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# **Using the Virtual Institute of Training and Learning (VITAL) for Online Modules in Biomechanics – An Effort by the Physical Education and Sports Science Academic Group at the National Institute of Education, Singapore**

Michael Koh, Hung Wei Loong & John Tan

## **Abstract**

*This article describes the development of an online education biomechanics module that is based on two pedagogical theories, namely, information processing and constructivism. A hybrid (blended) pedagogical approach was planned for the course so as to facilitate a supportive and affirmative learning environment, as well as to enable participants to have hands-on, real-life experiences in the applications of biomechanical concepts to human motion. Learners may then be able to tap on such experiences when perusing the online content as well as to actively engage in the electronic discussion forums. The module is offered for the first time in the Virtual Institute of Training and Learning (VITAL) management system of the Ministry of Education (MOE), Singapore. In subsequent implementations, refinements would be made to the pedagogical stance of the course based on students' feedback and research findings.*

## **Introduction**

Online courses have been touted to be more efficient and effective because of their ability to offer: (a) anytime, anywhere and just in time learning; (b) hypermedia delivery that allows more meaningful access to information based on related ideas; (c) ease of access to vast and recently updated information; (d) self-paced and self-directed learning; and (e) a suite of communication and collaboration tools that goes beyond classroom boundaries (Tan & Hung, 2001). In some university settings, it is often viewed as a vehicle for attracting a new client base and thus generating new income (Alderman & Milne, 1999). At the National Institute of Education (NIE), the sole teacher training institute in Singapore, developing an online distance education course was not for these reasons but to address a need.

The purpose was to facilitate learning by distance education students, allowing individuals to do so at their own pace and in a collaborative manner (Thorpe, 1998).

For online education to succeed, top management support and recognition is an essential ingredient (Alderman and Milne, 1999). Singapore's Ministry of Education (MOE) implemented an Information Technology Masterplan in the late 1990s (MOE, 2000). A Virtual Institute of Training and Learning portal, otherwise known as VITAL, was created to serve as a one-stop e-learning portal, enabling teachers to learn at their own time, own pace and own place (VITAL, 2001). As with typical e-learning management systems, VITAL uses the personal computer as one of the tools and the Internet as the main channel used to deliver learning resources. In this way, despite being away from the classroom, learners are still able to interact with an online community through chat, discussion and e-mail facilities.

A pilot project was carried out in 1998 for beginning teachers, students from the Gifted Education Programme and officers from MOE headquarters. Three online courses focusing on time management, Microsoft Office 97 and a database system known as Pupil Management System II, were carried out successfully. In July 2001, VITAL (see Fig. 1) was officially launched by the Permanent Secretary of Education, Mr Chiang Chie Foo.

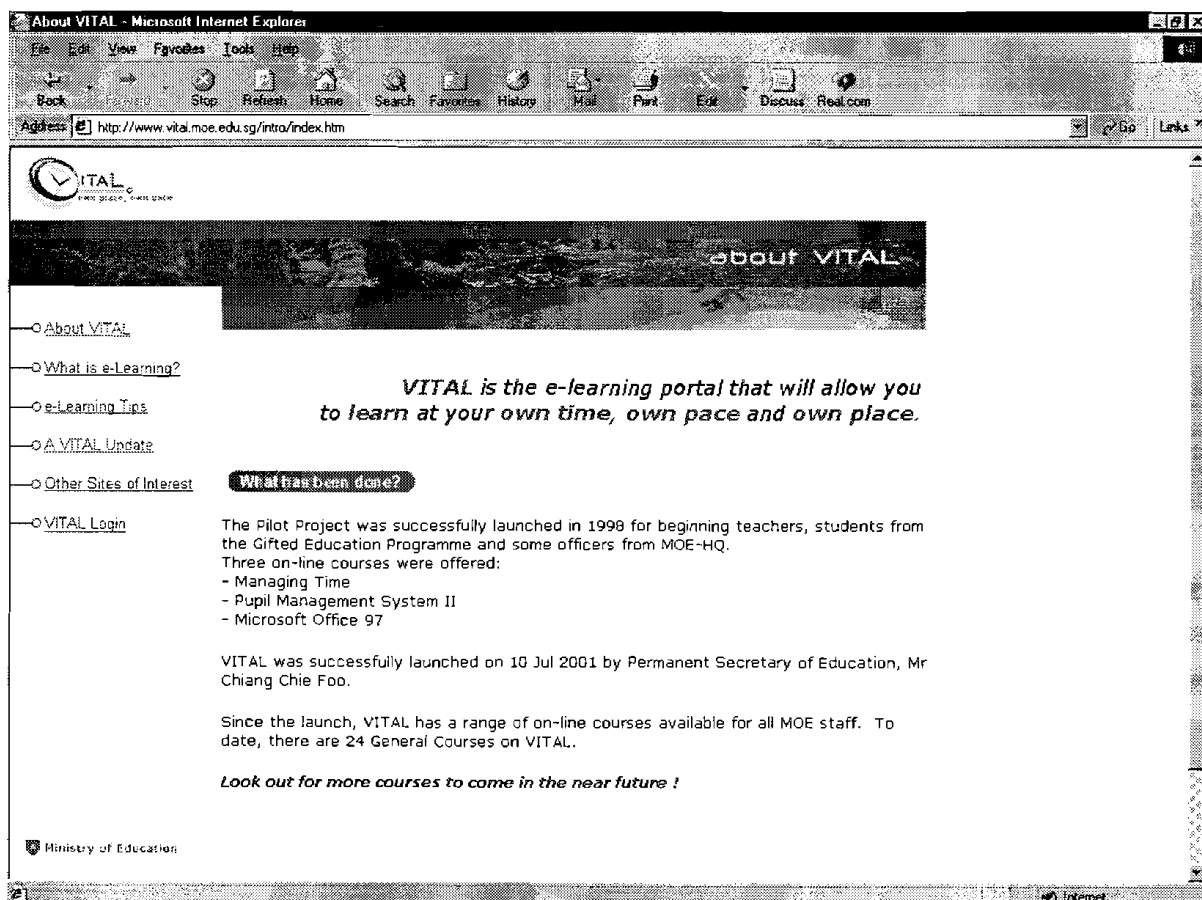


Fig. 1. The VITAL e-learning portal.

In August 2001, MOE officials collaborated with the staff of the NIE, to launch online distance education courses in VITAL for in-service teachers. Top management support and recognition was certainly evident. However, Alderman and Milne (1999) noted that making a commitment to a networked learning environment requires more than just top management support and recognition. Other essential ingredients include student interest and support and whether the educational activity would be enhanced by the online mode.

As a subject, Biomechanics has often been perceived by Physical Education (PE) trainee teachers to be esoteric and technical. This is not surprising as, among various definitions, biomechanics has been defined as the study of forces and their effects on living systems, in particular, the human body (Hay, 1993). It is a multidisciplinary field integrating knowledge from human anatomy, mechanics, engineering and mathematics (McGinnis, 1999). Also, PE teachers at NIE generally come from varied backgrounds of academic training, most being more inclined to the arts. While there was no guarantee of student support or interest, the authors viewed VITAL to be a powerful means of generating interest in the science of biomechanics among adult learners; after all, the MOE has a staffing of at least 22,000 teachers. Clearly, offering online modules with 24 hour access and delivery at any location, would suit the needs of our potential students who maintain full-time employment. Moreover, the module that was being conceived and designed could be subsumed into an advanced diploma in PE based on coursework for those considering the pursuit of such a qualification.

One major concern was whether the subject itself would benefit from the online delivery mode. From previous experience in teaching a course in biomechanics, the authors often found it challenging to pitch the delivery at a level appropriate to the audience. This was made more difficult as the trainee teachers typically have very varied backgrounds of academic training. The self-directed and self-paced feature of an online module appealed to the authors. It also facilitated the vivid illustration of mechanical concepts that were often not possible to be demonstrated physically. Additionally, Koh *et al.* (2002) found that the subject was certainly amenable as an educational activity that could be enhanced by the online mode. They reported that results from a 20 item objective test showed a significant improvement ( $\alpha = 0.05$ ) in the trainees' performance from pre-test to post-test ( $t = 16.5$ ,  $df = 33$ ) for a biomechanics module, that was conducted over a 2 week trial period. Although an improvement in the test performances need not necessarily be due to the online availability of materials, nevertheless, it provided an impetus for the authors to design an online biomechanics module within the VITAL management system. Figure 2 shows the module objectives. The authors recognize that more work needs to be done in the future, that would involve data collection in the traditional didactic teaching mode, in order to arrive at a conclusion about the effectiveness of online biomechanics courses.

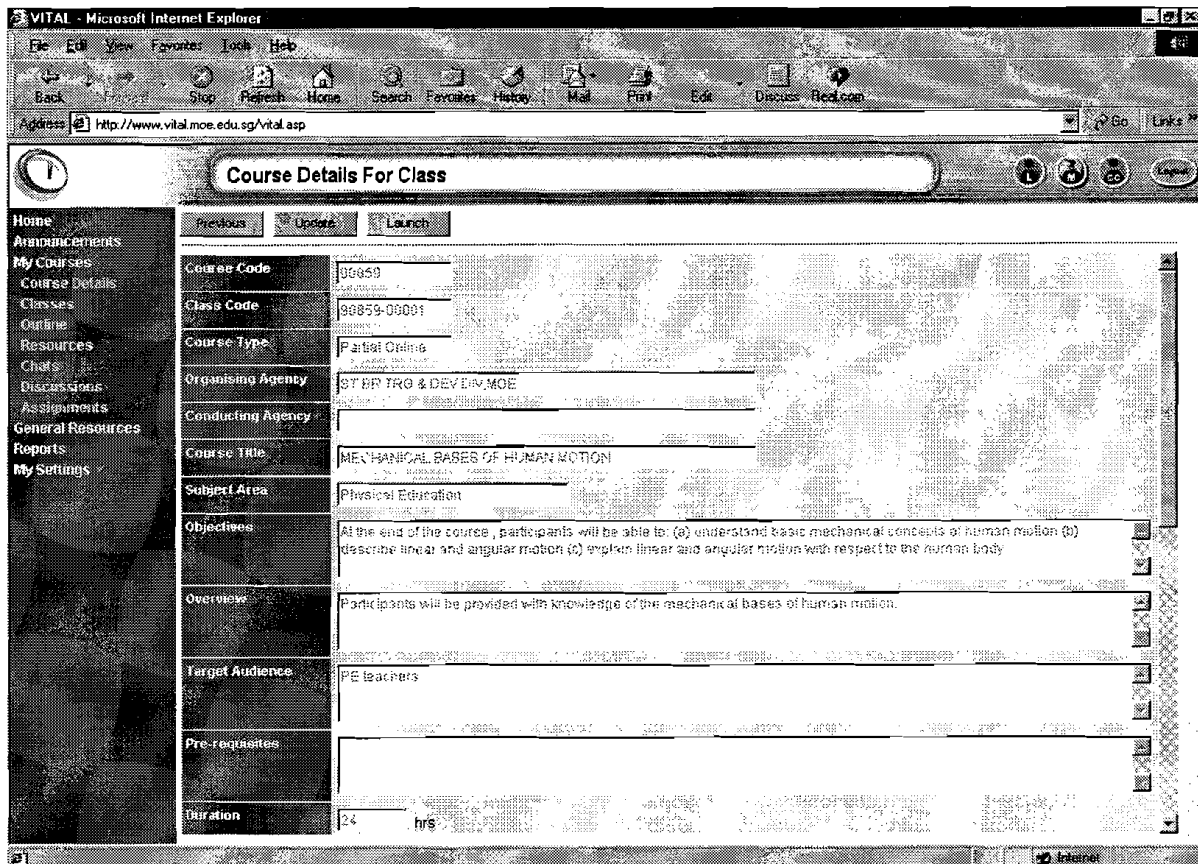


Fig. 2. Module objectives for biomechanics.

## Module Development Considerations

In designing the module, there were three key considerations. First, what pedagogical perspective should underlie the design of the module; second, how could the technology be harnessed in the course delivery to meet student needs; and finally, what support structure should be made available to the learners to address the prospects and problems associated with online learning.

Hannafin (2001) noted that information dumping, unstructured and unguided discussions as well as the mere reliance on other websites for information as instruction work against e-learning. He emphasized that it was more important to manage the information flow, structure communications throughout the online course, embed self-checks and provide support to improve the efficacy of e-learning. Consequently, we decided to design our webpage content based on information processing theory (Driscoll, 2000; Huitt, 2000). We hope to appropriate the principles of learning and good design into our module; however, we recognize that a step-by-step design implementation is needed as we pilot the module and as we refine the processes based on feedback and research findings.

The module explored the biomechanical concepts of kinematics (describing motion) and kinetics (explaining the causes of motion). It begins with a rationale for studying the mechanics of human motion. This was important so as to provide

a context for learning. Lim (2001) noted that learners need to know the reason for learning something as they must believe that there will be a personal benefit or that they expect to apply new knowledge and skills to their work or lives. The textual content was minimized as much as possible with little or no reference to mathematical formulae. This was important to allay learner's fears of the subject as well as to develop a qualitative understanding of the concepts. In addition, each webpage was designed such that only the important information was presented and the learner was cued to focus on the information. One strategy used was to provide specific information related to a visual. There was a heavy reliance on static graphics, stick figure animations and video clips to better illustrate the kinematic and kinetic concepts (see Fig. 3 for an example). The use of video and animation helped to gain and focus the learner's attention and it was also a powerful and realistic representation of processes (Fenrich, 1997), these being the mechanical concepts, in the online module. It also enabled the learners to replay at call, which facilitated rehearsal of information and thus internalization. Additionally, activities in the form of quizzes and self-experiments were set and embedded at appropriate sections of the online content, which required the learners to apply their knowledge. Answers at call, were provided as a means of support.

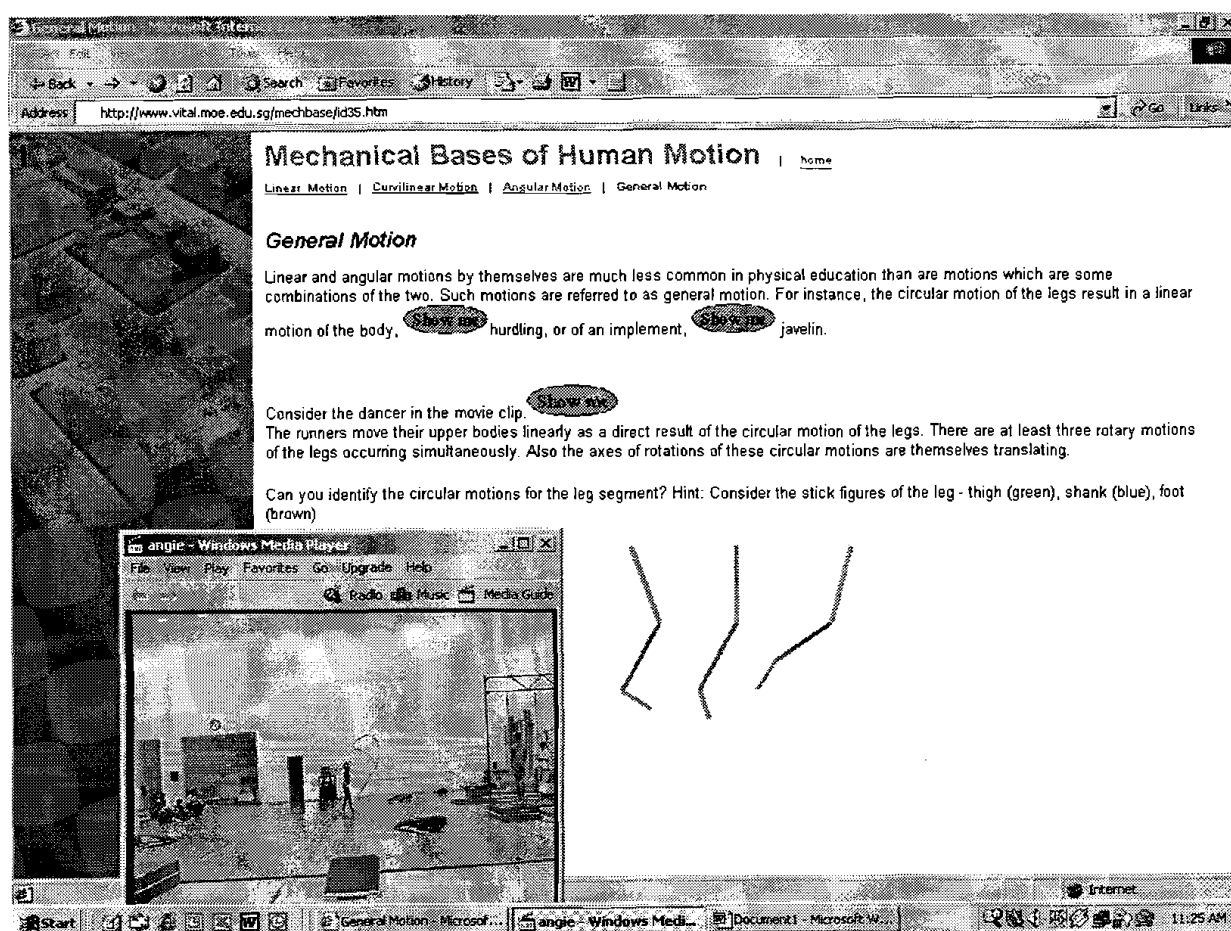


Fig. 3. The use of computer graphics and animation.

Miller (1996) noted that technology should allow a seamless movement between accessing and presenting information as well as supporting a community of collaborative learners. The potential of computer-mediated communications as a facilitator of both individual and collaborative learning was explored by means of asynchronous discussion forums built into the online content. We have currently adopted this approach as a supporting tool to help our students in discussing biomechanical concepts. In the subsequent implementation of this environment, we will consider how and when this form of online discussions can be more appropriately structured as part of our module based on student feedback. An idea currently being explored is to organize the online community into small groups, with individuals taking turns to initiate and conclude each discussion topic posed in the forum.

The purpose of the forum was to encourage critical and reflective thought among the learners. In so doing, the learner actively engages and constructs meaning not only from the web content but also from collaborative dialogue with others. This was our attempt to move beyond the one-way monologue of didactic teaching and to tap on a constructivist view of teaching and learning (Jonassen, 1994) in which one learns through a "reiterative and continual process of constructing, interpreting and modifying our representations based on one's experiences" (Alderman & Milne, 1999, p. 4). Researchers such as Berge (1995) have also affirmed the positive benefits of online social interaction in learning compared to traditional individual interaction with content. Figure 4 illustrates the online discussions that were implemented among the learners.

Lim (2001) asserted that dialogue is one of the most important components of any educational process. He goes on to say that dialogues enrich learning environments with the distribution of intelligence. Since dialogue is not confined to computer-mediated communications alone, we decided that the online modules would be supported not only via the asynchronous discussion forums and e-mail, but also by face-to-face tutorials, at least for this first module. A total of four tutorials have been planned, the first being an "ice-breaker" as well as to foster an affirmative and supportive environment, so that participants would not be averse to posting their reflections and comments in the asynchronous discussion forums. Subsequent tutorials will be of a practical nature to enable participants to have hands-on, real-life experiences in the applications of biomechanical concepts to human motion. Learners may then be able to tap on such experiences when perusing the online content.

This blended approach of online learning and real-life hands-on practice is to our minds the most sensible and feasible pedagogical approach to the subject at hand. Online means and forms of technology have been used to facilitate learning processes such as visualization (modelling of concepts) and constructivist notions of knowledge construction and dialogue. Real hands-on practices have been used to concretise learners' understanding of concepts and applying them in actual authentic situations and contexts.

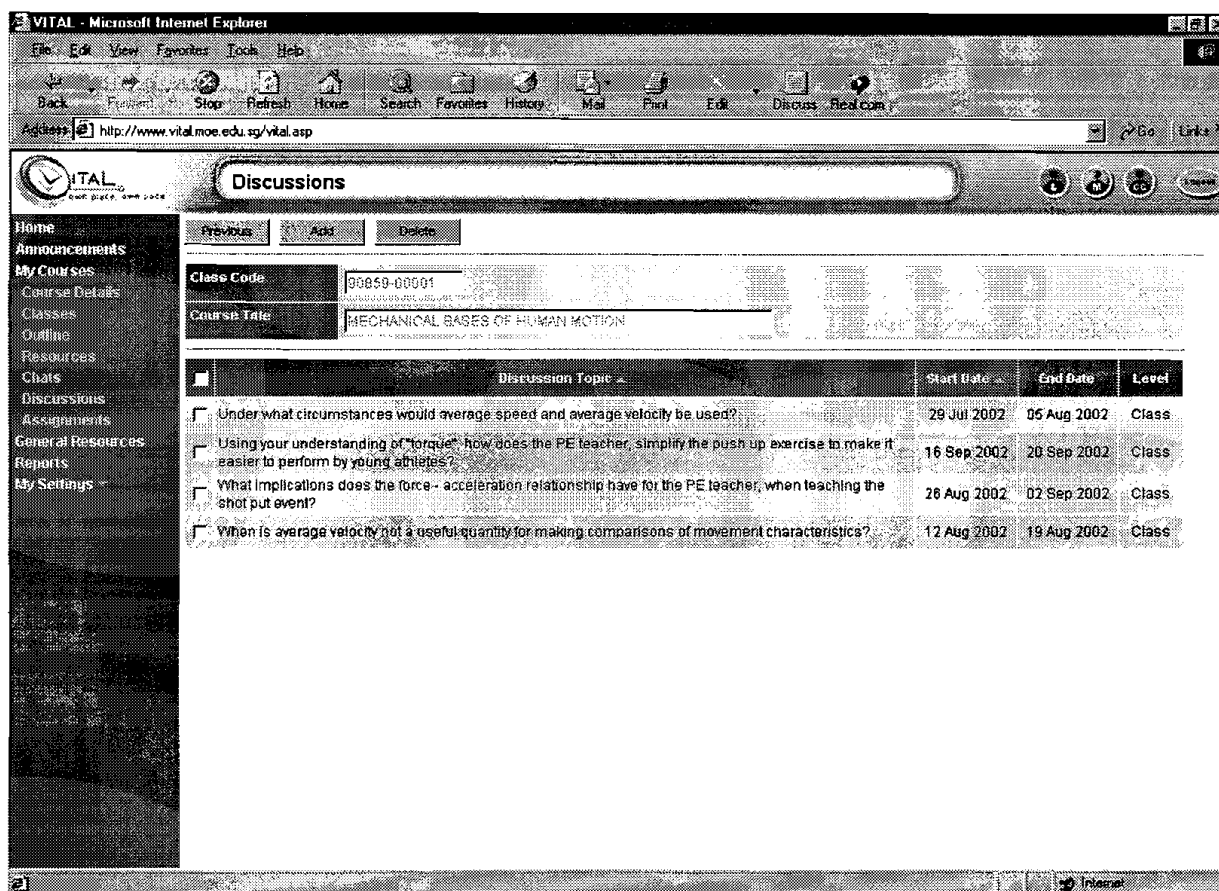


Fig. 4. Class online discussions on issues related to biomechanics.

## Conclusion

Through VITAL, teachers may come to learn of the science of biomechanics. In particular, we hope that learners may apply their newly acquired knowledge of biomechanics to understand more of their movement capabilities, evaluate their technique when performing exercises or sports and be able to diminish the risk of injury. Through the discussion forums and practical sessions, we hope that participants will be able to overcome their old fears and biases for the subject. More importantly, they may develop a more enquiring mind and think critically. The perception that biomechanics is esoteric by nature may perhaps be diminished via the online medium. Only time will tell. We aim in our future research efforts to collect some data to substantiate our conjectures and hopefully design a *meaningful* learning environment for our students.

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## References

- Alderman, B. & Milne, T. (1999). *Designing a web-based distance education course within a constructivist learning environment*. Paper presented at the HERDSA Annual International Conference, Melbourne, 12–15 July.
- Berge, Z. L. (1995). Electronic discussion groups. *Communication Education*, **43**, 102–111.
- Driscoll, M. P. (2000). *Psychology of Learning for Instruction* (2nd edn.). Boston: Allyn & Bacon.
- Fenrich, P. (1997). *Practical Guidelines for Creating Instructional Multimedia Applications*. Fort Worth: Dryden Press.
- Hannafin, M. (2001). *The Psychology of E-learning*. Paper presented at the Symposium on E-Learning: The future of education. Singapore, 6–7 September.
- Hay, J. G. (1993). *The Biomechanics of Sports Techniques* (4th edn.) Englewood Cliffs, NJ: Prentice-Hall.
- Huitt, W. (2000). *Educational Psychology Interactive: The Information Processing Approach* [Online]. Available: <http://chiron.valdosta.edu/whuitt/col/cogsys/infoproc.html> [April, 2002].
- Jonassen, D. H. (1994). Thinking technology: toward a constructivist design model. *Educational Technology*, **34**(4), 34–37.
- Koh, M., Tan, J. & Tan, S. C. (2002). *Online instruction in the teaching of biomechanics*. Paper presented at the 26th Annual Conference of the Pacific Circle Consortium: Diversity and Unity in Schooling for Future Citizens. Seoul, Korea, 1–3 May.
- Lim, C. P. (2001). *E-learners and U: Building a relationship in learning*. Paper presented at the Symposium on E-Learning: The future of education. Singapore, 6–7 September.
- McGinnis, P. (1999). *Biomechanics of Sport and Exercise*. Champaign, IL: Human Kinetics.
- Miller, G. (1996). Technology, the curriculum and the learner: Opportunities for open and distance education. In R. Miller & A. Tait (Eds.), *Supporting the Learner in Open and Distance Learning* (pp. 34–42). London: Pitman Publishing.
- Ministry of Education. (2000). IT Masterplan Homepage [online]. Available: <http://www1.moe.edu.sg/iteducation/masterplan/> [May, 2002].
- Tan, S. C. & Hung, D. (2001). *Beyond information: Creating a constructivist learning environment*. Paper presented at the Symposium on E-Learning: The future of education. Singapore, 6–7 September.
- Thorpe, M. (1998). Assessment and third generation distance education. *Distance Education*, **29**(2), 265–286.
- VITAL. (2001). Virtual Institute of Training and Learning [Online]. Available: <http://www.vital.moe.edu.sg/intro/index.htm> [May, 2002].