EXTENDING DIPSEIL PERFORMANCE SUPPORT SYSTEM BY INTEGRATING QUIZ MODULE FOR BETTER LEARNING RESULTS

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Abstract

Plovdiv University (BULGARIA) has more than ten years of experience in the implementation of performance-centered approach in education by utilizing the Distributed Internet-based Performance Support Environment for Individualized Learning (DIPSEIL). Each course in DIPSEIL contains a number of tasks, which require higher-level thinking to complete successfully. The student assessment is based on the results from the learning tasks performances and a final test exam. Our experience from the final exam results reveals that most of students fail to answer questions that require factual and procedural knowledge.

That is the reason why the new, fourth version of DIPSEIL was extended with a Quiz generation system. The system is based on the use of the functional programming language Elixir and consists of the following modules:

1 Quiz generation module that supports different types of questions (dichotomous, multiple choice, short answer)
2 Quiz statistics module that provides calculation of: difficulty index, discrimination index, reliability and validity of tests, etc.

The pilot experiment of DIPSEIL Quiz generation system was conducted during the first semester of the academic year 2018-2019. The experiment involved 40 fourth year students who had already had an experience with DIPSEIL. Students’ and teachers’ questionnaires were used for qualitative data collection. Results doubtlessly show that DIPSEIL Quiz generation system enhances student assessment and can improve learning outcomes.

Keywords: Quiz generation system, e-learning environment, Internet based performance support system.

1 INTRODUCTION

Distributed Internet-based Performance Support Environment for Individualized Learning (DIPSEIL) is a learning management system (LMS) that has been used in Plovdiv University Paisii Hilendarski for more than 10 years. DIPSEIL has two specific characteristics [1], [2]:

• The learning content is based on learning tasks. The teacher defines them according to the specified learning objectives;
• Students perform the learning tasks throughout the semester and collect credits for each learning tasks performance.

A DIPSEIL task combines the following elements [3], [4], [5]:

• Task description;
• Task-specific training - training materials which help the user to learn while performing the task;
• Reference information - task relevant resources which students either have to study or use just in time to perform the task;
• Instructions how to perform the task;
• Expert advice about a task.
At the end of 2018 the new forth version of DIPSEIL was released for testing and evaluation. The system is based on the functional programming language Elixir, which provides the following benefits:

- Good performance;
- Reliability and fault tolerance;
- Scalability -Elixir applications are stable even if the users grow exponentially;
- Concurrency - suitable for building applications with concurrent connections;
- Clean syntax - easy to write clean and understandable code.

The new functionalities of the system include a Quiz Generation System, which consists of the following modules:

1 Quiz Generation Module that supports different types of questions (dichotomous, multiple choice, short answer) and provides immediate feedback on the correctness of answers;
2 Quiz Statistics Module that provides calculation of: difficulty index, discrimination index, reliability and validity of tests, etc.

2 METHODOLOGY

Beta testing of DIPSEIL Quiz System was done by selected groups of students during the first semester of the academic year 2018-2019. The experiment involved 40 fourth year students who had already had an experience with DIPSEIL.

Teachers’ and students’ questionnaires are prepared to evaluate users’ perceptions about the usefulness and ease of use of DIPSEIL Quiz System. The users assess each statement in the questionnaire according to a 4-point Likert scale (1 - "No"; 2 - "Rather no"; 3 - "Rather yes"; 4 - "Yes").

The following statistical measures are used for data analysis:

- Median (Me) - a measure of central tendency;
- Mode (Mo) - a measure of central tendency;
- Interquartile range (IQR) - a measure of dispersion. It shows whether the responses are clustered together or scattered across the range of possible responses.

3 RESULTS

3.1 Results from the students’ questionnaire

Table 1 presents the results from the students’ questionnaire.

To the first statement "DIPSEIL Quiz System is stable and works well" 95.0% of students give a positive response: 65.0% - "Yes" and 30.0% - "Rather Yes".

A similar distribution is observed in answers to the statement "I found it easy to navigate through the DIPSEIL Quiz System." (67.5% - "Yes" and 25.0% - "Rather Yes"). The values of median and interquartile range (Me=4; IQR = 1) show that students unanimously agree on the opinion that the developed Quiz System is reliable and with intuitive interface.

To the next two items "I think that using DIPSEIL Quiz System is useful for gaining better understanding of the learning material." and "Learning tasks and DIPSEIL Quiz System fit together well to assure learning." 82.5% of students give a positive response. The value of the IQR is 1, which shows that students are in complete agreement that the enhancement of DIPSEIL with the Quiz System has improved their learning.

Fig. 1 presents the distribution of the answers to the fifth item. The values of median and interquartile range (Me = 3; IQR = 2) show lack of consensus between students that DIPSEIL Quiz System increased their motivation.
Figure 1. Distribution of the answers to the item “The use of DIPSEIL Quiz System motivated me to study”.

Table 1. Distribution of students’ answers for each item in the students’ questionnaire.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes - 4</th>
<th>Rather Yes - 3</th>
<th>Rather No - 2</th>
<th>No - 1</th>
<th>Me</th>
<th>Mo</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.DIPSEIL Quiz System is stable and works well.</td>
<td>26</td>
<td>12</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2.I found it easy to navigate through the DIPSEIL Quiz System.</td>
<td>27</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3.I think that using DIPSEIL Quiz System is useful for gaining better understanding of the learning material.</td>
<td>15</td>
<td>13</td>
<td>5</td>
<td>5</td>
<td>3.5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>4.Learning tasks and DIPSEIL Quiz System fit together well to assure learning.</td>
<td>22</td>
<td>11</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>5.The use of DIPSEIL Quiz System motivated me to study.</td>
<td>14</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6.The DIPSEIL Quiz System increased my sense of self-control over learning.</td>
<td>10</td>
<td>14</td>
<td>13</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1.25</td>
</tr>
<tr>
<td>7.The DIPSEIL Quiz System helped me to prepare for final test.</td>
<td>27</td>
<td>9</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

The values of median and interquartile range (Me = 3; IQR = 1.25) show that there is a moderate degree of consensus on the statement that the DIPSEIL Quiz System increased students’ sense of self-control over learning (Fig. 2).

To the last item "DIPSEIL Quiz System helped me to prepare for final test." 90.0% of respondents give a positive answer: 67.5% - "Yes" and 22.5% - "Rather Yes". Students express complete agreement on this statement (Me=4; IQR = 1).

Figure 2. Distribution of the answers to the item “The DIPSEIL Quiz System increased my sense of self-control over learning".
3.2 Results from the teachers’ questionnaire

Results from the teachers’ questionnaire are summarized in Table 2.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes - 4</th>
<th>Rather Yes - 3</th>
<th>Rather No- 2</th>
<th>No- 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DIPSEIL Quiz System is stable and works well.</td>
<td>90%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2. I found it easy to navigate through the DIPSEIL Quiz System.</td>
<td>80%</td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>3. Learning tasks and DIPSEIL Quiz System fit together well to assure effective learning.</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>4. DIPSEIL Quiz System provides all instruments necessary for developing high quality tests</td>
<td>60%</td>
<td>30%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>5. It took a lot of time to develop my first test with Quiz generation module.</td>
<td>0%</td>
<td>0%</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>6. I needed to learn many new things before using Quiz statistics module for the first time</td>
<td>0%</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
</tbody>
</table>

90% of teachers strongly agree that DIPSEIL Quiz System is stable and works well. 80% of them report that it is intuitive and effortless to navigate.

All teachers are confident that DIPSEIL performance support system, enhanced with a Quiz System can assure effective learning (this positive attitude is confirmed by data from the students’ questionnaire). 90% of them agree that DIPSEIL Quiz System provides all instruments necessary for developing high quality tests (60% “Yes” and 30% “Rather Yes”).

Results show that teachers didn’t encounter any difficulties while using the system. All teachers report that it was easy and didn’t take a lot of time to develop their first test. 80% of them answered negatively to the statement “I needed to learn many new things before using Quiz statistics module for the first time”.

4 CONCLUSIONS

Results from the students’ questionnaire show that students positively evaluate DIPSEIL Quiz System and perceive it to be effective to learning. Students agree that it is easy to use, helps them to prepare for the final exam and increases their motivation.

Obtained results from the teachers’ questionnaire show that teachers are confident that DIPSEIL Quiz System is useful, provides all instruments necessary for developing high quality tests and can enhance students’ assessment.

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REFERENCES


