Abstract—Virtual Reality (VR) on M-learning developed under the 3D Virtual Reality Media project, School of Information Technology, Sripatum University, Chonburi Campus. VR on M-learning were a new, exciting, promising field and also have professional cite benefits to learner. With the advantages of the mobile technology however, m-learning has evolved and the term is now most commonly used to refer to learning courses. Thus, the purpose of this research was to develop and evaluate the VR on M-learning for traditional musical courses. The samples for this study comprised of 10 students from Sripatum University Chonburi Campus and 5 experts. The sample was obtained by using the purposive sampling method. In order to find technology solutions, solutions of insufficient time spent for instruction in classroom, resulting in lack of proper practice, and create a variety ways to deliver and provide electronic resources for learner. In this system, each student in the VR will be log in and enter their own learning space and could see their 3-dimensional (3D) virtual environments. They could control their contents by using finger with multi touch and virtual joystick. The results at the moment reveals showed that: the satisfaction of the panel experts, the mean was 4.38 with the standard deviation of 0.50; the satisfaction was in the “High level”. In part of learners’ satisfaction, the mean was 4.19 with the standard deviation of 0.62; the satisfaction was in the “High level”. This can be summarized that 3D multimedia and VR are available to learning and deliver to learner via M-learning. Students who participated in VR on M-learning showed more interest and enthusiasm in learning. Moreover, learners had more time to practice outside classroom and reduced the differences in the learning of students in urban and rural.

Keywords—Virtual Reality; Multimedia; VR Learning Environments; M-Learning;

I. INTRODUCTION

The significance of education is absolutely clear. Education is the knowledge of putting one’s potentials to maximum use. This significance of education is important for two reasons. The first reason is that the training of a human mind is not yet flawless without education. Education makes people think that right. It tells people how to think and how to make decision. The second reason for the significance of education is that only through the attainment of education, people are enabled to receive knowledge from the global; to acquaint themself with past experience and receive all knowledge regarding the present. Without education, people are though in a closed room and with education them finds themself in a room with all its windows open towards outside world. Daily quality education in the schools/universities are an important part of a student’s extensive, well-rounded education program and a means of positively affecting, lifelong and well-being. The optimal education program will foster a knowledge commitment to activity as part of a life [1]. Ultimately, improved of innovation education and technology, it has been applied to learning since decades ago, but it has really prosperous with the advent of the Internet and mobile technology. In recent years the rapid growth of mobile technologies is a new revolutionizing that might be comparable with the Internet [2]. More and more devices with improved abilities are appearing on the market. Lots of mobile devices already support Internet access, making easy and less costly to develop portable education applications [3]. Thus, Mobile learning is an authority tool for develop innovation. Many researchers rethink the way to develop innovation media for learner, M-learning combines with VR is a one thing for create innovation media and provide a variety ways to deliver electronic resources and some methods such as system to deliver text, video, multimedia, animation and Virtual Reality learning environments (VLEs) to learner. Another advantage of the VR on M-learning does not require extensive computer skills, although familiarity with computers and software does help to reduce the intimidation factor [4].

Moreover, if VR technology has to apply to facilitate the presentation, the lesson may be interesting due to it is interactive. This is because virtual reality systems have the potential to allow learners to discover and experience objects and phenomena in ways that they cannot do in real life [5]. However, the purpose of this paper was to develop and combines VR and M-learning to create learning innovation for learner. In this paper we will be clarify about research framework, prototype of VR and M-Learning, and further work.

II. LITERATURE REVIEW

A. Virtual Reality (VR) and Education

The virtual reality systems is an education system based on the Virtual Reality technology that models conventional real-world education by integrating a set of equivalent virtual concepts for virtual homework, virtual classes, virtual tests,
virtual classrooms, virtual museums, virtual library and other external academic resources [6]. Immersion in VR is achieved with the disappearance of an artificial interface, replaced by natural every day’s actions present in the real world. This is one of the key aspects of VR that brings together many researchers to support it. Some other advantages of immersion are not so obvious, but very important for justifying the use of VR in education, such as: VR enables first person experiences, which are natural, unreflect and personal, generating direct, subjective and personal knowledge. VR provides a less symbolic interaction with the environment. Any description of an experience or action is usually transmitted through symbols, conventions and formalisms, meaning that traditional learning of a concept require previous knowledge. VR have the potential to allow learners to discover and experience objects and phenomena in ways that they cannot do in real life [8] [9].

B. Mobile Learning (M-Learning)

Mobile Learning: M-learning related to e-learning and distance education, it is distinct in its focus on learning across contexts and learning with mobile computational devices. In general by mobile device mean smartphone digital cell phone and tablet, but more generally people might think of any device that is small, autonomous and unobtrusive enough to accompany us in every moment in our every-day life, and that can be used for some form learning. These small tools can be seen as instruments for accessing content, either stored locally on the device or reachable through interconnection. They can also be a tool for interacting with people, via voice and through the exchange of written messages, still and multimedia animation [10].

III. RESEARCH FRAMEWORK

The paper presents the system of innovative instructional media on mobile or tablet. It was adopt and developed based on the research framework [11] consists of five design steps: 1) First step was assessed problems, needs: This phase was concerned with gathering information about situations, problems, needs, and tendency that were necessary to build the prototype. It was aimed to specify the user and system related requirements while developing a full understanding of the target user group and its tasks. However, the results of problems and needs were used as a guideline to develop the system. 2) Second steps were analysis and designed the system: This step was focused on components, environment and human computer interact. These were the basic idea of the VR on M-learning system. 3) Third steps were to development that includes the system, infrastructure and learning method. This step also aims to constructing a high-fidelity prototype based on the results of an initial user requirement of the previous phase. 4) Fourth steps the system was verified and validated by Alpha testing and Beta testing technique, experts testing and evaluation with target group, and 5) Fifth steps the system was conclusion and implement (see Fig 1).

Figure 1. Research framework

IV. THE APPROACH

The paper presents an innovative system of VR on M-learning. It begins with related work on using the learning innovation, VR technology, and mobile technology for create instruction media. The system is M-learning system which can access or download at http://innovation.east.spu.ac.th/vr. Accordingly this research will consider the possibilities and limitations of visual feedback as a promising channel of VR on M-learning. The basic aim of this system was to support Android and iOS platform (see Fig 2).

Figure 2. VR on M-learning

The interactive between students and VR through mobile or tablet was used as a learning approach. The mainly module of VR on M-learning system display typical 3D model, VR content and multimedia, then students can learn by following the VR content and interactive content. The proposed of this system can evaluate the learners’ skill and the learning achievement. The VR on M-Learning for traditional musical courses showed each learner’s participation graphically. It does not only measure the frequency of participation and intention, but also evaluate whether the opinions given by the learners are useful. According to the initial experiment, the students showed great interested due to the new approach. The students could spend their free time and interact with VR on mobile anytime and anywhere.
In addition, the instructor could randomly visit and look for students’ activities. The students also know that the instructor could see and observe every their behavior all the time. Therefore, this approach could be considered effective in control the students’ activities. The application of VR technology in learning is an innovative and gains a lot of attention of students. For example, students could virtually pick up an object in 3 dimensions which can be controlled by with multi touch and virtual joystick, making learning achievement more effective.

V. EXPERIMENTAL RESULTS

The purposes of this study were to develop the VR on M-Learning for traditional musical courses and 2) to evaluate satisfaction of VR on M-Learning. An initial study was conducted at Sripatum University Chonburi Campus, Thailand. The sample groups of this study consisted of 10 undergraduate students and 5 experts for summative evaluation to improve the system environment prototype. As described in approach, this study used the two phase of evaluation which the experts testing phase and satisfaction’ student phase and

A. Experts testing phase

Five experts with a high level of expertise in the research field reviewed the prototype version of system to identify any deficiencies or problems and provided recommend for its improvement. The evaluation criteria determined the overall quality of the software testing, its clarity and impact, and followed ISO 9241-110 (2006) [12]. The criteria consisted of eight standards, namely suitability for the concepts, suitability for the task, suitability for learning, suitability for individualization, conformity with user expectations, self-descriptiveness, controllability, and error tolerance. The surveys used a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). The experts’ estimation provided a recommended design for the modification of the system.

Form Table I, the overall quality of the system design was good and the degree of clarity of the system was rated higher than the target levels. The suitability of the concepts, the suitability for the task, suitability for learning, suitability for individualization, conformity with user expectations, the self-descriptiveness, controllability, and error tolerance were shown to have means of 4.80 (SD = 0.45), 4.20 (SD = 0.45), 4.60 (SD = 0.55), 4.00 (SD = 0.71), 3.80 (SD = 0.45), 4.80 (SD = 0.45), 4.20 (SD = 0.45), and 4.60 (SD = 0.55) respectively (Table I). According to the experts’ suggestions, several designs were changed including a redesign of graphic figures and more options for editing content.

B. Satisfaction’ student phase

An initial study was conducted at Sripatum University Chonburi Campus, Thailand. The sample groups of this study consisted of 10 undergraduate students. The result of students’ satisfaction was collected by using questionnaires about the satisfaction of learning environment. Research methods were applied to collect quantitative data using questionnaires. The data were analyzed using basic statistical tools, frequency, mean (X), and standard deviation (SD). The levels of student’ satisfaction was determined as 4.51 – 5.00 means definitely agree, 3.51 – 4.50 means strongly agree, 2.51 – 3.50 means quite agree, 1.51 – 2.50 means quite disagree and 1.00 – 1.50 means strongly disagree.

Form Table II, the overall satisfaction of the VR on M-learning for traditional musical courses was also conducted to identify a way of evaluating the quality of students. The level of satisfaction was determined through four categories: Course content, Devices supported, Practice sets structure and VR and Multimedia. These showed means of 4.24 (SD = 0.56), 4.30 (SD = 0.65), 4.11 (SD = 0.62), and 4.12 (SD = 0.66). The overall quality of the VR on M-learning was estimated as very good, and the clarity degree of system was rated higher than target levels.

TABLE I. THE RESULT OF EXPERTS TESTING PHASE

<table>
<thead>
<tr>
<th>Category</th>
<th>X</th>
<th>SD</th>
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<tbody>
<tr>
<td>Concepts</td>
<td>4.80</td>
<td>0.45</td>
</tr>
<tr>
<td>Suitability for the task</td>
<td>4.20</td>
<td>0.45</td>
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<tr>
<td>Suitability for learning</td>
<td>4.60</td>
<td>0.55</td>
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<tr>
<td>Suitability for individualization</td>
<td>4.00</td>
<td>0.71</td>
</tr>
<tr>
<td>Conformity with user expectations</td>
<td>3.80</td>
<td>0.45</td>
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<tr>
<td>Self-descriptiveness</td>
<td>4.80</td>
<td>0.45</td>
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<tr>
<td>Controllability</td>
<td>4.20</td>
<td>0.45</td>
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<tr>
<td>Error tolerance</td>
<td>4.60</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4.38</td>
<td>0.50</td>
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TABLE II. THE RESULT OF STUDENT’S SATISFACTION

<table>
<thead>
<tr>
<th>Category</th>
<th>X</th>
<th>SD</th>
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<tbody>
<tr>
<td>Satisfaction of Course content</td>
<td>4.24</td>
<td>0.56</td>
</tr>
<tr>
<td>Satisfaction of Devices supported</td>
<td>4.30</td>
<td>0.65</td>
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<tr>
<td>Satisfaction of Practice sets structure</td>
<td>4.11</td>
<td>0.62</td>
</tr>
<tr>
<td>Satisfaction of VR and Multimedia</td>
<td>4.12</td>
<td>0.66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4.19</td>
<td>0.62</td>
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</table>
This can be confirmed that developed system be successful, various aspects of VR on M-learning environment should be considered such as application domain knowledge, conceptual theory, user interface design, and evaluation about the overall quality of the design environment.

VI. CONCLUSION AND FUTURE WORK

VR on M-learning has been widely adopted for students’ learning. Pedagogically highly valued products are on the market and have a proven success in the improvement of learning as well as in students’ acceptance. Recently, The VR on M-learning is becoming a new form of interactive content, worthy of exploration for learning purposes. Educators are also looking for a new positioning in the changing setting of lifelong learning. Educators need to develop innovative forms of learning in order to provide concepts for lifelong learning to their prime students. VR on M-learning interact with learner via 3D virtual reality learning environments and also support mainly platform such as iOS and Android. More ever, the system can make more interest and enthusiasm of learning. Thus, researcher can conclude that the VR on M-learning presents an excellent environment for learning, which can be produce knowledge to students.

For the further, we plan to tryout the proposed system with more 100 students of primary school at Chonburi Province, Thailand and find the efficiency of this system. In addition, researcher plan to continue our research, looking for different technique for VR training and M-learning technology such as collaboration among users “avatars” in shared synthetic environments may support a wider range of pedagogical strategies (e.g. teaching, tutoring, training) and may make Virtual Reality learning environments (VLEs) more intriguing to students who are most motivated to learn when intellectual content is contextualized in a social setting. We also plan to investigate the effectiveness of learning technology in which three roles among 1) using the head mounted display (HMD) and data gloves, 2) extended to support all platform such as PC, Window, OSX, UNIX, Linux, Windows Phone, new Google Android and new iOS and 3) serving as external guide support and participating as a reflective observer

ACKNOWLEDGMENT

This work has been done exceptional thanks to Sripatum University Chonburi Campus for scholar and providing a great research opportunity. Also thank to Burapha University and King Mongkut's University of Technology Thonburi without their support, this study would not have taken its current form, nor would it have come to completion. Foremost, I would also like to thank Dr. Tau-tong Puangsuwan, people in school of information technology, Sripatum University Chonburi Campus and the Innovation Media Laboratory (InnoMedia Lab) for making some useful comments on both the concept of the research approach and a draft of the paper.

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