Blending Pedagogical Concept and Information Technology in Blended Learning: an Analysis in Sports Physiotherapy Course

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Abstract

The ultimate goal of health science education including in Sports Physiotherapy training is to empower the learner to apply, analyze, synthesize and evaluate the basic concept of medicine in clinical settings. These higher order thinking activities require powerful pedagogical strategy. This could be supported by information technology which during this past decade has infused in educational domain and brought many opportunities in designing teaching-learning strategies.

In the broadest sense, blended learning is defined as a hybrid of classroom and online learning without the complete loss of face-to-face contact. The efficacy of blended courses in health science education has been proven in many studies to be superior compared to either traditional or fully online courses. However, currently, e-learning education research and development is almost only focusing on the inclusion of new technological features and the exploration of software standards rather than taking into account the pedagogical concepts within.

This paper reviews a pedagogical based blended learning model in which the instructional model in the e-learning model is created based on the pedagogical concepts such as reflective learning, collaborative learning, self-pacing, and problem based learning. In conclusion, blended design, especially in Sports Physiotherapy course, is supposed to support the chosen pedagogical techniques rather than vice versa.

Keywords: Sports physiotherapy course, pedagogy, information technology, blended learning

I. INTRODUCTION

The continuing advances of medical research mean that countless techniques and management in medicine are being developed and introduced into clinical practice. This situation indicates the urgent requirement of the health science educator including in Sports Physiotherapy subject to ensure that those advances are delivered to health practitioner candidates (Shaffer et al., 2004). Information technology which has been infused deeply in education domain offers to maximize the teaching-
learning techniques in health science. In addition, the creative use of this technology is likely essential for health science education in the current and future medical educational environment as time and resources are in the shortage (Bonk et al., 2006; Shaffer et al., 2004).

Several pedagogical bases such as reflective learning, collaborative learning, self-pacing, and problem based learning have been identified as keys in health related subject learning (Shaffer et al., 2004). In line with this, e-learning has been observed to be able to support those pedagogical bases. Basically, e-learning education has been introduced into health science education as an instruction method for creative and critical thinking via the reorganization and restructuring of various new learning activities (Govindasamy, 2001). For instance, problem-based learning which has been a major breakthrough in the health science pedagogical concept can be more elaborated using computer resources and multimedia virtual patient (Shaffer et al., 2004).

It is generally accepted that learning process is optimum when it is assisted and personalized. Information technology gives potential benefit to the education system as they can be used to personalize learning. By implementing the technique learning can be design according to our needs while learning progress and evaluation can be recorded more conveniently (Singh, 2003). The opportunities offered by internet-based computerized learning, known as e-learning, have attracted the attention of educators.

E-learning is defined as the use of new multimedia technologies and the internet to improve the quality of learning by facilitating access to resources and services on line (Picciano, 2006). Essentially, e-learning is an alternative way to teach and learn. However, it is a recent phenomenon that e learning often not yet incorporated the pedagogical principles of teaching. Recent research on e-learning tools for learning via the internet has found that the software design of these tools does not stretch to pedagogy, and the pedagogical manner in which these tools are used in teaching is left to the educators. In other words there is a serious dysfunction
between the profusion of technological features that are put forward and the shortage of teaching principles for e-learning (Koper, 2003). There are yet no clear guidelines for analyzing, designing, developing, supplying, and managing e-learning materials pedagogically in Sports Physiotherapy course.

Pedagogical principles in blended learning are theories that govern good educational instruction (Koper, 2003). Instructional design has evolved in combination mainly with the development of the three basic learning theories: behaviorism, cognitivism, and constructivism (Govindasamy, 2001; Rovai, 2004). In health science education, information technology gives advantages in giving illustration and simulation of cases and phenomenon which might be difficult to find in the clinical setting probably because of the limitation of access and the rarity of the cases. This article describes the proposed method for health science learning. It was developed based on pedagogical principles incorporated with information technology in response to adult learning theory in the form of blended learning. In this model, pedagogical concepts and information technology are fused to combine different approaches (large-group didactic, small group discussion, individual study, and computer-assisted learning) to accommodate a variety of learning styles in Sports Physiotherapy course.

II. DISCUSSION

A. Definition and Dimension of Blended Learning

The term blended learning is used to describe a combination of several delivery methods, such as collaboration software, web-based courses, and knowledge management practices. Blended learning also is used to describe learning that mixes various event-based activities, including face-to-face classrooms, live e-learning, and self-paced learning (Alonso et al., 2005). However, it is not merely the mixing and matching of different learning delivery modes by itself that is of significance, but the focus on the learning outcome. Therefore essentially, the emphasise of blended learning is that:
Blended Learning focuses on optimizing achievement of learning objectives by applying the “right” learning technologies to match the “right” personal learning style to transfer the “right” skills to the “right” person at the “right” time (Singh et al., 2001).

The original use of the phrase blended learning was often associated with simply linking traditional classroom training to e-Learning activities (Alonso et al., 2005). However, the term has evolved to encompass a much richer set of learning strategy “dimensions”. Nowadays, a blended learning program may combine one or more of the following dimensions such as:

a. Blending offline and online learning
b. Blending self-paced and live collaborative learning
c. Blending structured and unstructured learning          (Alonso et al., 2005)

In the past, the ingredients for the blended learning were limited to physical classroom formats (lectures, labs, etc.), books or handouts. Nowadays, education system has a myriad of learning approaches to choose from including:

a. **Synchronous physical format**, such as: instructor-led classrooms & lectures, hands-on labs & workshops and field trips
b. **Synchronous online formats (Live e-Learning)** such as: e-meetings, virtual classrooms, web seminars and broadcasts, coaching and instant messaging
c. **Self-paced, asynchronous formats**: such as: documents & web pages, web/computer based training modules, assessments/tests & surveys, simulations, job aids & electronic performance support systems (epss), recorded live events, online learning communities and discussion forums (Alonso et al., 2005).

In health science education the component of blended learning “ingredients” may encompass varieties of teaching techniques such as: reflective learning, collaborative learning, self-pacing, and problem based learning which can be delivered synchronously or asynchronously.
B. The Benefits of Blending and the Evidence of the Efficacy of Blended Learning

Until recently, little formal research exists on the efficacy of blended program designs. However, research from institutions such as Stanford University and the University of Tennessee have given us valuable insight into some of the mechanisms by which blended learning is superior compared to both traditional methods and individual forms of e-Learning technology alone (Oliver, 2005). This research gives suggestion that blending not only offers us the ability to be more efficient in delivering learning, but more effective. In conclusion, blending strategy provides various benefits over using any single learning delivery type alone. Some of the benefits are the following (1) improved learning effectiveness, (2) extending the reach and (3) optimizing development cost and time (Oliver, 2005). In health science education, this approach is particularly valuable as it can increase the time and resource effectiveness as clearly for most of health science education system currently and in the future, time and resources are in the shortage.

C. Instructional Model of E-Learning Based Pedagogical Concepts

This instructional model is based on the systematic development of instruction and learning and is composed of seven phases; analysis, design, development, implementation, execution, evaluation, and review as described in figure 1.

Figure 1. Phases in Designing Instructional Designing Blended Learning
The model which is adapted from Alfonso (2005) includes a series of pedagogical prescriptions that further the learning process which is outlines as follows:

1. **Analysis.**
   The learner, resource and the educational contents to be taught are analyzed. Its purpose is to detect the learner’s learning characteristics and needs, and ascertain the environment in which the learning is to take place and the available resources. The next analysis then will be based on the determined learning objectives which need to be defined into primary and secondary objectives, as well as their hierarchical structure.

2. **Design**
   It specifies the learner’s learning process, defining the learning approach, the structure and granularity of the information to be delivered (facts, concepts, processes, procedures, and principles), standards to be used, execution criteria, and achievement expected of the learner. The presentation of information depends on the type of contents to be taught and should differ depending on whether the aim is to teach facts, concepts, procedures, or principles. The method includes setting activities and exercises to evaluate the knowledge acquired.

3. **Development**
   In the reality, often there are gap between theoretical and practical practice. In this phase, the design from previous phase sometimes needs to be revised according to the practical value.

4. **Implementation:**
   This phase involves building the software of the e-learning process using an authoring tool, and its location in a learning management system (LMS) platform. It outputs the different didactic units, with their respective e-lessons, of which this learning is composed.

5. **Execution:** this phase involves the learner using the learning process. This execution provides information on the problems encountered and the knowledge acquired.
6. **Evaluation**: information output during execution, which is stored in the learner log within the LMS platform, is gathered, and the results are analyzed on the basis of the learning objectives.

7. **Review**: this serves to refine the learning process by analyzing the results of the evaluation. Any instructional model phases can undergo review.

**D. Guideline for Situation Analysis in Creating a Blended Program: an example of situation in Sports Physiotherapy Course**

Practically, the analysis need to be conducted in two phases which are (1) the identification of focus between live and self-paced delivery models, and (2) a further mapping to the most appropriate delivery formats within each of these models in the continuum to decide the format of blended learning required (Singh, 2003).

**Table 1. Step 1: Delivery Model Mapping**

*Plot the answer on this scale*

<table>
<thead>
<tr>
<th>The audience learns best with a collaborative non linear format</th>
<th>The audience learns best with a sequential, independent format</th>
</tr>
</thead>
<tbody>
<tr>
<td>The audience motivation is variable or weak</td>
<td>The audience highly motivated to learn</td>
</tr>
<tr>
<td>Content is complex or requires interaction</td>
<td>Content is basic can be taught be describing</td>
</tr>
<tr>
<td>Attitudes or behavior need to be changed</td>
<td>Attitudes or behavior do not need to be changed</td>
</tr>
<tr>
<td>Complex physical skills need to be taught</td>
<td>Complex physical skills do not need to be taught</td>
</tr>
<tr>
<td>Would learners benefit from team interaction or collaboration?</td>
<td>Individual practice and drill is effective</td>
</tr>
<tr>
<td>Content must be developed quickly and at low cost</td>
<td>Resources and time are available for content development</td>
</tr>
<tr>
<td>Content must be updated frequently</td>
<td>Content is stable for 1 year or more</td>
</tr>
</tbody>
</table>

Consolidate the answers below*

*(Adapted from Singh (2003))*
Situation analysis on delivering model mapping in Sports Physiotherapy course in Sports Science Faculty, Yogyakarta State University: In this course, the consolidating answer places delivering format in the middle of the continuum as self-paced format will accommodate basic cognitive concepts while live format is needed to elaborate the concept in practical skill.

Table 2. Step 2a: Delivery Technology Mapping – Live Formats

Plot the answers on this scale

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Learners have the same base knowledge</td>
<td>Learners have different base knowledge</td>
</tr>
<tr>
<td>Learners are in a central location</td>
<td>Learners are distributed or mobile</td>
</tr>
<tr>
<td>Learning program has stable learner throughput</td>
<td>Many learners must be trained in a short time</td>
</tr>
<tr>
<td>Learning is most effectively delivered in a single session</td>
<td>Learning is most effectively delivered over time, or interleaved with job experience</td>
</tr>
<tr>
<td>Learners have schedule flexibility to attend class</td>
<td>Classes must adapt to learner schedules</td>
</tr>
<tr>
<td>High resistance to attitude or behavioral change</td>
<td>Low resistance to attitude or behavioral change</td>
</tr>
<tr>
<td>Complex physical skills need to be taught</td>
<td>Complex physical skills do not need to be taught</td>
</tr>
<tr>
<td>Remote expert or peer access not important</td>
<td>Remote expert or peer access important</td>
</tr>
<tr>
<td>Learner convenience is not important</td>
<td>Learning convenience is important – time in training, cost of travel</td>
</tr>
<tr>
<td>Availability of learning outside class not important</td>
<td>Self-paced viewing or reuse of live class content valuable</td>
</tr>
<tr>
<td>Learners do not have access to PCs</td>
<td>Learners have access to a PC with at least dial-up connectivity</td>
</tr>
</tbody>
</table>

Consolidate the answers below (Adapted from Singh (2003))

| Physical Classroom | Live eLearning |
Situation analysis on delivering technological mapping in live format model in Sports Physiotherapy course in Sports Science Faculty, Yogyakarta State University:

Based on the situation analysis, live format technique is likely to be better conducted in physical classroom rather then live e-learning (synchronous format) mainly because there is a great need of technological capability from the student and lecturer and also resources to accommodate the activity.

Table 3. Step 2b: Delivery Technology Mapping – Self paced formats

Plot the answer on this scale

| Subject matter requires a complex, pre-requisite skills/knowledge set to be acquired before its application | ↔ | Subject matter/content does not need to be accessed in a structured path, content may be accessed in chunks on as needed basis |
| Content needs to be presented independent of the actual work situation | ↔ | Content needs to be linked to a business process, software application, or job-task |
| Access to online content is not available during job task/ performance | ↔ | Online content is readily accessible during the job task performance |
| Instructional designers are available to map out the course content with media, interactive elements around course objectives. | ↔ | Content is available in job-aids and document format created by Subject Matter Experts (non instructional designers and web content designers) |
| Learners are motivated to complete structured course content in an online/web based format | ↔ | Learners are unlikely to complete full length online courses and need just-in-time information |
| Adequate time is available to master the content in a structured format before skill/knowledge application | ↔ | Content needs to be made available without lead time to master the content prior to job task performance |
| Learners do have the opportunity to schedule dedicated time to learn on-line | ↔ | Learners must remain on the job and may have bursts of time available for content access and reference |
| Assessment and completion or tracking is necessary component of training. | ↔ | Content needs to be access more for reference than for compliance or assessment |

Consolidate the answers below

(Adapted from Singh (2003))

Self-paced Courses ↔ On-demand/EPSS
Situation analysis on delivering technological mapping in self paced format model in Sports Physiotherapy course in Sports Science Faculty, Yogyakarta State University: Based on the situation analysis, self paced format technique is likely to be better conducted in self paced format rather then in on demand pace. The student in this course usually full time student and there are structured cognitive in skill that have to be mastered to develop them self into the ultimate goal which is problem solving skill in clinical setting.

E. Precaution: The Blunder of Blended Learning and How to avoid Them

This article highlights four of the most troublesome blended e-learning blunders and suggests ways to avoid them which are failing to (1) think a head, (2) develop clear learning objective and appropriate methodologies, (3) integrate and prepare right blend of expert resource and (4) execute blended learning design (Bonk et al., 2002).

Rather than choose blended learning reactively, blended learning should be used proactively using the appropriate mix of applicable training methods. To ensure the achievement of learning objectives, the following activities should be conducted:  

a. Through analysis of performance need to be improved  
b. Clarification of learning objectives including the skill and knowledge gaps that need to be addressed  
c. Selection of the the most appropriate learning methodologies to accomplish the objectives (Govindasamy, 2001).  

It is important to ensure that design and development expertise is up-to-date and developers are experienced in utilizing and blending training methods. In addition, those developing content are well versed in the subject matter or seek considerable input from subject-matter experts. Finally IT staff is knowledgeable about the e-learning project requirements as well as the education system technical infrastructure and can integrate and support the e-learning application appropriately. End users should be involved in the development process, including representation
from the target training group and line management accountable for the performance results while implementers have the expertise to identify and develop educational support requirements for the training initiative and address all related change management issues (Koper, 2003).

F. Blissful Blending: a Practice of the Use of Blended Learning in Sports Physiotherapy Course

Drawing out themes emerging throughout the previous sections of the review, the following recommendations for successful blended e-learning especially in Sports Physiotherapy training are made:

• Blended learning term should be negotiated therefore the user will obtain the synergistic meaning (Bonk et al., 2002).
• Blended learning should be deployed within the context and should be used as a driver for transformative course redesign (Govindasamy, 2001).
• Blended learning should help students develop their conceptions of the learning process (Oliver, 2005).
• Blended learning model should allow the dissemination and communication of the results of evaluation as the need to coordinate, promote and disseminate results from evaluations was identified as a crucial aspect of monitoring institutional strategies and course redesigns (Govindasamy, 2001).

III. CONCLUSION

With the integration of computers, and especially the web, into the education system, there has been a shift from centralised classroom-based education towards distributed e-learning courses that can be taken anytime and anywhere. This phenomenon is clearly evident in health science education as there are growing needs of learning methodology to deliver the complexities in medicine science including in Sports Physiotherapy area. However, research and development into this type of teaching has been mainly focused on the implementation of technological resources.
Less effort has been delivered into defining instructional processes suited for this type of pedagogy, leaving the design to the instructor reactive response. This should be avoided thus the features of blended learning which are highly valuable in health science education can be retained. Clearly, many finding suggest that blended learning will only be successful whenever it is based on pedagogical concept. In Sports Physiotherapy course analysis, it has been concluded that the most efficient teaching model is a blended approach, which combines self-paced learning, live e-learning and face-to-face classroom learning. The approaches are intended to give students the opportunity to develop their basic cognitive concepts as well as their practical skill in clinical settings.

IV. REFERENCES


Shaffer, K., & Small, J. E. (2004). Blended learning in medical education: Use of an integrated approach with web-based small group modules and didactic
