

# Multiple Intelligence Multimedia Courseware (MIMCO) Based on the Constructivist-Contextual Model for the Learning of Some Chemistry Concepts

Rio Sumarni Shariffudin, Sabrina Azanan, and Julia Guan Chin Hsien

**Abstract**—Research findings have shown that learners encountered many learning difficulties. However, for effective learning one has to know oneself and having knowledge about one's strengths and weaknesses. The process of teaching and learning will be more effective and meaningful when teachers and learners know their potential, their unique styles, strengths and weaknesses in learning. Howard Gardner's theory of multiple intelligences (MI) is a psychological and educational theory espousing that ten types of "intelligence" exist in humans, each relating to a different sphere of human life and activity. Nowadays, how learners interpret knowledge differs greatly from what used to be perceived by the teachers. The manner in which teachers deliver the knowledge may not match the expectations of the learners, thus results in teachers' instructional methods became inefficient and learners failed to learn. This mismatch calls for new and innovative instructional design of delivery methods that are student- centered which cater to their needs. This paper discusses the design and development of a multiple intelligence multimedia courseware (MIMCO) for the teaching and learning of some chemistry concepts. The courseware was designed in a systematic manner embedding principles of constructivist and contextual learning using the ADDIE model of instructional design. Learners are able to learn in their specific intelligence as the courseware caters to eight modes of intelligences as the learning environment. A preliminary evaluation of the courseware showed positive impact on the learners.

**Index Terms**—Multiple intelligence, instructional design, constructivist, contextual and multimedia.

## I. INTRODUCTION

An educational innovation towards the end of the century was the recognition that students learn differently from each other. With this revelation, a lot of groundbreaking work has laid a solid foundation for understanding individual differences, such as personality types, learning styles, and multiple intelligences. As we enter the new millennium, differentiation has become enormously important in the delivery of services to all students [1]. Unfortunately methods of instruction remain more or less the same for the normal students as well as the high achievers in the classroom. This causes much frustration especially to the high achievers as a result of the mismatch between their learning and instruction. Thus, a teacher or an educator has to bear in mind that [2]:

- 1) a. People differ consistently from each other in their preferences (e.g., emotional, environmental) for certain ways of processing information (the 'individual differences' assumption).
- 2) b. These individual differences are measurable.
- 3) c. Matching or mismatching students' learning styles with instructional techniques affects learning significantly (the 'matching hypothesis')

It is clear that teachers or the academic instructors should change their teaching strategies and materials to cater to learners' needs and preferences. For instance, Multiple Intelligence proposed by Howard Gardner (1983) implies that learning or teaching should focus on the particular intelligences of each learner [3]. When asked how educators should implement the theory of multiple intelligences, Gardner says, "It's very important that a teacher take individual differences among kids very seriously. The bottom line is a deep interest in children and how their minds are different from one another, and in helping them to use their minds well." An awareness of multiple-intelligence theory has stimulated teachers to find more ways of helping all students in their classes. Many research related to this theory indicate that students' multiple intelligences contribute significant differences in their learning output. So, it is critically important that a better understanding of students' intelligences will allow appropriate instructional materials or strategies to be developed according to the diversity of the learners.

## II. DESIGN AND DEVELOPMENT OF MIMCO COURSEWARE

The ADDIE model was used as a guide to design and develop the software systematically. The design and development of the courseware begins with the analysis, design, development, implementation and evaluation phases according to the ADDIE model. A needs analysis was conducted prior to the design phase to identify aspects related to the learners such as target group, prior knowledge, curriculum, content, learner level and learners MI. The design phase incorporates aspects such as learning outcomes, teaching strategies and test items. Principles of sound learning theories and pedagogical aspects of teaching and learning are taken into consideration while designing the courseware. The development phase brings together the pedagogy and technology to create the innovative product (refer to theoretical framework below).

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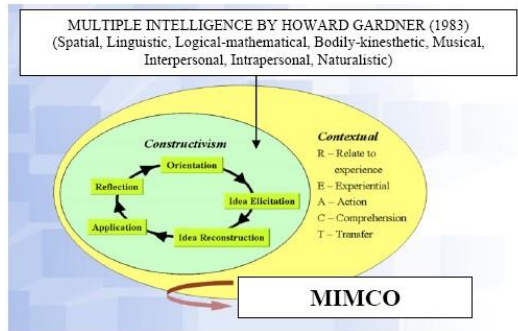


Fig. 1. Theoretical framework

The courseware begins with a montage that introduces the content of the courseware. According to the ARCS theory of motivation, the montage is important to focus learners' attention (Fig 2). For this purpose, Macromedia Flash was used to produce the animations to attract learners' attention. The montage gave an introduction to the eight multiple intelligences based on Howard Gardner.



Fig. 2.

The main menu of the courseware namely, *Learning Electronic Configuration Using MI* consists of the following: *About the software, Multiple Intelligence Test, Learn through your mode, Quit, Help, Glossary and Credit*. This menu is divided into two parts: *About the software, Multiple Intelligence Test, Learn through your mode and Quit*. The display below depicts the main menu (Fig. 3).

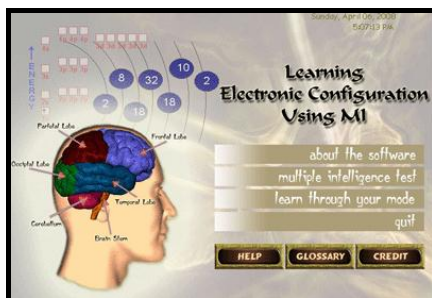


Fig. 3.

This below menu (Fig 4) displays a MI test for learners to determine their MI. Learners taking the test must answer some questions and submit their response. The courseware will automatically display the MI of the learners. After determining their MI, learners will be able to choose the MI mode that suits them. The MI test was developed by using FLASH (Rio Sumarni and Julia Guan, 2003).



Fig. 4.

The MI learning mode consists of eight MI modes: *Music, Verbal-Linguistic, Intrapersonal, Bodily-Kinesthetic, Visual-Spatial, Logic-Mathematic, Interpersonal and Naturalist* [4]. (See Fig. 5)



Fig. 5.

The strategy applied in designing the learning environment in all the eight modes is based on the constructivist and contextual principles of learning. Each mode embeds the constructivist learning model which translates into: *Do you know?, What is your idea?, What exactly it is?, When to apply it? Is it clear to you?* (Refer to some clips of courseware below, Fig. 6-10).

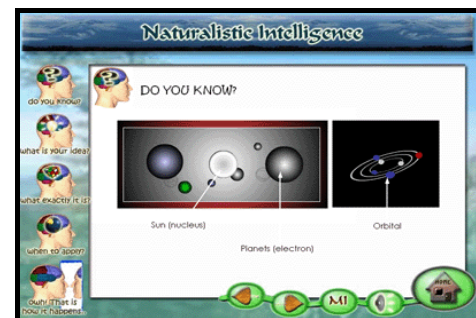


Fig. 6. Do you know?

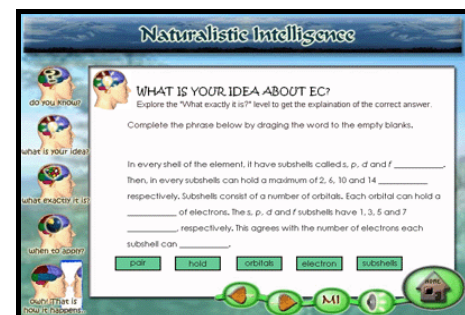


Fig. 7. What is your idea?

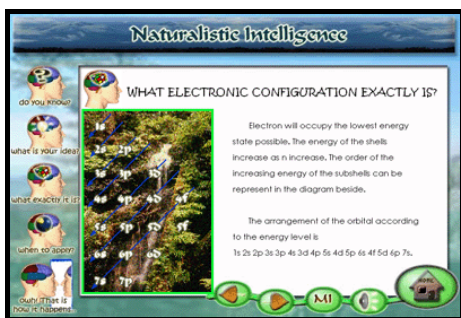


Fig. 8. What exactly is it?



Fig. 9. When to apply it?



Fig. 10. Owh! That is how it happens.

The Help menu provides information about the icons used throughout the courseware. (See Fig. 11 and 12)



Fig. 11.



Fig. 12.

The glossary provided in the courseware acts as an

electronic dictionary providing brief information about the terms used throughout the courseware. Learners have just to click the alphabet on the provided keyboard to obtain the requested information. (See Fig. 13)

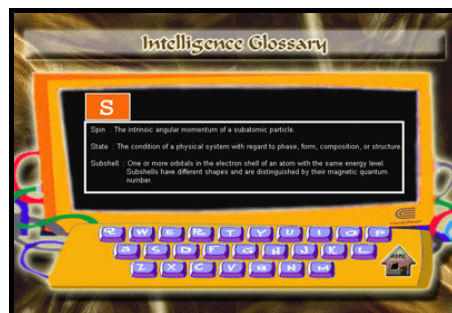


Fig. 13.

### III. RESULTS AND DISCUSSION

Evaluation of this courseware was undertaken by some trainee teachers teaching chemistry. All the respondents agree that the courseware possesses the following uniqueness:

- 1) Has eight learning modes
- 2) An electronic MI sorter
- 3) Design based on sound pedagogy and current technology
- 4) Consider learners diversities.

### IV. CONCLUSION

This study attempted to design and develop a courseware based on learner's diversities, learner-centred and taking into consideration pedagogy and technology. Technology alone may not be able to support effective learning. But complementing technology with pedagogy it would be possible to contribute a conducive learning environment for diverse learners. Also the courseware is designed and developed using the ADDIE model of instructional design. In this way the courseware was developed in a systematic manner which complies to instructional design practice.

### ACKNOWLEDGEMENTS

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