Dimensions of Culturally Sensitive Factors in the Design and Development of Learning Objects

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Abstract: Open educational resources (OERs) are designed to be globally reusable. Yet comparatively little attention has been given to the cultural issues. This paper addresses the issue of culturally sensitive factors that may influence the design of reusable learning objects. These influences are often subtle and hard to manage. The paper proposes a structured approach to explore and organise the culturally sensitive factors that are likely to be encountered in terms of four major dimensions. These dimensions serve to articulate and classify the large and diverse literature on cultural differences into a manageable format. This provides a basis to address the cross-cultural issues during the process of the design and development of open educational resources (OERs).

Keywords: Open Educational Resource, Learning Object, Culture, Culturally Sensitive Factors, Cultural Dimension

1 Introduction

Open educational resources (OERs) are designed to be globally reusable. While this provides a number of potential benefits, it also raises a number of concerns and issues about cross-cultural delivery and reuse. Mayes (2003) explains this dilemma: "Once all of the technical, and even pedagogical, issues are out of the way, we will still be faced with cultural, social and organisational factors that will determine the extent to which learning objects are actually reused" (p.11).

Culture, for the purposes of this paper, is defined as "the collective programming of the mind which distinguishes the members of one group or category of people from others" (Hofstede, 2001, p.9). When values are widely shared by a group of people, they are provided with a common mechanism by which they can share understandings and interpretations of their world, and establish what is important and clarify priorities (Wild & Henderson, 1997). Learning does not occur in isolation. Psychologists and educationists (Vygotsky, 1978, Lefrancois, 1994) indicate the powerful influence of culture on human development. Where designers and learners belong to different cultures, it may lead to conflicting views of usefulness and may affect pedagogical effectiveness and reusability. A problem with designers for culturally reusable design is that comparatively little practical advice is available on how to understand culturally sensitive factors relevant to the design and development of learning objects (LOs). There is a growing need to support the designers of LOs in considering cultural factors.

In order to address the problems of cultural adaptability, this paper explores culturally sensitive factors involved in the design of learning objects and categorizes them as four dimensions. This work intends to generate a consistent approach by which the originators, or adaptors, of OERs can address the influences of cultural diversity on their products to enhance reusability and ensure an equivalently rich pedagogical impact in culturally different learning contexts.

2 Dimensions for Culturally Sensitive Factors in the Design and Development of Learning Objects

"The comparison of culture presupposes that there is something to be compared …" (Hofestede, 2001, p24). In order to identify and organise culturally sensitive factors, four high level dimensions are identified and elucidated in this article. Each of these dimensions refers to one of the main aspects of design. Exploring culturally sensitive factors in each of these aspects reveals an effective and viable way to address the issues of the influence of culture. The dimensions are as follows:

- *Knowledge Dimension*, which is related to the knowledge that is to be gained from learning objects, and the knowledge context that may differ between learners in different cultural backgrounds.

- *Pedagogy Dimension*, which refers to the pedagogical issues that determine teaching methods and learning activities that are built into the learning objects and may be considered as having cultural preferences.

- *Access Dimension*, which is related to all aspects providing appropriate expression of the contents, accessible interface, and interactive channel between learners and the learning objects.

- *Technology Dimension*, which refers to technologies that are utilised to facilitate learning which include technical media used to develop learning objects and the technological context that may differ between learners and their cultural backgrounds.

The four dimensions cover the main aspects of the design and development of learning objects. Each dimension contains some culturally sensitive factors that may affect learning object design in terms of cultural adaptability and flexibility.

3 The Knowledge Dimension of Learning Objects

3.1 Cultural Issues in Learning Content

Culture-related issues can be seen in many subjects as components of learning content and permeate the core of the subjects. The representation of culture-related issues in learning content involves a growing number of disciplines or subjects that give specific consideration to the effect of variables such as race, class, religion, and gender. Many attempts have been made to reflect and support cultural issues by the increasing availability of resource manuals for the modification of course content (Bronstein & Quina, 1988; Olsen & Jaramillo, 1999; RET, 2006).

For instructional design, designers need not only to consider the representation of the cultural issues but also the reaction of learners when they are dealing with culturally sensitive content. Tatum (1992) suggests that "the introduction of these issues often generates powerful emotional responses in students that range from guilt and shame to anger and despair" (p.1). If teachers did not address these emotional responses, they could result in students' resistance to the culture-related content areas. Such resistance can ultimately interfere with the cognitive understanding and mastery of the content. This resistance and interference are particularly detrimental to distance learning which lacks direct and immediate support from tutors.

The values of the culturally sensitive factor of 'learning content' may range from inclusive to exclusive (Figure 1). The value at the left end is exclusive which means no culturally sensitive factors are involved in the learning content. For example, the learning object of While Loops [1] in Java programming that aims to teach a programming technique uses a hammer, a running car, and a submarine as examples to

explain the abstract concept. There is no strongly specific culturally sensitive issue included. In this case, the culturally sensitive factor of learning content directs towards the left end.
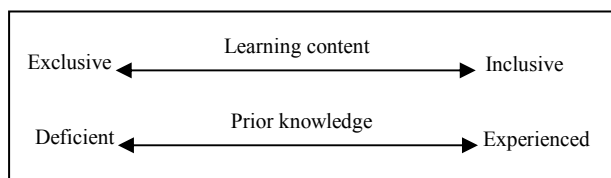
Figure 1 Knowledge dimensions

The other extreme value is at the right end, which means the learning object deals with a culturally sensitive content. For example, the learning object of Genomics - Ethical, Legal and Social Issues is about the ethical, legal and social aspects of genetic testing. It is fully related to the culturally sensitive issues. Therefore, the content of this learning object is culturally inclusive which is at the right end of the dimension. Between the two extremes there is a continuum with a graduated range of values that indicate more or less culturally sensitive factors included.

3.2 Diversity in Prior Knowledge

A second culturally sensitive factor in the content domain is 'prior knowledge'. The term prior knowledge is generally also called background knowledge (Strangman, et al, 2003). For example, Stevens (1980) defines background knowledge quite simply as "… what one already knows about a subject …" (p.151). Biemans & Simon (1996) define background knowledge as "all knowledge learners have when entering a learning environment that is potentially relevant for acquiring new knowledge" (p.6). Prior knowledge is the whole of a person's knowledge, including explicit and tacit knowledge (Dochy et al., 1999) and represents a knowledge state at a certain time, that is present before execution of a learning task, that is directly available or can be retrieved, that is relevant for the objectives of the learning task, that is hierarchically structured, that is applicable to other learning tasks, and that has a dynamic nature (Martens & Hermans, 1999 c.f. Dochy, 1992; Dochy & Alexander, 1995).

The learners' prior knowledge as a part of learning context may differ at cultural/national, institutional, and individual levels. Course structures may also differ in different national context countries. In a case study (Qi et al 2007), which elucidates the influence of culture on using LOs for Java programming in two universities in China and the UK, the students in China were studying the module in their third year and had learnt C programming. In contrast, the students in the UK were first year students and had no experience of programming. There were differences in knowledge context for the two groups of students using the Java LOs, which led to some different approaches to using the LOs.

The values of the second culturally sensitive factor – prior knowledge – are included in Figure 1. A position at the right end means that the prior knowledge is fully satisfied for a learning task, while at the left end means the prior knowledge is not sufficient. The middle points between the two extremes represent the degree of sufficiency of the prior knowledge. For example, if a learner has more prior knowledge of a topic area he/she might meet less difficulty when learning through the learning object, and vice versa.

The 'knowledge dimension' thus categorises the culturally sensitive factors as relating to learning content and prior knowledge. The culturally sensitive factors in knowledge dimension and their descriptions are summarised in table 1.

Table 1 Culturally sensitive factors in knowledge dimension

Factors	Description and Cultural Sensitivity
Learning Content	The topic to be taught in the learning object
	Culturally sensitive issues included in the learning object, e.g., race, class, religion, gender, etc.
Prior Knowledge	The knowledge related to the topic that learners should have beforehand in learning through the learning object
	Special knowledge involved in the learning object that may be not familiar to learners in other cultures

If there were any culturally sensitive elements involved in learning content, one would first try to avert the culturally sensitive issues to make the content more acceptable to a wider audience. For some cultural factors that are a part of the learning content and have to be addressed, designers should pay more attention to cautious expression of the issues, so that the LOs could be more acceptable. For example, topics that represent and explore cross-cultural differences in perspectives should signal the level of "culture-saturation" (McLoughlin, 1999) in the learning objects in order to avoid them being attached to a particular worldview.

4 Pedagogy Dimension of Learning Objects

Pedagogical effectiveness is the most important aspect of learning object design and also is the most complex aspect. However, learning activities are varied. It is difficult to address all types of learning activity. Therefore, a systematic way is necessary for this work to explore culturally sensitive factors involved in learning activities. Laurillard's (2002) conversational framework systematically organises and categorises learning activity; each named learning activity group is related to particular kinds of learning experience. This provides a systematic framework for tackling the cultural influences on learning design. Table 2 summarizes the groups of learning activity and the learning experiences that they cover.

Table 2 Groups of learning activities with learning experiences covered (adapted from Laurillard, 2002)

Group of learning activities	Learning experiences
Narrative based activity	Attending, apprehending, experiencing
Interactive based activity	Investigating, exploring
Adaptive based activity	Scaffolding, experimenting, practising
Communicative based activity	Discussing, debating, group project
Productive based activity	Articulating, Synthesising,

In order to identify culturally sensitive factors involved in LOs comprehensively, each group of learning activities is discussed with regard to culturally related aspects in the following section. Narrative based activity is discussed first.

4.1 Narrative Based Learning Activity

Narrative is a traditionally favoured teaching method in formal education in schools. It is the process by which a teacher or media provides learners with descriptions of a concept. There is a single direction of information in a narrative activity, sending from one side and receiving at the other side. Only the teacher

is able to articulate the conception. Narrative based activities in the e-learning environment set up a single direction of flow of information from the e-learning resource to learners.

The design of narrative based learning activities involves not only the subject matter for teaching, but also "teachers' beliefs of the subject matter" (Grossman et al., 1989, p31). Grossman and colleagues (1989) also claim that teachers' beliefs about the subject matter combined with their beliefs about students, schools, learning and the nature of teaching powerfully affect their teaching. These beliefs legitimatise or exclude a range of pedagogical strategies that teachers feel to be appropriate or inappropriate for teaching their subject matter to a given group of students (Gudmundsdottir, 1995). From this view of point, narrative forms are culturally influenced (Ochs & Capps, 2001) and should be viewed as culturally situated (Philpott, 2005).

Narrative can be regarded as a manner of speaking which involves linguistic phenomena. Recent trends in linguistics and philosophy emphasize that language is more than a medium for communication; rather it is "a cultural resource" that produces and reproduces the social world (Duranti 1997). Elaborating information with alternative examples to explain a new concept or alternative explanations of why a concept may be framed in a particular way makes the new information more meaningful for learners (Castaneda, et al., 1972). It would be easier for a learner to understand or comprehend a new concept if the way that illustrates it is familiar or acceptable; contrariwise, an unsuitable illustration may confuse learners or even ruin their learning interest.

Illustrations are an important component of stories. There are two kinds of probable problems in illustration that may be unsuitable for learners' cultural environment. One is using something that is unfamiliar to a particular group of learners to illustrate or express a new concept. Here is a simple example. There is a "Mobile Learning RLO – a tool for using mediaboard" (RLO-CETL, 2008), with "Tate" on the interface. The "Tate" refers to the Tate museum where the mediaboard is used. It would confuse students who do not know the modern museum in London if the learning object was reused in other countries. For this kind of problem, it simply needs to be localized for the particular culture. Or, in this case, one can add a comment to the LO to explain that the "Tate" is a modern museum of art.

The other one is to elaborate a new concept by using something that is conflicting or unacceptable for a local religion, culture, or traditional views (e.g. religious taboo). Some examples may not be against a local culture, but not quite appropriate for the cultural convention. For example, in a case study of LOs of Java programming (Qi et al 2007), some students in China thought the example of "throwing coin" was not very interesting, because it seems not serious enough to be used in an educational situation in Chinese traditional culture. For this kind of problem, designers need to consider carefully avoiding or eliminating the potential controversial elements.

4.2   Interactive Based Learning Activity

An interactive based learning activity includes those that learners act within the environment to accomplish their learning task. The learners receive meaningful intrinsic feedback on their actions that relate to the nature of the task goal. In contrast with the narrative based activity, interactive activity is a two-way process in which learners acquire knowledge or information. Interaction in an e-learning system enables learners to actively participate in the learning process and promotes intrinsic motivation by highlighting relevancy. Interaction also allows learners to tailor their learning experiences to meet their particular needs or abilities.

Interactive based learning activity refers to those functions and/or operations made available to learners to enable them to work with content material presented in an e-learning environment. The interaction here is more about a "dialogue" (Jonassen, 1988) that takes place between learners and the content that they are trying to master rather than physical interaction at the interface (e.g., button presses and mouse clicks). Interactive based activities cannot be trivialized or limited to simple menu selection, clickable objects or linear sequencing. It is not to say that basic interactivity, such as "point and click", is

inappropriate, but rather the level of interaction may not be adequate to facilitate the acquisition of knowledge or the development of new skills and understanding.

The pedagogical focus of interactive activities in an e-learning environment is "the nature of the learner control" (Laurillard, 2002). The most important thing for learners is to figure out how the system works or what they need to do to start and carry on the learning process. The e-learning environment should provide learners with the information that is needed to manage the steps of study, scope of the content, type of alternative media needed for the content presentations, and approximate time spent on a particular learning task. Learner control is particularly important if learning is to take place in a distant or a distributed learning context.

Learners moving towards self-regulated or self-directed learning may differ based on their cultural background. For example, learners from cultures where strong authority figures are common (i.e., from high power distance culture) would expect teachers to outline paths to follow, whereas learners from a low power distance culture may desire to find their own ways of study (Hofstede, 1986). Therefore, considering learners' culturally diverse needs and preferences, design of learner control in a learning activity may need to provide direct instruction to learners who are used to learning dependently, or to provide oriented guidance for learners who prefer to find answers through independent thinking. An inappropriate control level may cause confusion or instil less confidence in learners.

4.3   Adaptive Based Learning Activity

Adaptive based learning activity refers to learning activities by which learners apply their new knowledge and skill to solve a problem in a given situation. According to Laurillard (2002), working in an adaptive based learning activity learners provide input to a given model that represents an aspect of knowledge, run the model, and then observe the feedback from the learners' actions. The learners can explore an abstract concept or an aspect of the complex real world by acting on a simulated environment.

Adaptive based learning activity is a kind of experiential learning, but students' actions are confined to operating in a given model (Laurillard, 2002). The model, at the level of a learning object, could set up exercise tasks towards the goal of the learning object. By accomplishing the tasks learners acquire a more comprehensive understanding of the concept (Bransford, et al., 2000).

Empirical studies show that there are differences between learners with different cultural backgrounds in terms of the type of learning tasks. Students in strong uncertainty avoidance culture, which is likely to be intolerant of differences and ambiguity and to be reluctant to take risks (Hoftstede, 2001), are more likely to feel challenged or uncomfortable with the learning tasks if the answer is unpredictable or unique. In contrast, students in a weak uncertainty avoidance culture may be eagerly compliant to discover something new by themselves. In addition, learners in a small power distance culture are encouraged to find their own way to solve a problem, while learners in a large power distance culture expect their teacher to outline paths to follow, and teachers usually do so.

4.4   Communicative Based Learning Activity

Communicative based activity includes learning tasks through discussion, debate, and group projects. The common trait of this kind of learning activities is to involve learners in such a learning community so that they take part in the collaborative learning activities. Communicative based learning activity, as an effective learning approach, involves learners working together to create meaning, explore a topic, or improve skills (Harasim, et al., 1995). As Seufert et al. (2002) describe, ensembles of learners "share a common language, world, values in terms of pedagogical approach and knowledge to be acquired and pursue a common learning goal by communicating and cooperating through electronic media in the learning process" (p.47). DeSancitis and Gallupe (1987) argue that provision of an electronic communication channel enhances information exchange within a group and leads to a more balanced

involvement of group members, which will in turn lead to better decision outcomes. This argument implies two assumptions that may be culturally specific. The first assumption is that it is important for each group member to have an equal opportunity, regardless of status diversity, to express an opinion in a group discussion. Second, it assumes that all group members prefer open and direct communication to resolve conflict or disagreement.

Cultural influences are often at the root of the communication challenge (DuPraw & Axner, 1997) where misunderstandings and misinterpretations occur (Geer, 2001). Learners of different cultural backgrounds may have different attitudes towards collaborative exchange (Freedman & Liu, 1996), division of labour (Watson, et al., 1994), and handling conflict and making decisions (Watson, et al., 1994; DuPraw & Axner, 1997). Because collective working is the essence of communicative based activity, Hofstede's cultural dimensions of individualism vs. collectivism and power distance are germane to this study.

Cultural differences between collectivism and individualism affect learners' performances during discussion and debate in group learning. Collectivist culture promotes collective goals and individualism culture favours individual rights (Hofstede, 2001). In the latter there is a sharing of authority and acceptance of responsibility among group members for the group's actions. The underlying premise of collaborative learning is based upon consensus building through cooperation of group members. Communication based learning activities pursue cooperative or competitive goals. Some activities are developed to lead members to compete against one another while others emphasize cooperative goals and minimize team competition. The goal of the cooperation is for the group as a whole to achieve a positive outcome. Each member of the group has very few items or a small task to master and shares their information or results. In contrast competition encourages individuals to be better than other group members. An empirical study completed by Watson and his colleagues shows students from different cultures performed differently in group work (Watson, et al., 1994). Students from Singapore were sufficiently satisfied with a group solution that could create greater shared understanding of a broad set of beliefs. In contrast, American students demonstrated a higher capacity for accommodating differences, and encounter many situations where divergent views must be reconciled in order to reach a decision. DuPraw and Axner's work (1997) showed similar results.

Communication between members of a learning group includes synchronous and asynchronous modalities. Although the two modalities are reported to be useful by all participants of a survey completed by Wang (2007), the students from a collectivist culture, e.g. China and Korea, in particular, preferred more asynchronous discussion than American students. Students from collectivism culture feel that the asynchronous type of communication allows them to think through discussion topics and to contribute more thoughtful and better-worded ideas (Watson, et al., 1997).

4.5   Productive Based Learning Activity

Productive based learning activity is a type of learning activity in which learners have to synthetically use their knowledge and skills to produce their own contribution that can be a representation of a concept, a new idea, or a product. Productive based learning activities allow "learners to go beyond exploration of a given model to creating their own model" (Laurillard, 2002, p.167). Through the learning process, learners reflect upon theory in the light of their experiences. Therefore, productive based activity has a great emphasis on reflecting on conceptions and building artefacts in their own way.

Theoretical frameworks concerning productive learning may be drawn from experiential learning (Kolb, 1984) and reflective practice (Schon, 1983). Learners are involved in a productive activity which is used to test out ideas and assumptions rather than to obtain practice passively. So it is essential to "enable learners to create and produce a system of their own, designed to achieve a specific end" (Laurillard, 2002, p163). This process requires learners to exercise some independence from their teachers. It is not sufficient simply to have the experience. Learning from experience must involve links between doing and thinking – reflection. Intrinsic feedback provided from a productive learning system is crucial for

learners to have the evidence upon which to reflect. It is also important to establish an appropriate emotional tone for learners to value their own experience and to trust themselves to draw conclusions from it.

It is hard to not make mistakes in experiential learning. Experiential learning is highly valued because it provides opportunities for learners to "learn from mistakes" (Beard & Wilson, 2002). Cultural differences on the value of errors in learning have been examined in both theoretical and empirical ways. Tweed and Lehman (2002) use a Confucian – Socratic framework to analyze culture's influence on academic learning. In their framework they suggest that Socratic-oriented learning (in the Western culture) highly encourages learners to question and evaluate material presented by instructors. Questioning the ideas of others asserts one's independence and thereby fulfils the cultural ideal of individualism. Exposing an error in a person's answer and evoking a doubt is believed to be the first step in attaining knowledge (Jacobsen, 1999). On the other hand, the Confucian-oriented learning (in Chinese culture) is not focused mainly on questioning, evaluating and generating knowledge but expects learners to respect and obey authority figures. Innovation is acceptable in certain contexts, but the tendency to innovate or criticize without extensive preparatory knowledge is a fault, according to Confucius. So teachers tend to fully structure contents to ensure students correctly acquire the knowledge; and students rarely ask questions in classrooms to avoid making mistakes (Biggs, 1998).

In addition, students in a collectivist culture avoid making mistakes to save "face" among their group members. In contrast, in an individual culture, students' "face consciousness is weak" (Hofstede, 1986). Therefore, an error or a mistake that takes place in a learning activity may become a stimulant for some students to explore the right solution, but may also cause others to feel frustration and even drop out of the activity. Cultural influences on the performance of learners may become stronger with increases in the degree of complexity of tasks for productive based learning activities.

4.6 Summary of Pedagogy Dimension

The pedagogy dimension explores the culturally sensitive factors likely to be encountered in the instructional design of LOs. This dimension focuses on the influence of culture on instructional activities themselves, i.e. learners' performance and probable reactions to the learning tasks in LOs, rather than learners' human-computer interaction, which will be discussed in the following section. Each section discussed one type of learning activity in which culturally sensitive factors can be examined. Table 3 summarises the culturally sensitive factors in the pedagogical dimension.

Table 3 Culturally sensitive factors in pedagogy dimension

Factors	Description and Cultural Sensitivity
Orientation	To introduce learners into the learning process in a proper way, e.g., quick introduction or extended introduction
	Groups of potential learners differ in motivation of attending the learning and may need different types of introductions to attract or engage them in the learning.
Elaboration	To interpret or explain a concept with proper language, e.g., academic language or plain language, and examples
	Language involves differences in acceptable tone and style of communication;
	Examples may reference particular social cultural contexts.
Learner control	To guide learners to accomplish a learning task in a proper way, e.g., to outline the path and ways or only direct orientation and aims
	Cultural differences in perception of appropriate allocation of responsibilities between learners and teachers.

Feedback	To respond to learners' actions in a proper way
	Groups of potential learners prefer or expect different feedback which may affect their performance of learning emotionally.
Motivation and Stimulation	To elicit learners' performance of learning by employing different ways, e.g., encouraging, praising, or urging
	Cultures differ on meaning of success in academic and manner of stimulation.
Practical task	To require learners to apply the new knowledge by generating questions on the topic that may be closed or open-ended
	Learners' experiences differ in terms of performance of practical tasks.
Collaborative task	To require learners working together to achieve a learning goal which may relate to collaborative manner, group size, division of labour and teaching support
	Egalitarianism, non-critical acceptance of ideas, or presentations of thoughts are different in the Western and the Eastern culture.
Communication manner	To create channels for learners to communicate with each other which may need to be synchronous or asynchronous, and anonymous or signed
	There are cultural differences in preferences for the manners of communication.
Engagement	To engage learners in a productive or creative task which may need to provide extra explanation or support
	Learners may have different expectations of learning tasks that are creative, contributed, or productive.
Value of error	To consider the importance of error in learning
	Cultural differences on the value of errors in learning.

To ensure the pedagogical effectiveness of LOs means that the instructional design has to accommodate learners' needs as far as possible. Questions need be asked about whether the instructional design is sufficient for learners who are in culturally different learning contexts. This section and Table 3 provide a guide to the factors that need to be considered.

5   Access Dimension in Learning Objects

Accessibility for e-learning systems indicates whether the resources "can be used by all learners regardless of environmental or technological constraints, and allows individual learning styles and preferences to be accommodated" (Perry, 2004, p1). Cultural diversity can cause serious mismatch between the interface of e-learning resources and learners' needs and preferences (Russo & Boor, 1993; Smith, 2001). The access dimension focuses on the influences of culture on human-computer interaction (HCI) design.

Specific preferences and need for accessibility of learning resources represent what the user wants a system to look like and what functionalities should be included. The idea of "access for all" (IMS, 2004) is "intended to make it possible to identify resources that match a user's stated preference or need" (p1). The IMS Accessibility for Learner Information Package Specification (IMS ACCLIP Specification) defines three groups of elements that represent accessibility preference of learners. The three groups are

- **Display**: display technology preferences that indicate how user interfaces and content should be presented.

- **Control**: technologies that provide alternative ways of controlling a device; typical devices are keyboard and mouse, but they could be switches, touch-screen, joystick tactile devices or an auditory voice recognition system.

- **Content**: preferences regarding the content which specify any desired transformation or enhancements.

This specification considers accessibility to meet individual needs or performance with regard to how learners interact with an e-learning system, especially special needs for disability. The focus of ACCLIP is to accommodate learners' needs and preferences. For the purposes of this study, accessibility denotes the global requirement for access to LOs by individuals with different abilities, skills, requirements, and preferences in a variety of contexts of use. It describes a relationship between a learner and a learning object as accessible when the characteristics of the learning object are delivered to match the learner's culturally particular needs and preferences.

Therefore, the access dimension addresses culturally sensitive factors that affect the accessibility of LOs with regard to presentation and control at the human/computer interface. These preferences are likely to have a considerable impact on user interface design of LOs. They may be presented in a standard, default form, or adapted to the needs of different users (Figure 2).
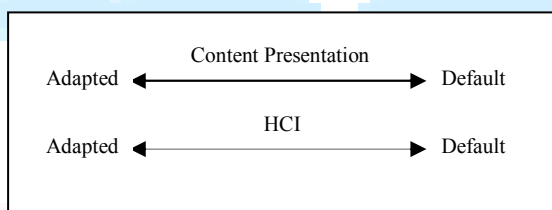
Figure 2 Access dimension for design of culturally sensitive LOs

The importance of cultural issues on interface design for international users has been reported in many literatures. Fernandes (1995), for example, suggests that users would be frustrated by a culturally inappropriate interface because it would not represent their view of the real world around them. An interface is culturally inappropriate when it is not localized to accommodate the user's cultural background (e.g., an interface with a national bias from the country in which it was developed) and conveys messages that are interpreted as inappropriate by the user. This lack of familiarity could lead to frustration and after that to rejection of the products.

Some researches (del Galdo, 1990; Russo & Boor, 1993; Galdo & Nielsen, 1996; Badre, 2000) on cultural aspects of interface design have tried to outline a range of cross-cultural elements, in order to provide some guidelines. Galdo and Nielsen (1996) describe the following aspects influenced by culture:

- Character sets: Different scripts (Cyrillic, Hebrew, Kanji, Latin) need different functionality and display features

- Collating sequences: Different cultures have different rules for sorting characters

- Currency, time, date, and numeric formats and telephone numbers

- Icons, symbols and colours

- Screen text

- Menu accelerators (positional keys) and documentation

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Russo and Boor (1993) examine the factors on interface design for international use. They describe that information, such as text and graphical components of an interface, should be arranged on the screen in a way that depicts the logical flow of information; for example left-to-right or right-to-left orientation on the screen because of reading/writing background. The functionality, like images, colours, and symbols, and product features chosen for one culture may not be appropriate for all cultures.

Besides the interface design elements (e.g., icons, images) which can be interpreted differently by users from different cultures, some researchers also evaluate features of interfaces of web sites designed in different cultures by applying Hofstede's cultural dimensions (Dunn & Marinetti, 2002; Dormann & Chisalita, 2002; Ford & Gelderblom 2003). For example, Marcus and Gould (2000) compare differences between web pages designed in different countries by using Hofstede's cultural dimensions. They found cultural differences in two groups of websites from Malaysia, which is a high power distance culture, and Holland, which is a low power distance. They also propose guidelines for web interfaces design for high power distance culture such as:

- providing highly structured access

- giving prominence to leaders

- using both explicit and enforced security measures

- having a strong focus on authority, certification, or official stamps

These should be opposite for a low power distance culture, according to Marcus and Gould (2000).

However, the use of Hofstede's cultural dimensions model of managing the aspects of cross-cultural interface design has been criticized as being too stereotypical (Bourges-Waldegg & Scrivener, 1998) or rigid (Jagne, et al., 2004). Some previous attempts to apply Hofstede's cultural dimensions to interface design have resulted in conflicting and inconclusive findings. For example, Gould, et al., (2000) found that Malaysian websites contain links on the home page to website administration, which relates to the high power distance culture of Malaysia. However, this does not explain why low power distance cultures, such as the US, also contain such links on their websites.

The contrast seems to suggest that there are cultural differences on presentation of content between different cultures, but cultural dimension models should be used with care unless their relevance to interface design is better proved.

Analyzing the existing literature in this area, a fundamental problem of designing interfaces for culturally diverse users can be understood as a divergence between what the target meaning and the interpreted meaning of presentation is (Bourges-Waldegg & Scrivener, 1998). It is because the meaning of metaphors and other representations used in a system may be rooted in culturally specific contexts, and a user's interpretation of a representation's meaning may be influenced by specific cultural contexts. Therefore, the understanding of a representation's meaning in a given context is the main issue of designing culturally appropriate interfaces.

According to the discussion above, the culturally sensitive factors in access dimension is summarized in table 4.

**Table 4 Culturally sensitive factors in access dimension**

Factors	Description and Cultural Sensitivity
Language/ Text	Text that represents the learning content (includes language in video and audio files) Special jargon, slang, adage, etc.

Image	Images or pictures that visually describe the learning content (include images in animation and video files)
	Difficult or impossible to understand or comprehend in other cultures
	Containing potentially controversial elements
Symbol	A symbol that cannot be misinterpreted by target users
	Causing potential misinterpretation
Number, Date, Time	Number, date, time format
	Using a comma or period to separate the whole part of a number from the decimal part (6.5 or 6,5);
	day-month-year or month-day-year or year-month-day;
	12 hour clock (9pm) or 24 hour clock (21:00)
Colours	Colours used in the interface
	Special meaning of colours for particular cultures
Navigation	Navigation patterns that direct learning through the LO on the structural level
	Selection of navigation tools: including Section buttons, Previous/Next buttons, Back/Forward buttons, Map, Index, Menu, and hypertext links
Holistic Structure	HCI design with holistic consideration of how to organise components of an interface
	Organisation of components of an interface, e.g., functional or thematic structure

6 Technology Dimension

The technology dimension examines the cultural difference on the technologies at national infrastructure level and individual knowledge and skill level (Figure 3).
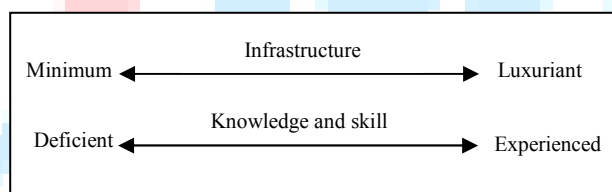
Figure 3 Technology dimension for design of culturally sensitive LOs

Lack of infrastructure severely restricts use of the Internet, which is often limited to scientists and the academic elite of less developed countries, while students access to computers is minimal, e.g., the only viable access is at learning centres in these countries (Rogers, 1998; Haymond, 1998; Latchem, et al., 1999). As Eastmond (2000) claims, there is a technological challenge to promoting e-learning in low technology countries, who cannot provide the advanced information communication infrastructure as the high technology countries are able to do.

On other hand, not all e-learning activities require equally technological supports. For example, the narrative-based learning activity requires less specialized equipment and facilities, e.g., narrative media (Laurillard, 2002). Other activities, such as interactive learning activities may require interactive multimedia. It may be a potential problem for designers as to whether the infrastructure is sufficient for the technology (hardware and software) employed in LOs.

The culturally sensitive factor, *infrastructure*, has a range of values, showed in figure 3. The position at the left end indicates the minimum running environment demanded, including hardware and software. The position at the right end indicates what facilities can make the most of the pedagogical and technological effectiveness of a learning object.

Learners' experience of computers and their knowledge and skills in information technology make a difference in their perception of the e-learning (Freedman, & Liu, 1996). Zahedi, et al. (2001) assert that those who have a higher level of ICT knowledge will use web documents more effectively because their skills with the technology give them more ease in accessing what they need and prevent anxiety or distraction regarding the technology. Moreover, learners' personal belief about their ability to perform specific tasks influence computer use. Barker (1998) found that the "novice basically exhibits a very different degree of receptivity to different interface and media type than does the experienced user" (p.60). Therefore, if a user of e-learning resources lives in a country that has more communication facilities and ICT is used more widely, then the user is expected to be more at ease with using the e-learning resource, and vice versa.

The culturally sensitive factors in the technology dimension concern the technology that is employed to develop and use LOs (Table 5).

Table 5 Culturally sensitive factors in technology dimension

Factors	Description and Cultural Sensitivity
Infrastructure	Software and hardware equipments needed for running the learning object
	Special software or hardware that are out of main stream and not used commonly
Knowledge or Skills	Technological knowledge and skills that are prerequisite to use the learning object
	Special knowledge or skills that learners may not have it generally

Because of the imbalance of the development of the technology between different countries, it is expected that using LOs in different contexts may run into technical obstacles. As discussed above, the obstacles include two aspects: technological infrastructure at a social level and technological knowledge and skills at an individual level. Therefore, differences in technology should be considered as a cultural issue. For example, the latest technology may offer the best design of LOs, but may require much infrastructure. There are advantages in employing the latest technology in developed countries, but this may cause problems for running the LOs in a less developed country. Therefore, designers may have to decide what functions are necessary, or what are so luxurious that they may reduce reusability of the LOs from the viewpoint of technology in order to attain a wider reusability.

7 Conclusion

Cultural influences may occur in different aspects of the design and development of LOs, and are often subtle and hard to manage. This paper has explored culturally sensitive factors that are likely to be encountered in the design and development of LOs, and categorised them into the four dimensions: knowledge, pedagogy, access, and technology.

It is noticed that a single LO may touch only some of the culturally sensitive factors described above, which may vary between LOs. For example, since race equality as a cultural issue in learning content does not appear in the Java programming LOs, we would not include the culturally sensitive factors. If a LO does not consist of cooperative learning activity, the culturally sensitive factors of group work would not be involved in the LO. Some culturally sensitive factors, such as the factors in the interactive dimension may be very common, existing in many LOs. That is what designers should take into account during the process of design and development of LOs.

The four cultural dimensions provide learning object designers with a consistent way to understand culturally sensitive factors in the design and development of LOs. The four dimensions indicate the

cross-cultural issues in the design and development of LOs explicitly and consequently laying a foundation for designers to consciously examine cross-cultural issues in order to ensure the cultural acceptability of LOs. It is important to have an explicit identification of culturally sensitive factors, because cultural issues are often subtle and complex.

This knowledge and awareness is a prerequisite of developing culturally reusable LOs. The four dimensions of culturally sensitive factors help designers to understand the influences of culture on LOs and consequently to develop LOs that are more flexible and adaptable in different cultural contexts.

8   References

Badre, A. N. (2000). *The effects of cross cultural interface design orientation on world wide web user performance*, GVE Research Technical Reports, Accessed online on 1 Mar. 2010 at: http://www.cc.gatech.edu/gvu/reports/2001/abstracts/01-03.html

Barker, T. (1998). Analyzing your users, in *Writing Software Documentation: A Task-Oriented Approach*, Boston, Ma: Allyn & Bacon, pp.25-85

Beard, C., Wilson, J. (2002). *The Power of Experiential Learning: A Handbook for Trainers*, Kogan Page Ltd

Biemans, H. J. A., Simons, P. R. J. (1996). CONTACT-2: A computer-assisted instructional strategy for promoting conceptual change. *Instructional Science*, 24, 157–176.

Biggs, J. (1998). Learning from the Confucian heritage: so size doesn't matter? *International Journal of Educational Research*, 29 (8), pp.723-738

Bourges-Waldegg, P., Scrivener, S. A. R. (1998). Meaning, the central issue in cross-cultural HCI design, *Interacting with Computers*, 9 (3). pp.287-309

Bransford, J., Brown, A., Cocking, R. (2000). *How People Learn: Brain, Mind, Experience, and School*. Washington, DC: National Academy Press.

Bronstein, P. A., Quina, K. (Eds.) (1988). *Teaching a psychology of people: Resources for gender and sociocultural awareness*, Washington, DC: American Psychological Association.

Castaneda, A., Ramirez, M., Herold, P. (1972). *Culturally democratic learning environments: A Cognitive style approach*, Multi-lingual Assessment Project, Riverside, CA: Systems and Evaluation in Education.

del Galdo, E. (1990). Internationalization and translation: some guidelines for the design of human-computer interfaces, In J. Nielsen (Ed.) *Designing user interfaces for international use*, New York: Elsevier, pp.1-10

DeSanctis, G., Gallupe, R. B. (1987). A foundation for the study of group decision support systems, *Management Science*, 33 (5), pp.589-609

Dochy, F. J. R. C. (1992). Assessment of prior knowledge as a tool for learning, *Studies in educational evaluation*, 23, pp.279-298

Dochy, F., Segers, M. & Buehl, M. M. (1999). The relation between assessment practices and outcomes of studies: The case of research on prior knowledge, *Review of Educational Research*, 69 (2), pp.145-186.

Dochy, F. J. R. C., Alexander, P. A. (1995). Mapping prior knowledge: A framework for discussion among researchers, *European Journal of Psychology of Education*, 10 (3), pp.225-242.

Dormann, C., Chisalita, C. (2002). Cultural Values in Web Site Design, in *Proceedings of the 11th European Conference on Cognitive Ergonomics ECCE11 (2002)*

Duranti, A. (1997). *Linguistic Anthropology*, Cambridge: Cambridge University Press

DuPraw, M., Axner, M. (1997). Working on Common Cross-cultural Communication Challenges, Accessed online on 1 Mar. 2010 at: http://www.pbs.org/ampu/crosscult.html

Dunn, P., Marinetti, A. (2002). Cultural Adaptation: Necessity for Global eLearning, Accessed online on 1 Mar. 2010 at: http://www.linezine.com/7.2/articles/pdamca.htm

Eastmond, D. (2000). Realizing the Promise of Distance Education in Low Technology Countries, *Educational Technology Research and Development*, 48 (2), pp.100-111

Fernandes, T. (1995). *Global Interface Design*, Academic Press, London

Ford, G., Gelderblom, H. (2003). The effects of culture on performance achieved through the use of human computer interaction, *Proceeding of SAICSIT 2003*, pp.218-230

Freedman, K. & Liu, M. (1996). The importance of computer experience, learning processes, and communication patterns in Multicultural Networking, *Educational Technology, Research & Development*, 44 (1), pp.43-59.

Galdo, E.d., Nielsen, J. (Eds.) (1996). *International User Interfaces,* Wiley, New York

Geer, R. (2001). The necessity of considering cultural influences in online collaborative learning, in *Proceedings ED-MEDIA 2001 World Conference on Educational Multimedia, Hypermedia & Telecommunications*. Tampere, Finland.

Gould, E.W., Zakaria, N., Yusof, S.A.M. (2000) Applying culture to website design: a comparison of Malaysian and US websites, in *Proceedings of the IEEE Professional Communication Society's International Professional Communication Conference and Proceedings of the 18th Annual ACM International Conference on Computer Documentation: Technology and Teamwork. IEEE Educational Activities Department*, Piscataway, NJ, USA, pp.161–171

Grossman, P. L., Wilson, S., Shulman, L. S. (1989). Teachers of substance: Subject matter knowledge of teaching, in M. C. Reynolds (Ed.), *Knowledge base for the beginning teacher*, Oxford, Pergamon Press, pp.23-36

Harasim, L., Hiltz, S. R., Teles, L. and Turoff, M. (1995). *Learning Networks - a Field Guide to Teaching and Learning Online*. Cambridge Massachusetts: The MIT Press.

Haymond, R. (1998). Internet Accessibility in Latin America, *Educational Technology Research and Development*, 46 (3), pp.116-117

Hofstede G. (1986). Culture Differences in Teaching and Learning, *International Journal of Intercultural Relations*, 10 (3), pp.301-319

Hofstede G. (2001). *Culture's Consequences: Comparing Values, Behaviours, Institutions, and Organisations*, 2nd ed., Thousand Oaks, Calif.; London: Sage Publications

IMS (2004). IMS Access For All Meta-data Overview. Accessed online on 1 Mar. 2010 at: http://www.imsglobal.org/accessibility

Jagne, J., Smith, S.G., Duncker, E., Curzon, P. (2004). *Cross-cultural Interface Design Strategy*, Technical Report: IDC-TR-2004-006, Interaction Design Centre, Middlesex University

Jacobsen, D. A. (1999). *Philosophy in classroom teaching: Bridging the gap*, Upper Saddle River, NJ: Merrill

Jonassen, D. H. (1988). *Instructional Designs for Microcomputer Courseware*, Hillsdale, NJ: Lawrence Erlbaum

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*, New Jersey: Prentice-Hall.

Latchem, C., Abdullah, S., Ding, X. F., (1999). Open and dual-mode universities in east and southeast Asia, *Performance Improvement Quarterly*, 12 (2), pp.96-121

Laurillard, D. (2002). *Rethinking University Teaching: A conversational framework for the effective use of learning technologies* 2nd ed., London: Routledge

Lefrancois G. R. (1994). *Psychology for Teaching, 8th ed.,* Belmont, CA: Wadsworth Publishing Company

Marcus, A., Gould, E. W. (2000). Crosscurrent: Cultural Dimensions and Global Web User-Interface Design, *Interactions*, 7 (4), pp.32-46

Martens, R., Hermans, H. (1999). Internet based formative prior knowledge assessment, Open University of the Netherlands, Accessed online on 1 Mar. 2010 at: http://www.eurodl.org/materials/contrib/1999/assessment_issue/martens/index.html

Mayes, T. (2003). Introduction to Part 1 of Reusing Online Resources: Vision and Theoretical Perspectives, *Journal of Interactive Media in Education*, 2003 (1) Special Issue on Reusing Online Resources, pp.9-11

McLoughlin, C. (1999). Culturally inclusive learning on the web. Teaching and Learning Forum 99, Accessed online on 1 Mar. 2010 at: http://otl.curtin.edu.au/tlf/tlf1999/mcloughlin.html

Ochs, E., Capps, L. (2001). *Living Narrative: Creating Lives in Everyday Storytelling*, London: Harvard University Press

Olsen, L., Jaramillo, A. (1999). *Turning the tides of exclusion: A guide for educators and advocates for immigrant students*, Oakland, CA: California Tomorrow

Perry, S. (2004). Accessibility Guidelines and specifications for e-learning, Centre for Educational Technology Interoperability Standards (CETIS), Accessed online on 1 Mar. 2010 at: http://www.jisc.ac.uk/uploaded_documents/Acc%202%20Guidelines%20and%20Specifications%20for%20eLearning%20110604.doc

Philpott, C. (2005). *Narrative as a Cultural Tool for Experiential Learning in Teacher Education*, Sociocultural Theory in Education Research and Practice Conference 2005, Manchester University, Accessed online on 1 Mar. 2010 at: http://orgs.man.ac.uk/projects/include/experiment/carey_philpott.pdf

Qi M., Boyle T. and Xue Y. (2007) *Cultural influences on learning object design and development*, Paper presented at ALTC 2007, Nottingham, UK, September 2007

RET (Race Equality Toolkit) (2006). Learning and Teaching, Universities Scotland, Accessed online on 1 Mar. 2010 at: http://www.universities-scotland.ac.uk/raceequalitytoolkit

RLO-CETL (2008). Accessed online on 1 Mar. 2010 at: http://www.rlo-cetl.ac.uk

Rogers, J. (1998). The Internet: Emerging technologies in two west African countries, *Educational Technology Research and Development*, 46 (3), pp.103-109

Russo, P., Boor, S. (1993). How Fluent is Your Interface? Designing for International Users, *Proceedings of the INTERCH '93 conference on Human factors in computing systems*, pp.342-347

Schon, D (1983). *The Reflective Practitioner*, London: Temple Smith

Seufert, S., (2002). Cultural Perspectives, in Adelsberger, H. H., Collis, B., Pawlowski, J.M., (Eds.) *Handbook of Information Technologies for Education and Training*, Spring-Verlag

Smith, S. J. (2001). The impact of culture and gender on web sites: An empirical study, ACM SIGMIS Database, New York: ACM, 32 (1), p. 18-37

Stevens, K. C. (1980). The effect of background knowledge on the reading comprehension of ninth graders, *Journal of Reading Behavior*, 12 (2), pp.151-154

Strangman, N., Hall, T., Meyer, A. (2003). Background knowledge instruction and the implication for UDL implementation, Accessed online on 1 Mar. 2010 at: http://www.cast.org/system/galleries/download/ncac/ncac_BK_UDL.pdf

Tatum, B. D. (1992). Talking about Race, Learning about Racism: The Application of Racial Identity Development Theory in the Classroom, *Harvard Educational Review*, 62 (1), pp.1-24

Tweed, R. G., Lehman, D. R. (2002). Learning Considered within a Cultural Context: Confucian and Socratic Approaches, *American Psychologist*, 57 (2), pp.89-99

Vygotsky L.S. (1978). *Mind in Society: the development of higher psychological processes.* Cole M., John-Steiner V., Scriber S., Souberman E., (Eds,), Cambridge, MA: Harvard University Press

Wang, M. (2007). Designing online courses that effectively engage learners from diverse cultural backgrounds. *British Journal of Educational Technology*, 38 (2), pp.294-311

Watson, T. R., Ho, T. H., Raman, K. S. (1994). Culture: a Fourth dimension of Group support Systems, *Communications of The ACM*, 37 (10), pp.45-55

Wild, M., Henderson, L. (1997). Contextualising learning in the World Wide Web: accounting for the impact of culture. *Education and Information Technologies,* 2 (3), pp.179-192.

Zahedi, F., Van Pelt, W., Song, J. (2001). A conceptual framework for international web design, *IEEE Transactions on Professional Communication*, 44 (2), pp.83-103

9 Footnotes

[1] The learning objects for programming are located at:
http://www.londonmet.ac.uk/ltri/learningobjects/