolded to help pupils solve problems. Students can build on prior knowledge and choose learning environments. When enough learner data is available, the system may scaffold. Reminder alerts students to
upcoming assignments and class topics. The first-week students use scaffolding to reach each learning stage's goals. In the following weeks, coaching teaches more information based on weekly test scores and problem-solving time. Each stage's numbers determine next week's schooling funding. Even with low scores, the method helps. The algorithm stops aiding if scores are adequate. Students are guided by higher-scoring peers to manage issues. Here are the learning steps.

1) Disclosure of issues. The technology sends a notification to the student's tablet when it's almost time to study, giving them time to get themselves organized. Automatically, the system will then provide a challenging scenario to the students.

2) Identifying and comprehending the issue at hand. The u-LMS interface on the tablet computers allows the students to examine and comprehend the issue situation provided by the system through group discussion and brainstorming. After identifying issues, students feed that information back into the system.

3) The progression of developing theories. Members of the group talk to one another and come up with ideas to determine what could be causing the issue. There is no censorship of members' opinions. Students arrange the hypotheses in a logical order, then enter the information into the system.

4) Learning goals are being formed. To determine what knowledge is needed to disprove the chosen hypotheses, a group engages in debate and brainstorming to develop learning objectives. The students then submit this consolidated report to the system as their learning objectives.

5) Additional data gathering. The team divides up the work of gathering fresh data from various sources. The information needed will be searched on the tablet computer and will be in line with the previously established educational goals.

6) Evaluation and integration of fresh knowledge. Participants summarise the study and identify which findings support the hypothesis and which do not in a group setting. The group then draws a judgment about the evidence and determines whether or not it is adequate to disprove the hypothesis. The student's hand in their findings from the information synthesis and evaluation.

7) Insightful summation. Members of the group meet virtually to deliberate on the problem-based study's findings, concepts, and ideas, and then write a summary of their collective thinking. Students feed their perspectives into the system as a consequence.

**Results of evaluation of model suitability**

Tables 1 through 4 show the findings of five experts' assessments of the models' viability.

Table 1. Analyzing the structure and effectiveness of this kind of education.

<table>
<thead>
<tr>
<th>Evaluation Lists</th>
<th>Results</th>
<th>Appropriateness</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>S.D.</td>
<td></td>
</tr>
</tbody>
</table>
Based on their evaluations (Table 1, $x = 4.33$, $S.D. = 0.76$), the experts agree that this teaching strategy works well at a high level. This suggests that the components and procedure of the instructional model were well-suited to the educational setting.

**Table 2. An analysis of the learning process's pre-learning preparatory phase.**

<table>
<thead>
<tr>
<th>Evaluation Lists</th>
<th>Results</th>
<th>Appropriateness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$x$</td>
<td>$S.D.$</td>
</tr>
<tr>
<td>1. Orientation</td>
<td>4.80</td>
<td>0.45</td>
</tr>
<tr>
<td>2. Enrollment and Training</td>
<td>4.60</td>
<td>0.55</td>
</tr>
<tr>
<td>3. Class division</td>
<td>4.60</td>
<td>0.55</td>
</tr>
<tr>
<td>4. Pre-Learn Assessment of Problem-Solving Abilities</td>
<td>5.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>4.75</strong></td>
<td><strong>0.39</strong></td>
</tr>
</tbody>
</table>

According to Table 2, at the most advanced level, the experts deemed the pre-learning preparation stage appropriate ($x = 4.75$, $S.D. = 0.39$). This implies that the students could be given a variety of tools at this stage to help them succeed in the instructional management phase.

**Table 3. Assessment of the current level of knowledge acquisition.**

<table>
<thead>
<tr>
<th>Evaluation Lists</th>
<th>Results</th>
<th>Appropriateness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$x$</td>
<td>$S.D.$</td>
</tr>
<tr>
<td>1. The issue must be presented.</td>
<td>5.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2. Explain the problem's definition and scope.</td>
<td>4.80</td>
<td>0.45</td>
</tr>
</tbody>
</table>
3. The progression of developing theories.  4.60  0.89  Highest
4. Create a set of educational goals.  4.80  0.45  Highest
5. Go out and get some more data.  4.80  0.45  Highest
6. Apply your newfound knowledge through synthesis and evaluation.  5.00  0.00  Highest
7. Take stock and judge  4.80  0.45  Highest

| Summary | 4.83 0.38 Highest |

Table 3: At the most advanced level, the experts agreed that the learning environment was optimal (x = 4.83, S.D. = 0.38). This signifies that the management of teaching presented here was appropriate for educational purposes.

Table 4. The findings from tests of this pedagogical approach.

<table>
<thead>
<tr>
<th>Evaluation Lists</th>
<th>Results</th>
<th>Appropriateness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This framework works well to improve analytical reasoning.</td>
<td>4.80 0.45</td>
<td>Highest</td>
</tr>
<tr>
<td>2. The approach fits the bill for raising awareness of context.</td>
<td>4.60 0.55</td>
<td>High</td>
</tr>
<tr>
<td>3. It is feasible to use the model.</td>
<td>4.60 0.55</td>
<td>High</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td>4.67 0.52 High</td>
<td></td>
</tr>
</tbody>
</table>

According to Table 4, the experts agreed that this educational style worked well at the advanced level (x = 4.67, S.D. = 0.52). Consequently, the model is applicable and useful for teaching problem-solving techniques.

**CONCLUSION**

Any education institutes that apply this instructional model should prepare their infrastructure, and prepare both learners and instructors so that they could create Ubiquitous learning environment. The developed model can be applied with undergraduates of all field and all levels. Also, this model can be used in all theoretical sections of all subjects. There should be motivations for the learners during learning process in order to stimulate their enthusiasm to learn. The limitation of using this model is that the learners must have mobile devices with internet connection such as tablet or cell phone. Our Proposed algorithm excels out in preparing the students in the field of problem-solving skills and context awareness.
REFERENCES


