

**HYPERMEDIA PROTOTYPE IN SECONDARY SCHOOL:  
CELL AS A BASIC UNIT OF LIFE**

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**HYPERMEDIA PROTOTYPE IN SECONDARY SCHOOL:  
CELL AS A BASIC UNIT OF LIFE**

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fulfillment of the requirements for the degree  
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by

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## ABSTRAK

Projek ini bertujuan untuk merekabentuk dan membangunkan sebuah prototaip hypermedia yang bertajuk “Sel sebagai unit asas hidupan”. Prototaip ini bertujuan bagi memperkenalkan dan memperkukuhkan konsep yang dipelajari dalam tajuk berkenaan bagi pelajar sekolah menengah (Tingkatan Satu hingga Tingkatan Tiga). Sebagai tambahan, pengkaji telah membuat sedikit kajian penilaian mengenai *usability* perisian kursus berkenaan. Prototaip ini dibangunkan dengan menggunakan pendekatan berorientasikan perhubungan-entiti, dalam Relationship Management Methodology sebagai teknik permodelan.

## **ABSTRACT**

The purpose of this project was to design and develop a hypermedia prototype on topic “Cell as a basic unit of life”. The aim of the prototype was to introduce and consolidate the concept learnt on the topic for student in secondary school level (Form One until Form Three). Additionally, researcher have done some evaluation studies about the usability of the courseware. The prototype was develop using the entity-relationship (E-R) model in Relationship Management Methodology (RMM) as a design tool.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

Hypermedia systems have been readily accepted by educational computer assisted learning (CAL) developers largely because of the ease of program development, allows greater learner control, access to multimedia learning materials and a variety of modalities of interaction with the learning material and a general fascination with the possibilities offered by linking information in a non-sequential way (Quentin-Baxter & Dewhurst, 1992, Viau & Larivee, 1993, Ken Neo & Neo Mai, 1998). The dynamic nature of the Biology subject cannot be easily demonstrated in laboratory sessions and it is therefore a prime candidate for the development of interactive learning materials that include multimedia and hypermedia.

Indeed, this particular electronic learning aid may provide certain advantages over conventional tutorials: computer tutorials can be used by the student repeatedly, at their own convenience; dynamic biological phenomena (*e.g.* cell division and examples) can be explained using animations and digitized video, media which are not normally available in the conventional tutorial setting. Furthermore, computer tutorials could be of particular value to external students who do not have direct access to advice/feedback from academic staff outside of residential schools.

The computer's ability to manage and quickly respond to learner inputs, to represent information in multiple media forms, and to accommodate individual learner needs, among other things, makes it an effective delivery medium for tutorial courseware (Heinich, Molenda, Russell, & Smaldino, 1996). And computer-based hypermedia has

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## BIBLIOGRAPHY

- Balasubramanian, P., Isakowitz, T., Stohr, E.A.(August,1995). RMM: A methodology for structured hypermedia design. *Communications of the ACM*, 38(8):33-44.
- Barab, S. A., Bowdish, B. E., & Lawless, K. A. (1997). Hypermedia navigation: Profiles of hypermedia users. *Educational Technology Research and Development*, 45(3), 23-41.
- Díaz, P. (2003). *Usability of hypermedia educational e-books*. In D-ib Magazine, 9(3), ISSN 1082-9873, March, 2003. Retrieved on 23.01.2004 from the World Wide Web:  
  
[http://tm.wc.ask.com/r? links&o=0&u=http://www.dlib.org/dlib/march03/diaz/03diaz.html](http://tm.wc.ask.com/r?links&o=0&u=http://www.dlib.org/dlib/march03/diaz/03diaz.html).
- Díaz, P., Sicilia, M.A. and Aedo, I.. Evaluation of hypermedia educational systems: criteria and imperfect measures. *Proc. of the International Conference on Computers in Education*, Auckland 3-6 December, 2002. 621-626.
- Duchaste, P. (1990). Examining cognitive processing in hypermedia usage. *Hypermedia*, 2(3), 221-233.
- Ebersole, S. (1997). Cognitive Issues in the design and deployment of interactive hypermedia : implications for authoring www sites. *Interpersonal Computing and Technology: An Electronic Journal for the 21st Century*, 5 (1-2), 19-36.
- Frasincar, Jan Houben & Vdovjak. (2001) An RMM-based methodology for hypermedia presentation design. *Communications of the ACM*, 38(8):33-44, August 1995.
- Garzotto, F., Mainetti, L. and Paolini, P. Hypermedia Design, Analysis and Evaluation Issues. *Communications of the ACM*, 38(8), 1995. 74-86.
- Heinich, R., Molenda, M., Russell, J., & Smaldino, S. (1996). *Instructional Media and technologies for learning*. Upper Saddle River, New Jersey: Prentice Hall.
- Hopper, G. (1998). Just Cause-Or Impediment? *Proceedings of sixth annual conference, ASCILITE, Computers in Learning in Tertiary Education*. Canberra: Canberra College of Advanced Education, pp. 153-161.
- Hutchings, G.,A., Hall, W., Briggs, J., Hammond, N.V., Kibby, M.R., McKnight, C. & Riley, D. (1992). Authoring and evaluation of hypermedia for education. *Computer Education Journal*, 18(1-3), 171-177.

- Jonassen, D.H., & Grabinger, R.S. (1989). Issues in designing hypermedia for learning. In Shu Ching Yang, Designing instructional applications using constructive hypermedia. *Educational Technology Magazine*, Nov-December 1996. New Jersey: Educational Technology Publications.
- Nielsen J., (1994), *Usability Inspection Methods*, John Wiley & Sons, New York,
- Ken Neo & Neo Mai, T.K., (1998). *The Multimedia Pavilion : Trends and Technology*. Petaling Jaya: Meway Computec Sdn. Bhd.
- Knussen, C., Tanner, R.G., & Kibby, M.R. (1991). An approach to the evaluation of hypermedia. *Computers and Education*, 17(1), 11-24.
- Layman, J., and Hall, W. (1991). Applications of hypermedia in education. *Computers Education*, 16(1), 113-119.
- Leader, L.F. & Klein, J.D. (1996). The effects of search tool type and cognitive style on performance during hypermedia database searches. *Educational Technology Research and Development*, 44(2), 5-15.
- Lee, S., H.. Usability testing for developing effective interactive multimedia software: concepts, dimensions and procedures. *Educational Technology & Society*, 2(2), 1999.
- Oliver, R. (1995). Interactions in Multimedia Materials. *The Electronic Library*, 13(3), 187-194.
- Pawling, Elaine (1999). Modern languages and CD-ROM-based learning. *British Journal of Educational Technology*. 30(2). Oxford: Blackwell Publishers.
- Preece, J., Rogers, Y., Sharp, H. (2000). *Interaction Design: beyond human-computer interaction*. . John Wiley & Sons, Inc. New York,.
- Quentin-Baxter, M., & Dewhurst, D. (1992). A method for evaluating the efficiency of presenting information in a hypermedia environment. *Computer Education Journal*, 18(1-3), 179-182.
- Riley, F. (1995). *Understanding IT: Developing multimedia courseware*, University of Hull.

- Spoehr, K.T. (1994). Enhancing the acquisition of conceptual structures through hypermedia. In Kate McGilly, ed., *Classroom lessons: Integrating Cognitive theory and classroom practice*, 75-101. Cambridge, Massachusetts: The MIT Press.
- Squires, David and Preece, Jenny (1996). *Computer Education*, 27(1), 15-22. Britain: Elsevier Science Ltd..
- Practical heuristic for evaluating usability* .Retrieved on Jan 17, 2004 from the World Wide Web:
- [www.acm.org/~perlman/question.cgi](http://www.acm.org/~perlman/question.cgi)
- Trentin, G. (1992). Case study: Supporting the structure of personal knowledge with computers. *Educational & Training Technology International*. 29(4), 283-291.
- Viau, R. & Larivee, J. (1993). Learning Tools with hyper, text: an experiment. *Computer Education Journal*, 20(1), 11-16.