VIRTUAL LEARNING FOR HUMAN RESPIRATORY SYSTEM VIA NON-IMMERSIVE VR (V-HURESYS): AN EVALUATION

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INTRODUCTION

Why?

- Students commonly fail in science subject due to a lack of proper teaching methods as well as the insufficiency of necessary teaching aids (A.R.B.Olayinka, 2016)
- Students usually find it hard to understand because of the complicated concept, a biological process that cannot witness with the eyes, abstract concepts as well as terminologies (A. Crimer, 2012).
- Students thought that memorizing is the only way in learning biology subjects in schools (A. Crimer, 2012).
INTRODUCTION

To study something new in order to enhance one's knowledge, student must possess the necessary information on the subject.

Student must have the ability to differentiate between the knowledge that has already discovered and new areas that should explore to become effective leaners.

To be able to learn effectively, student must assess a new advancement of knowledge such as science subject.

Student who can ultimately oversee their knowledge would be able to focus on their energy and time to learn the areas of knowledge.
INTRODUCTION

Method of teaching and materials are essential aspect required to convey the knowledge.

Both are fundamental in promoting teacher's competency and upgrade student's knowledge and abilities.

Virtual Reality (VR) is one of the instructional aid used in effective teaching and learning.

VR technique is a type of computer-generated simulations in 3D environment.

VR reflected in the improvements in prescribed structures of knowledge

Exercise on visualization helped to conceptualize, initiate and evaluate the understanding of students' performance.

Hence, the objectives of this study is to evaluate the effectiveness of application in learning the Human Respiratory System through VR application.
RESEARCH BACKGROUND

Kirkpatrick's Model

- Is used to evaluate a training's effectiveness (M. Paul, C. Whitsed, A. Girardi, 2016)
- Fields of training adapted Kirkpatrick's model by utilizing four levels of evaluation:
  - Comprises outcome
  - Performance
  - Knowledge
  - Motivation
- All correlated to
  - Reaction
  - Learning
  - Behavior
  - Result

- It uses the iterative approach
Kirkpatrick's Model

Example adaptation:

- technical communication services and product such as assessment of learning in higher education
- Use questionnaires as pre-quiz and post-quiz to evaluate trainees' learning effectiveness and analyze using descriptive statistics.
**METHODOLOGY**

**Participants**

- Form 3 students in secondary school who take science subjects.
- 35 students.
- Occurred at Sek Men Pak Badol, Kota Bharu, Kelantan.
- Investigate the usage of non-immersive virtual reality for students to learn Human Respiratory System.
- Three types of questionnaires.
METHODOLOGY

Instrument

Pre-test (before used the application) and Post-test (after used the application)

To test if respondents understand the V-HURESYS application (This not being discussed in this paper)

Effectiveness - Kirkpatrick model

To test the effectiveness of the V-HURESYS application

Information aimed: achievement, understanding, interest, effectiveness, how students perceive
**Methodology**

Questionnaires for Effectiveness Testing

| Part A | Demographic data |
| Part B | Knowledge on VR |
| Part C | Evaluate Reaction, Learning and behavior on contents and application |

### Questions with code reference

<table>
<thead>
<tr>
<th>Element</th>
<th>Code</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction</td>
<td>RE1</td>
<td>Aplikasi ini, membantu dalam mempelajari topik Sistem Respirasi Manusia.</td>
</tr>
<tr>
<td></td>
<td>RE2</td>
<td>Aplikasi ini membantu untuk lebih fokus belajar.</td>
</tr>
<tr>
<td></td>
<td>RE3</td>
<td>Aplikasi ini mudah untuk digunakan,</td>
</tr>
<tr>
<td></td>
<td>RE4</td>
<td>Aplikasi ini sangat berguna di masa hadapan.</td>
</tr>
<tr>
<td>Learning</td>
<td>LE1</td>
<td>Aplikasi ini menjelaskan konsep dengan baik</td>
</tr>
<tr>
<td></td>
<td>LE2</td>
<td>Aplikasi ini membantu saya mevisualisasi topik Sistem Respirasi Manusia.</td>
</tr>
<tr>
<td></td>
<td>LE3</td>
<td>Aplikasi ini membantu dalam mengingati fakta yang penting</td>
</tr>
<tr>
<td></td>
<td>LE4</td>
<td>Aplikasi ini membantu mengingati fakta menerusi warna yang menarik</td>
</tr>
<tr>
<td>User behavior</td>
<td>UB1</td>
<td>Teknologi ini membantu meningkatkan daya aktif ketika pembelajaran</td>
</tr>
<tr>
<td></td>
<td>UB2</td>
<td>Saya berasa seronok belajar menggunakan teknologi virtual reality</td>
</tr>
<tr>
<td></td>
<td>UB3</td>
<td>Aktiviti ini amat sesuai dengan tahap pelajar.</td>
</tr>
<tr>
<td></td>
<td>UB4</td>
<td>Aplikasi ini membantu mendapatkan perkara yang ingin diketahui dengan mudah.</td>
</tr>
</tbody>
</table>
**METHODOLOGY**

**Procedure**

1. **Step 1** → **Pre-test**
   - Student answering the pre-test question before the evaluation started

2. **Step 2** → **Playing application**
   - Student playing the application

3. **Step 3** → **Post-test**
   - Student answering the post-test question after playing the application

4. **Step 4** → **Effectiveness testing using adapted Kirkpatrick model**
   - Student answering the effectiveness testing after pre and post test.
**SCENE OF APPLICATION**

Struktur sistem respirasi manusia mengandung beberapa bahagian iaitu bermula dari rongga nasal, trakea, bronkus, bronkiol, paru-paru dan diafragma.

Ini ialah alveolus yang diliputi kapiler darah. Setiap alveolus mempunyai dinding setebal satu sel dan didalamnya dilapisi satu lapisan lembap.

Bahagian paru-paru terbagi kepada lobus superior kanan, lobus superior kiri, lobus inferior kanan, lobus inferior kiri dan lobus medius kanan.

Mekanisme pernafasan melibatkan proses menarik nafas dan menghembus nafas yang berlaku silih berganti.
RESULTS AND DISCUSSION

Evaluation process
RESULT OF PRE-TEST AND POST-TEST

- Consists of 17 males and 18 females.
- Students choose the most suitable answer to examine the contents.
- To identify whether gender influences the performance or not.

Finding shows that gender not influences in terms of performance because of small differences.
### RESULT OF LEARNING PROCESS

<table>
<thead>
<tr>
<th>Element</th>
<th>Item</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction</td>
<td>RE1</td>
<td>3.34</td>
</tr>
<tr>
<td></td>
<td>RE2</td>
<td>3.60</td>
</tr>
<tr>
<td></td>
<td>RE3</td>
<td>3.74</td>
</tr>
<tr>
<td></td>
<td>RE4</td>
<td>3.29</td>
</tr>
<tr>
<td><strong>Total Mean</strong></td>
<td></td>
<td><strong>3.49</strong></td>
</tr>
<tr>
<td>Learning</td>
<td>LE1</td>
<td>3.77</td>
</tr>
<tr>
<td></td>
<td>LE2</td>
<td>3.84</td>
</tr>
<tr>
<td></td>
<td>LE3</td>
<td>3.82</td>
</tr>
<tr>
<td></td>
<td>LE4</td>
<td>3.59</td>
</tr>
<tr>
<td><strong>Total Mean</strong></td>
<td></td>
<td><strong>3.76</strong></td>
</tr>
<tr>
<td>User behavior</td>
<td>UB1</td>
<td>3.55</td>
</tr>
<tr>
<td></td>
<td>UB2</td>
<td>3.70</td>
</tr>
<tr>
<td></td>
<td>UB3</td>
<td>3.93</td>
</tr>
<tr>
<td></td>
<td>UB4</td>
<td>3.06</td>
</tr>
<tr>
<td><strong>Total Mean</strong></td>
<td></td>
<td><strong>3.56</strong></td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td></td>
<td><strong>3.60</strong></td>
</tr>
<tr>
<td>% of Overall</td>
<td></td>
<td>(3.60/5) * 100</td>
</tr>
</tbody>
</table>

- The highest total means is in Learning elements: 3.76.
- It proves that the V-HURESYS is an effective learning aid in enhancing students' understanding of Human Respiratory System.

- The total means of students' reaction is 3.49.
- It shows that students provide a positive feedback on this teaching aid in acquiring knowledge of Human Respiratory System.

- The total means of students' behavior is 3.56.
- It coherent with the aim of this research to assist the learning process to become more interactive so students will be able to understand and visualize the topic studied.

- The overall average is 3.60 which is 72%.
- It demonstrates that students agree the V-HURESYS application is an effective aid.
CONCLUSION

- The Kirkpatrick model is the most suitable model to examine the application’s effectiveness as well as a pre-test and post-test questions.
- The evaluation result indicated; it was found that this application was effective in students to learn the Human Respiratory System.
- Feedback evaluation received indicated that students preferred to used V-HURESYS application in gaining knowledge about Human Respiratory System.