CHAPTER 9
CONCLUSIONS AND RECOMMENDATIONS

9.1 Introduction

The research rationales were introduced in Chapter One. In particular, this study focused on student-centric e-learning environment which would be utilised in schools to cater for various learning styles of students and at the same time emphasising on sound pedagogy. To achieve the expectations of this study, three main objectives were formed:

1. To study learning theories and propose strategies to improve pedagogical quality of e-learning environment.

2. To propose features for an e-learning environment, that is based on sound pedagogical practices, as well as features that are perceived to be useful in catering for the diversity of learning in the e-learning environment.

3. To test hypotheses related to the usefulness and ease-of-use of the functionalities provided in the e-learning application (SCEnE).

Any assumptions and related hypotheses were also listed. The research objectives and the review of literature (Chapter Two) led to a structured method of this research (Chapter Three to Chapter Eight) which involved investigation, elicitation, deduction, analysis, construction, collaboration, modelling and evaluation processes. A proposed conceptual framework for effective e-learning (Chapter Three) and requirements gathering on students e-learning preferences based on their intelligence type (Chapter Four) guided to
student centric instructional design process model for the proposed e-learning environment (Chapter Five) and the learning design specifications of the environment for building the e-learning environment (Chapter Six) were defined. The implementation of student centric e-learning environment (SCEnE) prototype (Chapter Seven) was utilised to investigate the e-learning concept based on sound pedagogy and its functions in terms of the perceived usefulness and ease-of-use with students of different learning styles. In addition, evaluation was conducted with two panel groups of educators, instructors and experts. The results of these evaluations (Chapter Eight) including the testing of hypotheses have contributed to the conclusions and suggestions for future studies outlined in this final chapter. This final chapter gives a summary of the research study and highlights the contributions and the expected benefits of our research. The chapter ends with an outline of future research that would extend the benefits of this research.

9.2 Original Contributions

The work in this thesis can be divided into five major phases. Some work in the thesis has been published before, and the researcher gives references to these papers for each phase:

Literature study: The researcher presents a literature review on learning styles and multiple intelligences theory particularly. The detailed discussion on Gardner’s theory of multiple intelligences includes the description on the theory and how it is being practiced, educational suggestions, and related studies and application of MI theory. Secondly, review of literature on e-learning which comprises of strategic importance of e-learning, categorisation schemes for e-learning, and features review on existing e-learning systems
and their adherence to accepted learning pedagogy. Thirdly, the discussion was on the need to incorporate MI theory into an e-learning environment. Finally, review of literature on the theoretical foundation in instructional design. This includes the discussion on learning theories and their implications for instructional design and for e-learning, and a review on appropriateness of the available instructional design model for student centric e-learning.

Conceptual framework for effective e-learning: This conceptual framework defines the pedagogical approach, which includes the listing of instructional principles based on learning theories and the instructional strategies for each of the principles. The descriptions on the key elements of the proposed framework are presented in (Krishnasamy & Lee, 2007a).

Requirements gathering in the context of Malaysian Smart School: The researcher has also surveyed current and proposed e-learning practices generally but more specifically in Malaysian Smart School Environment in relation to multiple intelligences. The results and conclusion of this survey can be found in (Krishnasamy, Lee and Palaniappan, 2003) and (Krishnasamy, Lee and Palaniappan, 2006).

Student-centric e-learning environment instructional design process model and learning design specification conceptual model: The proposed instructional design process model consists of a conceptual structure and procedural guidelines on features to be included in the student centric e-learning environment (Krishnasamy & Lee, 2007b). The objective of the learning design specification is to provide a containment model of elements that describes the proposed teaching-learning process.
Implementation of **Student Centric E-learning Environment (SCEnE)**: SCEnE is an e-learning prototype that is developed to demonstrate the e-learning approach as prescribed by the conceptual framework for effective e-learning and instructional design process model. SCEnE functionalities to accommodate the proposed learning concepts are described in (Krishnasamy & Lee, 2007c).

The next section presents the expected results and benefits of this research.

### 9.3 Expected Results and Benefits

The use of sound learning theories and a particular learning style theory as the foundation of e-learning environment design was addressed in this study. Learning style theory can be applied to teaching in various areas of curriculum design, instructional methods, assessment, and student guidance (Curry, 1990). The primary idea in the research described in this thesis was to teach a course with appropriate activities to cater for the diversity of student’s learning styles. To accommodate this in the e-learning environment, learning concepts that support good pedagogical practices were incorporated. This idea has resulted in the formation of a Student Centric E-learNing Environment (SCEnE) Instructional Design Process model that is described in both its structural and content components. This model is built upon a proposed framework for effective e-learning.

Therefore, the results of this study provide information for instructors as they attempt to perceive individual differences among different groups of students at schools, colleges or universities. In understanding students’ learning style preferences, instructors may adapt their instructional strategies and styles to enhance students’ performance and
effectiveness either through traditional or online mode of learning. To enhance e-learning effectiveness in Smart Schools, requirements elicited from the findings of the survey for this study provide different criteria or information for grouping students. Selected Smart School students’ learning styles, computer/Internet usage, and attitudes towards technology-integrated instruction have been viewed as the essential variables for achieving a successful e-learning application.

The study has been significant to Smart School educators in Malaysia who might use the results of the study as a reference for instruction curriculum design for the Smart School or higher learning institutions. In order to serve as a springboard to a new design challenge and provide foundations for good quality design, this study aimed to provide useful information for those who are interested in e-learning development and educational technology adhering to sound pedagogy and accommodating multiple intelligences learning styles. The appropriate use of the findings from this study may improve the design of software and e-learning systems, to elevate the characteristics of e-learning that accommodates various intelligences, and to provide a meaningful learning environment for learners to gain motivation and confidence.

The main and sub-objectives of this study have been achieved. In particular, the following conclusions can be drawn from the outcomes of this study.

**For Students**

In summary, the advantages of using e-learning incorporating multiple intelligences within the school curriculum could be the potential for:
Conclusions and Recommendations

i. Deeper levels of engagement – in the online environment there is greater opportunity for pause and reflection before responding, that can sometimes be the case in a conventional face-to-face conversation or conventional discussion;

ii. Broader range of views of opinions to be reported and represented than is sometimes the case in conventional conferences or classroom encounters where it is likely that self-confident individuals are more likely to speak;

iii. Students to have more direct control over the learning or discussion in which they choose to participate;

iv. Greater range of feedback from co-learners, as well as teachers/tutors; and,

v. Involvement in e-learning in that the time for involvement in learning can be at the point most conducive to the student – contrasted with a conventional timetabled activity within schools and face-to-face interaction.

vi. The design is completely modular, permitting easy enhancement, upgrading and scaling of the system by replacing modules. Agent technology that can be added in the upcoming version and a robust database system to permit knowledge views (individual intelligence, skills, experience etc.) to be assembled on the fly.

For Instructors

i. The suggested activities are indeed perceived by the instructors as based on sound pedagogy and useful in catering for the diversity of students’ learning styles;

ii. The proposed student centric e-learning environment has the potential to assist classroom teaching tasks;
iii. Instructors agreed that tools which let users build activities automatically (i.e. without having to have programming knowledge) and easily should be included in e-learning environment;

iv. Instructors felt that the existing prototype functionalities, although adequate, required enhancement. However, there was a small number of novice teachers who thought the prototype was excellent;

v. Instructors would like SCEnE prototype to be implemented in schools;

For Experts

Experts agreed that the prototype, although adequate, required enhancement;

Both experts and instructors were in agreement on the perceived usefulness of the proposed SCEnE functionalities.

When asked to give further comments, instructors suggested that there was a need to implement the prototype in school. They believed it brings more advantages than disadvantages. However, some were concerned about the accessibility of such technology. If used only during school time equality of access among school children was also one of the concerns.

Generally, there were positive indications to conclude that:

The perceived usefulness of the activities in addressing learning based on sound pedagogy and catering for students’ learning styles, postulates that, the desirable features for e-learning environment can incorporate the functionalities proposed in this study.
The limitations of this study are discussed in the next section. Taking into account these limitations, the following section suggests future research topics which could be considered by expert or researchers from different areas.

### 9.4 Limitations and Recommendations

In this study two sets of survey instruments were designed to gather requirements. The first set of the survey determined the learning styles of the respondents based upon the theory of multiple intelligences whereas the second set of survey form was used to gather data pertaining to e-learning aspects. These self-report questionnaires make two assumptions:

1. scores based on the answers from the first set of questionnaire can be used to determine a participant’s most developed intelligence
2. participants can answer questions on the theory of MI and E-learning aspects with an understanding of their own skills

SCEnE despite being heavily laden with features, addresses only three groups of user profiles. These three groups of users are administrators, students and instructors. Features related to content development are consolidated under the tools for instructors, hence, implying that the tools provided and consequently the tasks pertaining to content development are the responsibility of the instructors. This implication can make implementation difficult because it does not depict the gradual stages of expanding the instructors’ responsibility. Furthermore, this may lead the learning institution to believe that content development is the most natural thing that every instructor should be able to
do without any form of training. Ideally, the tools should be grouped and packaged under different categories of user profiles so that the actual number of people involved in performing content development work is well represented. SCEnE should refine the grouping of tools into various suites of user profiles like content experts, instructional designers, developers and etc.

The prototype of student-centric e-learning modules incorporates only a small subset of the potential representations and entry points that can be used for explanation variants of the subject matter. A limitation of developing e-learning application based on multiple intelligences is that each variant must be individually designed by a person knowledgeable in the subject matter, in the educational methodologies of multiple intelligences approach, and in Web technologies and e-learning. The prototype is necessarily a simplification of the design for the entire multiple intelligences e-learning module.

It is a preliminary study and the results of this study have limited generalisation. The sample of the study was lower secondary students. Several studies have indicated that there are differences in learning styles based on age, gender, level of education and major. This study did not take into account these factors. These differences can be examined in future studies. We list student prerequisites or requirements for e-learning outside the classroom as follows:

- Students must have convenient access to the Internet at home, or through school, library, and community computer labs.
• Students must have basic knowledge of using computers and navigating the Internet
• Students have their own email accounts, or access to a group conferencing program
• Students must demonstrate the maturity to responsibly use the Internet and their own email accounts, or lose these privileges
• Students must be self-motivated to get online and conduct their “homework” Internet activities
• Students must have the self-confidence and maturity to be engaged in their own learning to the degree they will interact openly and honestly

It should be made clear that SCEnE system approach model (SCEnE instructional design process model), as it stands, is not a curriculum design model. In order to design a curriculum many more steps would be required before identifying the instructional goals. Some of these techniques are known as needs assessment and job analysis. One should use the model in curriculum development projects after the instructional goals have been derived.

Most lay and scholarly writings about intelligence focus on a combination of linguistic and logical intelligences as the intellectual strengths. However, a fuller appreciation of students occurs if spatial, bodily kinesthetic, musical, interpersonal, and intrapersonal intelligences are taken into account. While all of us have these intelligences, individuals differ for both genetic and experiential reasons in their respective profiles of intellectual strengths and weaknesses. No intelligence is in and of itself artistic or non-
artistic; rather several intelligences can be put to aesthetic ends, if individuals so desire. No direct educational implications follow from this psychological theory; but if individuals differ in their intellectual profiles, it makes sense to take this fact into account in devising an educational system.

9.5 Future work

SCEnE e-learning environment and the Semantic Web

If the format and structure of the content is described in formalized and machine-readable languages, then it can be searched and acted upon, not only by humans but also by computer programs commonly known as autonomous agents (Hendler, J. et al., 2008). The Semantic Web is populated by a variety of autonomous agents. These agents are small computer programs designed to navigate the Web, searching for particular information and then acting on that information in support of their assigned task. In SCEnE e-learning environment, student agents will be used for intelligent searching of relevant content to suit their MI type, and as secretaries for booking and arranging for collaborative meetings, for reminding students of deadlines, and for negotiating with the agents of other students for assistance, collaboration or socialization which enhances the Interpersonal intelligence. Instructor agent will be used to provide remedial lesson, and to assist with record keeping, with monitoring student progress, and even with marking and responding to student communications.
Evolution in personalisation

Key trend is driven by the recognition that e-learning environments must support students’ diversity and individual needs. This diversity can include student differences in prior knowledge, competencies, learning style, communication preferences, cognitive style, and so on. Based on sound pedagogic strategies, personalized e-learning would ideally offer multimedia content, activities and collaboration adapted to students’ specific needs and influenced by their specific preferences and context. Personalised e-learning can enhance students’ e-learning experience in terms of relevancy, motivation, effectiveness, efficiency, and satisfaction. The challenge in successfully developing personalised e-learning services lies in the complexity of both, developing adaptive e-learning systems and authoring such adaptive e-learning experiences. Research in personalised learning technologies has so far focused on fusing intelligent systems and (semantic) Web technologies. Examples of personalised e-learning environments include the Adaptive Hypermedia Architecture (AHA!), Knowledge Tree, and the Adaptive Personalised e-Learning Service (APeLs), which have achieved dynamic personalised composition of multimedia content based on a student’s prior knowledge, interests, and demonstrated achievements. Research in this area should consider incorporating SCENE’s sound pedagogic strategies and emphasis on multiple intelligences as for the learning styles.

A need for more in-depth community

Future studies will need to determine if students’ multiple intelligences do change as a result of instructional methods and information technology. In this study, instructional
methods and technology were designed to accommodate multiple intelligences of students, with activities also being structured in a way to help students strengthen their less dominant intelligences. Future work will involve exploring further the role of challenge in e-learning environments. It will involve determining the influence of different types of resources on individual learners and their effect on learning performance. More research will also be conducted to explore what influences learning activity and learning gain.

Future research questions related to the instructors survey results in this study, would include measuring the developmental time of future modules to determine if there was a learning curve effect, and attempt to measure the benefit of the glossary of terms and pre-requisites.

9.6 General Conclusions

The growth and success of e-learning is closely related to the design of quality learning, enabled through the use of technology. This study discusses the instructional design model for the development of effective e-learning. Application of instructional design offers some advantages to helping students in their learning. It helps the students to identify the activities involved in learning the subject. It also enables students to identify their learning objectives. Lastly, it helps students to assess their learning styles based on MI theory.

The teaching and learning theories and paradigms have been practiced in the traditional education for a long time. The evidence showed that the e-learning can be the
innovative means to improve the efficacy and quality of teaching and learning. There are widely used applications in the universities and schools for e-learning, but what is important for the design of the e-learning environment is the appropriate instruction and guidelines. As a bridge between separate paradigms about what it means to learn and teach well, the researcher transforms e-learning climates into centers that welcome more diverse perspectives on any topics, while adapting sound pedagogy. This study has illustrated the collaborative learning environment with its components and techniques to aid the e-learning courseware design. These components and techniques are being evaluated for some of the lower secondary lessons. The results were critically analysed and refinements are incorporated for improvement and enhancement.