Journal of Universal Computer Science, vol. 14, no. 17 (2008), 2877-2896
submitted: 30/6/08, accepted: 27/9/08, appeared: 28/9/08 © J.UCS

Authoring & Culture in Online Education

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Abstract: The Cultural Artefacts in Education (CAE) questionnaire is used to determine the educational values of different cultures. In this paper I examine the results for ten countries, specifically focussing on their attitudes towards adaptive hypermedia in an educational setting. These results can inform the authoring process for adaptive systems & content, with Adaptive Hypermedia systems being able to employ stereotype adaptation to deliver content pre-adjusted to a learner's cultural background.

Keywords: Hypermedia systems, Adaptive Hypermedia, Adaptive Educational Hypermedia, Culture, Cultural Education, CAE
Categories: H.2.8, H.5.4

1 Introduction

Adaptive Hypermedia (AH) [Brusilovsky, 02] is concerned with delivering a personalised Web experience to each user. Adaptive Hypermedia can be considered the solution to the problems of traditional Hypermedia systems such as: static content, "lost in hyper-space" syndrome and the "one-size-fits-all" approach. With the development of the Semantic Web [Berners-Lee, 03] and the ongoing push to develop Ontologies [Gruber, 93] for knowledge domains the importance of AH has increased. Indeed, AH now appears to be the tool of choice for collating the static information of these new approaches and bringing then to life.

Adaptive Educational Hypermedia (AEH) [Brusilovsky, 01] is, in principle, superior to regular Educational Hypermedia (EH) as it allows for the personalization of the educational experience. Educational systems (real or virtual) that adapt their presentation to the needs of each learner aim to improve the efficiency and effectiveness of the learning process. In AEH, learning materials are delivered to the user dependant upon a given series of user factors, such as: background education, goals, learning styles to name a few. The research performed in Computer Supported Collaborative Work (CSCW) that addresses the social aspects of learning (after all education is not undertaken in a vacuum) is also an important consideration in the learning process. As it is essential for learners: to be able to build common ground; to ask and answer (negotiate meaning); to argue and debate; to explicate mental models; to share expertise; to collaborate; and to construct novel ideas and understanding.

Given these qualities of AEH systems, it might be reasonable to expect a much wider uptake than actually is happening. A major hindrance of this is that the creation of good quality AEH is not trivial, often involving a greater expenditure of time and

money to produce than standard online educational systems. Creating content within a single AEH system can be a very difficult undertaking.

As authoring for such systems is already a complex and time consuming task for the currently extant user factors (as described in a system's User Model), adding additional user factors would obviously increase this complexity and the reasons for doing so should be carefully thought through beforehand. To this end research into solving the authoring problems facing the AEH community has to be informed by the system requirements for the type of user adaptation involved.

With the widespread use of distance learning, and the many different learning systems (both adaptive and non-adaptive) that provide this service, the cultural background of a student may have a great impact on their ability and efficiency to learn a given set of content. In addition many distance learning classes (indeed even traditional classes) have a great mix of student cultures involved, this will affect the social interactions and therefore the learning effectiveness of the entire group.

Therefore it seems a reasonable conclusion that the user factor of 'cultural background' should be added to an AEH's User Model. As stated above however any addition to the user model may greatly increase the complexity of the authoring problem, and any such addition should be carefully studied to see if this increase is both desired and worthwhile.

Within the domain of education, be it adaptive or not, there is little work that can be used to perform such a study. This paper address the lack of such work in this area by examining factors behind the adoption of a cultural stereotype in AEH systems, and drawing conclusions for how this would affect the already complex issue of AEH authoring.

Before continuing let us define 'culture' in the context of this paper, by using the UNESCO definition [UNESCO, 02]:

"... culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs"

By applying this definition within the domain of education (ie how the 'features of a society' can effect our education) and at the rather gross level of 'culture' being equivalent to 'nationality', this paper can draw conclusions from the data gathered by the CAE questionnaire (see Section 3).

For the purposes of this paper ten different cultures (as identified by the simplistic labelling of the students nationality) have been chosen and a comparison between them undertaken. The ten cultures selected are: Austria; China, Germany, France, Greece, India, Ireland, The Netherlands, Saudi Arabia and the United Kingdom. The comparison of these cultures will allow us to determine if there are any significant differences between them.

The rest of the paper is structured as follows: Section 2 introduces the questionnaire used to gather this data and the reasons behind its design. Section 3 presents the results from the questionnaire for the ten cultures being examined in this paper. Finally section 4 discussed what these results may mean to the authoring of cultural stereotypes for AEH systems.

2 Related Work

There has been a lot of research effort into the "authoring challenge" of AH and AEH, [Hendrix, 07][Cristea, 04][Murray, 03][Specht, 01][Wu, 1998] but none of this has focused on the learner's cultural background. There have been several projects concerning 'eCulture' (such as [DigiCULT, 03] and [CHIP, 08]), but these are focused on the field of cultural heritage, specifically the gathering, storage, tagging and dissemination of cultural information (eg museum data). Using a learner's cultural background as part of a AEH user model has yet to be investigated by this community.

In other areas culture has been considered as a vital part of the development cycle, with the development of internationalisation and localisation as growing areas in software development [Sun, 08; Chan, 06]. Knowing who your user *is*, is vital and their cultural history is an important aspect of that background.

In the domain of *business* (at IBM), Hofstede [Hofstede, 80] demonstrated that any given culture could be defined by their position on four indices. The Values Survey Module (VSM) questionnaire [Hofstede, 94] allows a person to be stereotyped within these indices and cultural 'zones'. This level of stereotyping has obvious applications within AEH: if a user's cultural values can be estimated through the use of a cultural stereotype then the AEH system can better adapt the educational experience. For example this could be done by automatically, assigning a default cultural stereotype to a new user. This stereotype would obviously just be the starting point for the personalised delivery of content, but could take into account that an 'individualised' web experience may not be desired equally by all cultures. Some users may not want to be separated or singled out from their fellows in such a manner.

In the domain of education, the assumptions and conclusions of Hofstede's (performed as they were in an entirely different milieu) can not be simply adopted. Respecting and understanding different cultures in teaching is being addressed [NWT 08; Stephens, 07] but in a limited and non-adaptive manner.

3 Why CAE?

The CAE (Cultural Artefacts in Education)[CAE, 08] questionnaire is designed to gather the information required to determine if there is a cultural bias towards online education, specifically Adaptive Educational Hypermedia (AEH)[Brusilovsky, 01].

This questionnaire is based upon the cultural indices of Hofstede and the interpretation of those indices relevant for web based systems as given by Marcus & Gould [Marcus, 00]. The user focus of the questionnaire is upon the Educational domain, hence students or researchers within academia. The reason for this is that Hofstede's VSM questionnaire [Hofstede, 94] is designed to determine cultural values within a corporate setting (specifically that of IBM). The CAE questionnaire is designed to investigate the following four hypotheses:

Hypothesis 1: Hofstede's cultural dimensions apply to the educational domain. (Hofstede's cultural dimensions were extracted from data from the corporate world; can they be mapped from this domain to the educational domain?)

Hypothesis 2: Students desire to be taught in the manner that they have been brought up with. (Is there a cultural bias to education? Do students recognize this? Would they desire a different cultural bias to their own?)

Hypothesis 3: A student's educational cultural bias is resistant to change. (Do students adopt the local bias? So, do Chinese students, when taken out of China, still behave like Chinese students?)

Hypothesis 4: There is a cultural bias in the acceptance of openly acknowledged Adaptive Educational systems. (Is there a cultural bias in the desire for AEH – do some cultures accept the teacher's viewpoint no matter how it is presented and would therefore resent that being 'changed'. Can this adaptation be hidden and therefore accepted? Do students want to conform or not?)

This paper will focus on investigating hypotheses two and four. The CAE questions addressing these hypotheses are questions 19 to 32 (the previous 18 questions deal specifically with the hypotheses 1 and 3).

The questions used to examine hypotheses 2 and 4 are:

19. I would prefer to be educated in my own language.
20. Given the chance, I would prefer to be educated in another country
21. In choosing a university, the ability to practice languages other than my own is important
22. I respect the manner in which my teachers have taught me
23. I often feel constrained by the pace of my teaching
24. Different perspectives are important to me in my education
25. I enjoy experiencing other cultures

For questions 26 to 32, the students read a short text concerning adaptive educational hypermedia before proceeding to answer questions 26 to 32; that text is:

"Adaptive Education System is a on-line system that will measure your personal behaviours and preferences, store them and use these to alter the nature of the education given to you. The aim is to deliver a personalised and unique education to you - and in so doing give you the best education you can receive."

26. I think the idea of an Adaptive Education System is a good one.
27. I do not have concerns about the type of the personal data that is gathered.
28. Security of my personal data is of utmost importance.
29. I would rather that the lesson the teacher has written is not altered in any way
30. I would like to have control over the level of alteration that the Adaptive Education System makes
31. I would be very happy to receive a 'personal' education but only one approved by the teacher
32. I would prefer a personalised education even if it differs from that received by my peers

Each of these questions was answered using a Likert scale, as shown in table 1.

Possible Response	Score assigned to the response
Strongly Agree	1
Agree	2
Neither agree or disagree	3
Disagree	4
Strongly Disagree	5

Table 1: the Likert scale used by respondents to the CAE questionnaire and the score assigned

The responses to the CAE questionnaire can be used to determine the impact that a learners culture may have on their preferred mode of learning. Following on from this a students preferred mode of learning will obviously effect the AEH authoring process. For example, author A is preparing materials for a distance learning course (at a Dutch university), the course students come from varying backgrounds but the majority come from either the UK or from China. How should the author proceed, should they create a separate course for each language or just one in their native tongue (Dutch)? Not only this but how should the course materials be presented? A simple example is that in many western cultures 'red' is used a warning colour (indicating 'danger' or 'do not proceed'); compare this to the fact that in China 'red' indicates 'good luck' and nationalism and so the semantics are opposed.

Another simple example would be in response to questions 26 to 32, if a given culture tends to disapprove of adaptive education then an author may have to ensure that a learner only receives non-adapted content (although there may be others ways to personalise the educational experience).

The outcomes from the CAE questionnaire can be used to inform the authoring process in many ways, some of which are discussed in the Conclusions.

Country	n
Austria	6
China	6
France	6
Germany	6
Greece	6
India	12
Ireland	23
Netherlands	4
Saudi Arabia	5
United Kingdom	29

Table 2: the numbers of respondents (given by 'n') from the ten countries examined in this paper

Question	'p' value
Q19: "I would prefer to be educated in my own language."	<0.00
Q20: "Given the chance, I would prefer to be educated in another country"	<0.00
Q21: "In choosing a university, the ability to practice languages other than my own is important."	<0.00
Q22: "I respect the manner in which my teachers have taught me"	0.76
Q23: "I often feel constrained by the pace of my teaching"	0.87
Q24: "Different perspectives are important to me in my education."	0.40
Q25: "I enjoy experiencing other cultures"	0.36
Q26: "I think the idea of an Adaptive Education System is a good one."	0.20
Q27: "I do **not** have concerns about the *type* of the personal data that is gathered."	0.73
Q28: "*Security* of my personal data is of utmost importance."	0.53
Q29: "I would rather that the lesson the teacher has written is not altered in any way."	0.44
Q30: "I would like to have control over the level of alteration that the Adaptive Education System makes."	0.36
Q31: "I would be very happy to receive a 'personal' education but only one approved by the teacher."	0.68
Q32: "I would prefer a personalised education even if it differs from that received by my peers."	0.52

Table 3: the CAE questions and the 'p' value (significance) determined from the null hypothesis when using a one-way ANOVA test

4 Survey Results

Sampling of students from universities around the world has taken place, from Hong Kong to Saudi Arabia to Ireland. The CAE questionnaire makes no distinction between undergraduates and postgraduates, but does record if a respondent is an academic. The initial sample size examined in this paper is 145 (14 of which were

academics). These respondents were from a mix of cultures, ranging from German, to Chinese to Burmese – a total of 47 countries in total. The ten countries chosen for further analysis in this paper are Austria, China, France, Germany, Greece, India, Ireland, the Netherlands, Saudi Arabia and the United Kingdom, as they all passed the threshold for the numbers of respondents (i.e. n>=4). The numbers of respondents from each country are shown in table 2.

The goal was to determine if there was a statistical difference between each of the ten countries' responses to each question. To do this the data were analysed with a one-way ANOVA (analysis of variance) test. The result of the test gives a 'p' value which indicates the significance of the difference between the sets of data within the group.

The Null Hypothesis for analysing these data was that there is no significant difference between each of the country's respondents when it comes to answering the CAE questions.

The results from the ANOVA test for each question are shown in table 3. These results show that a there exists a statistical difference (at the p<= 0.10 boundary) for questions 19, 20 and 21. Further information on the analysis for each question follows.

It is worth noting that whilst there are some very significant p values determined through the analysis, the data tends have low R-Sq values, as this does not invalidate the p values, the following analysis considers the p values alone.

4.1 Results: no statistical difference between countries (p>0.1)

Table 4 below shows the summary data for each question analysed, note that even the questions that have proven statistical differences within them (Qs 19, 20 and 21) are included, but will be discussed in more detail in Section 4.2.

Question	Mean	StDev	Median	Mode	Range	Closest Interpretation
Q19	2.2	1.1	2	1	4	Agree
Q20	2.7	1.0	3	2	4	Neither
Q21	2.9	1.3	3	2	4	Neither
Q22	2.2	0.8	2	2	4	Agree
Q23	3.0	0.9	3	3	4	Neither
Q24	1.6	0.6	2	2	2	Agree
Q25	1.6	0.6	2	2	3	Agree
Q26	2.1	0.9	2	2	4	Agree
Q27	3.2	1.2	3	4	4	Neither
Q28	1.7	0.9	1	1	4	Strongly Agree
Q29	3.1	0.9	3	4	4	Neither
Q30	2.1	0.7	2	2	4	Agree
Q31	2.4	0.9	2	2	4	Agree
Q32	2.7	0.9	2	2	4	Agree

Table 4: median scores and interpretation for all other questions not previously examined

Lessons may still be drawn from the questions that have no significant difference between the distribution of responses for each country. By examining Table 4, we can draw the following conclusions.

Question 22: With a median score of 2 (+/- 0.8) and a mode of 2, it seems that the majority of respondents agree with the statement "I respect the manner in which my teachers have taught me".

Question 23: With a median score of 3 (+/- 0.9) and a mode of 3, it seems that the majority of respondents neither agree nor disagree with the statement "I often feel constrained by the pace of my teaching".

Question 24: With a median score of 2 (+/- 0.6) and a mode of 2, it seems that the majority of respondents agree with the statement "Different perspectives are important to me in my education". However unlike the majority of the other responses this question only has a range of 2 (cf the more usual range of 4 for all except one other question), which, along with the relatively small Standard Deviation (StDev), implies that students not only 'agree' with this statement, but that there are fewer than normal dissidents from this common norm.

Question 25: With a median score of 2 (+/- 0.6) and a mode of 2, it seems that the majority of respondents agree with the statement "I enjoy experiencing other cultures". Again the Range (3) for this statement is lower than that for the bulk of the questions. Along with the small StDev (0.6) and a mean of 1.6, this again suggests that the majority of students agree with this statement with fewer dissenters than average.

Question 26: With a median score of 2 (+/- 0.9) and a mode of 2, it seems that the majority of respondents agree with the statement "I think the idea of an Adaptive Education System is a good one".

Question 27: With a mode of 4, it seems that the majority of respondents disagree with the statement "I do **not** have concerns about the *type* of the personal data that is gathered". This is interesting, as it seems that students care less concerning the type of data gathered for an AEH system than they do the security of that data (see Q28). See Section 4.3 for further analysis of this question. It should be noted that with a median score of 3 (+/- 1.2) that the distribution of this data is uneven.

Question 28: With a median score of 1 (+/- 0.9) and a mode of 1, it seems that the majority of respondents strongly agree with the statement "*Security* of my personal data is of utmost importance". Unsurprisingly the majority of students attach a great deal of importance to the security of their data, and possibly as a consequence do not seem to care about the type of data (as long as it is secure). An interesting aside is that the range for this question is 4, considering the strong feelings that this question is bound to raise, it seems that there are still students that do not seem to care about the security of their data.

Question 29: With a mode of 4, it seems that the majority of respondents disagree with the statement "I would rather that the lesson the teacher has written is not altered in any way". See Section 4.3 for further analysis of this question. It should be noted that with a median score of 3 (+/- 0.9) that the distribution of this data is uneven.

Question 30: With a median score of 2 (+/- 0.7) and a mode of 2, it seems that the majority of respondents agree with the statement "I would like to have control over the level of alteration that the Adaptive Education System makes". This result certainly bears out previous work that whilst students agree to receiving personalised lessons they still want to control the level of adaptation that takes place.

Question 31: With a median score of 2 (+/- 0.9) and a mode of 2, it seems that the majority of respondents agree with the statement "I would be very happy to receive a 'personal' education but only one approved by the teacher".

Question 32: With a median score of 2 (+/- 0.9) and a mode of 2, it seems that the majority of respondents agree with the statement "I would prefer a personalised education even if it differs from that received by my peers". Both Q31 and Q32 support the introduction of AEH systems into educational settings, given the reservations expressed in the previous questions.

4.2 Results: statistical difference between countries (p<=0.1)

To examine the data for the three questions that have a significant difference between the 10 countries analysed Fisher's Least Significant Difference (LSD) method was applied. The data was examined with a 'p' of <0.1 and <0.05. The following results given the description of the data for each question by Country (Tables 5, 6 and 7) and the boxplot showing the distribution of the data in Figures 1, 3 and 5 (for questions 19, 20 and 21 respectively). In addition Figures 2, 4 and 6 show the results of the Fischer's multiple comparison test, highlighting significant differences at p<0.1 and p<0.05.

4.2.1 *Question 19*: "I would prefer to be educated in my own language"

Question 19 focuses upon the issue of language and determines if there is a cultural preference that creates a barrier to learning for different countries

As can be seen from Table 5, the data for the UK and Ireland tend towards strongly agreeing to the statement "I would prefer to be educated in my own language". Figure 1 shows that these countries are highly significantly different to all of the other countries in the study at p<=0.05. At the opposite end of the spectrum students from the Netherlands tend to disagree with the statement, with a significant difference to Austria, Germany, India as well as the aforementioned UK and Ireland. Hence we can conclude that UK and Irish students do not wish to learn new languages to study abroad (in fact they are actively against this), whilst students from the Netherlands would wish to be taught in another language rather than their own. For the remaining countries the language of choice for teaching is irrelevant for them.

Country	Mean	StDev	Median	Interpretation
Austria (AUT)	2.7	0.5	3.0	Neither
China (CHN)	3.0	0.6	3.0	Neither
France (FRA)	3.0	0.9	3.0	Neither
Germany (DEU)	2.5	1.2	3.0	Neither
Greece (GRC)	2.8	1.3	2.0	Agree
India (IND)	2.9	1.2	3.0	Neither
Ireland (IRL)	1.4	0.5	1.0	Strongly Agree
Netherlands (NLD)	3.8	0.5	4.0	Disagree
Saudi Arabia (SAU)	2.8	1.3	3.0	Neither
United Kingdom (GBR)	1.6	0.7	1.0	Strongly Agree

Table 5: median scores and interpretation for Q19

Q19	FISCHER Comparison								
	Austria	China	France	Germany	Greece	India	Ireland	Netherlands	Saudi Arabia
China									
France									
Germany									
Greece									
India									
Ireland	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05			
Netherlands	p0.1			p0.05		p0.1	p0.05		
Saudi Arabia							p0.05		
UK	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05		p0.05	p0.05

Figure 1: significant differences between countries for Q19, determined by the Fischer LSD comparison (both $p<0.05$ and $p<0.1$ are shown)

4.2.2 Question 20: "Given the chance, I would prefer to be educated in another country"

Question 20, was designed to determine if there is a difference between cultures in their desire to be taught outside of the 'comfort zone' of their own surroundings. It should be noted that respondents to the CAE questionnaire consist of students who are already studying abroad (n=62) but are also (and always have been) studying from their home countries (n=83). In an additional ANOVA between those students that responded to the CAE questionnaire and have studied abroad, and those students who have stayed at home, there is a statistical difference ($p<0.00$), the details are shown in Table 6.

Home vs abroad	n	Mean	StDev	Interpretation
Abroad	62	2.2	0.97	Agree
Home	83	2.8	1.00	Neither

Table 6: scores and interpretation for home students vs those who have studied in more than one country, for Q20

As can be seen from Table 6, students who have already studied in a country other than their home are in agreement with the statement and actively look forward to studying abroad. Students who have not yet studied abroad are ambivalent to the possibility of such opportunities, neither agreeing nor disagreeing with the statement.

Table 7 shows that of the ten countries studied, only the British are against being educated in another country to their home. The Irish are neither for nor against, whilst all of the remaining countries agree with the statement and would prefer to be educated in another country. These differences are highly significant (Figure 2) in the case of the UK and shows they are significantly more likely to consider language an issue when choosing a university. The Irish are significantly different from China, India, the Netherlands and Saudi Arabia. The remaining countries all have a median of 2, showing that there are more open and desiring for an education in another country.

Country	Mean	StDev	Median	Interpretation
Austria (AUT)	2.3	0.8	2.0	Agree
China (CHN)	2.2	0.8	2.0	Agree
France (FRA)	2.3	0.8	2.0	Agree
Germany (DEU)	2.3	1.0	2.0	Agree
Greece (GRC)	2.3	1.5	2.0	Agree
India (IND)	2.0	0.6	2.0	Agree
Ireland (IRL)	2.8	0.9	3.0	Neither
Netherlands (NLD)	2.0	0.8	2.0	Agree
Saudi Arabia (SAU)	2.0	0.0	2.0	Agree
United Kingdom (GBR)	3.7	0.6	4.0	Disagree

Table 7: median scores and interpretation for Q20

Q20	FISCHER Comparison								
	Austria	China	France	Germany	Greece	India	Ireland	Netherlands	Saudi Arabia
China									
France									
Germany									
Greece									
India									
Ireland		p0.1				p0.05			
Netherlands							p0.1		
Saudi Arabia							p0.1		
UK	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05	p0.05

Figure 2: significant differences between countries for Q20, determined by the Fischer LSD comparison (both $p<0.05$ and $p<0.1$ are shown)

4.2.3 Question 21: "In choosing a university, the ability to practice languages other than my own is important"

Question 19 determined if language was a barrier to learning for different cultures. Question 20 concerned the preference for either studying in another country to a learner's home country. Question 21 investigates similar issues but from a more

positive attitude – that of the student actively selecting to go to another culture with the intent of learning a new language (and by implication, culture).

Country	Mean	StDev	Median	Interpretation
Austria (AUT)	1.8	0.8	2.0	Agree
China (CHN)	3.0	1.1	3.0	Neither
France (FRA)	1.7	0.8	1.0	Strongly Agree
Germany (DEU)	2.3	1.8	1.0	Strongly Agree
Greece (GRC)	2.7	1.5	2.0	Agree
India (IND)	2.7	1.1	2.0	Agree
Ireland (IRL)	3.2	1.2	4.0	Disagree
Netherlands (NLD)	1.8	0.5	2.0	Agree
Saudi Arabia (SAU)	2.2	1.1	2.0	Agree
United Kingdom (GBR)	3.7	1.0	4.0	Disagree

Table 8: median scores and interpretation for Q21

Table 8 shows the distribution of data within the sample sets of the ten countries under investigation. Rather surprisingly there is quite a spread of responses to this question, much more so than for either of the previous two questions.

As would be expected from Questions 19 and 20, both the British and the Irish disagree with the statement, they are not concerned with practising languages other than their own. The Chinese respondents show no preference one way of the other; this issue seems of little importance to them. Whilst the Austrians, Greeks, Indians, Dutch and Saudis all agree with the statement, they would prefer to practice another language when at their university. The most powerful assertion comes from the French and the Germans, students from these countries strongly agree with the statement, with a median of 1 (the French in particular have a small StDev of 0.8).

Q21	FISCHER Comparison								
	Austria	China	France	Germany	Greece	India	Ireland	Netherlands	Saudi Arabia
China	p0.1								
France		p0.05							
Germany									
Greece									
India			p0.1						
Ireland	p0.05		p0.05	p0.1					
Netherlands		p0.1					p0.05		
Saudi Arabia							p0.1		
UK	p0.05		p0.05	p0.05	p0.05	p0.05		p0.05	p0.05

Figure 3: significant differences between countries for Q21, determined by the Fischer LSD comparison (both $p<0.05$ and $p<0.1$ are shown)

Figure 3 backs up these conclusions, showing that the UK and Ireland are significantly different from many of the other countries (7 for the UK and 5 for Ireland). As can be seen from Figure 3, China is significantly different from Austria, France and the Netherlands.

4.3 Results: Further Analyses

Although the majority of this paper investigates the differences and similarities between the ten selected cultures for questions Q19-Q32. It is also interesting to note that a study into the affect of Gender and Age has upon the responses to these questions.

A one-way ANOVA for each of the questions Q19 to Q32 was performed to determine if the respondents gender has any affect upon their response. The results of this test are not shown as there was no significant difference for any of these questions.

Another series of one-way ANOVAs was performed to study what affect (if any) the age of the respondent had upon their answers. To do this the data was gathered into the groups shown in Table 9, these were created by using the age of the youngest respondent and grouping them with a span of 5 years.

Age group	n
18-22	19
23-27	48
28-32	23
33-37	6

Table 9: median scores and interpretation for Q21

This examination revealed that two of the questions had age related differences within them, Q27 and Q29. The details of these studies are given below.

4.3.1 Question 27: "I do not have concerns about the type of the personal data that is gathered"

Age Group	Mean	StDev	Median	Range	Interpretation
18-22	2.7	1.1	2.0	4.0	Agree
23-27	3.3	1.1	3.0	4.0	Neither
28-32	3.1	1.2	3.0	4.0	Neither
33-37	4.0	1.1	4.0	3.0	Disagree

Table 10: median scores and interpretation for the effect of age in answering Q27

As can be seen from Table 10 there is a general trend that as age increases then so does disapproval of the statement. With the younger groups being less concerned about the type of data gathered and the older groups (potentially with greater experience) being much more careful.

There are significant differences ($p<0.1$) between the 18-22 group and both the 23-27 and 33-37 groups. In addition there are significant differences ($p<0.1$) between the 28-32 and 33-37 groups.

4.3.2 Question 29: "I would rather that the lesson the teacher has written is not altered in any way"

Age Group	Mean	StDev	Median	Range	Interpretation
18-22	2.7	1.1	2.0	4.0	Agree
23-27	3.0	0.9	3.0	3.0	Neither
28-32	3.3	0.7	3.0	2.0	Neither
33-37	3.8	0.8	4.0	2.0	Disagree

Table 11: median scores and interpretation for the effect of age in answering Q29

Once again there seems to be a trend for the younger groups to agree with the statement and the older groups to move from this position towards disagreement. This trend is confirmed by the significant difference between the 18-22 group and both the 28-32 and 33-37 groups. As well as by the 23-27 group and the 33-37 group.

This data identifies that older students are much more likely to desire a lesson to be changed from the teacher's original materials. Whilst younger students maintain that the teachers original materials should not be modified. It should also be noted that the two middle age groups (23-27 and 28-32) are both indifferent to this issue.

5 Conclusions

Hypotheses two and four state that:

Hypothesis 2: Students desire to be taught in the manner that they have been brought up with. (Is there a cultural bias to education? Do students recognize this? Would they desire a different cultural bias to their own?)

Hypothesis 4: There is a cultural bias in the acceptance of openly acknowledged Adaptive Educational systems. (Is there a cultural bias in the desire for AEH – do some cultures accept the teacher's viewpoint no matter how it is presented and would therefore resent that being 'changed'. Can this adaptation be hidden and therefore accepted? Do students want to conform or not?)

The research detailed in this paper describes the data gathered to address these issues. The similarities and differences between the responses given by respondents from the ten countries has been analysed using one-way ANOVAs and the Fischer's LSD multiple comparison method. The results from these analyses have been presented and significant results have been detailed at the $p<0.1$ as well as the $p<0.05$ levels. Of the 14 questions analysed, 3 were found to contain significant differences caused by the respondents culture, and in an additional study 2 further questions were identified to contain significant differences caused by the age of the respondent. This leaves 9 questions that had no observable differences, however the fact that the responses were so similar allows us to examine the data set as a whole and draw further conclusions.

In examining the results and concluding it is possible to describe a single country according to all of their responses. For example, the Chinese respondents appear to be unconcerned with issues of language but enjoy the prospect of experiencing different environments and cultures. Along with the other countries studied that they are indifferent to the pace of their education, and are generally positive concerning Adaptive Education as long as security issues are addressed and they have some degree of control of the adaptation.

Compare this to both the French and the Germans, who would consider the fact that they could practice a foreign language an important issue (whilst being indifferent to being taught in their own).

All three of these countries differ markedly in these responses to both Britain and Ireland, both of whom have very strong feelings about being educated in their own language and do not consider practising another language a factor when choosing where to be taught.

These answers help guide us towards answering Hypothesis 2: "Students desire to be taught in the manner that they have been brought up with". The influences here are not only the students' original language but their openness to experiencing different cultures. Questions 19 top 25 help elucidate their responses to this issue. Three of these questions show significant differences between the countries involved (Questions 19, 20 and 21).

The results from these questions are summarised in Table 12 below.

Country	Q19	Q20	Q21	Q22	Q23	Q24	Q25
Austria (AUT)	☺☺	☺	☺	☺	😐	☺☺	☺
China (CHN)	😐	☺	😐	☺	😐	☺☺	☺☺
France (FRA)	😐	☺	☺☺	☺	😐	☺☺	☺☺
Germany (DEU)	😐	☺	☺☺	☺	😐	☺	☺☺
Greece (GRC)	☺	☺	☺	☺	😐	☺☺	☺☺
India (IND)	😐	☺	☺	☺	😐	☺☺	☺
Ireland (IRL)	☺☺	😐	☹	☺	😐	☺	☺
Netherlands (NLD)	☹	☺	☺	☺	😐	☺☺	☺☺
Saudi Arabia (SAU)	😐	☺	☺	☺	☺	☺	☺☺
United Kingdom (GBR)	😐	☹	☹	☺	😐	☺	☺

Table 12: summary of responses for Questions 19 to 25, examining Hypothesis 2 (light grey = positive response, white = indifferent, dark grey = negative)

Austria, China, France, Germany, Greece, India and Saudi Arabia, all responded positively to the majority of these questions, which indicates that they enjoy mixing with other cultures and are open to learning about new societies and languages. These countries all refute Hypothesis 2, which states that students prefer to be taught in the manner in which they were brought up.

Ireland has a negative response in their desire to practice languages other than their own, but is otherwise generally positive when considering the possibility of experiencing other cultures. As such Ireland does not confirm nor refute Hypothesis 2.

The Dutch would prefer *not* to be taught in their own language and as such also refute Hypothesis 2.

Finally the British, whilst stating that they 'enjoy experiencing different cultures', would prefer not to be educated in another country nor learn and practice a new language. Of all of the countries studied, the British are closest to confirming Hypothesis 2.

Conclusion: Hypothesis 2 – *refuted*. Students *do not* desire to be taught in the manner that they have been brought up with.

These conclusions can of course have major implications in designing and authoring for AEH systems. If a system was to adapt the content to be given in the home language of the student then students from the Netherlands may well consider that they were not gaining as much from the experience as they might otherwise get from being taught in a non-adaptive off line environment. On the other hand a system would be best designed to always offer British and Irish students the content in their home language. Hence any author for a given series of content may well not have to have create as many different language versions as there are nationalities involved in a course. For example, a student from France is being educated in China, presenting the content in Chinese would be a reasonable start to their education. Obviously all of these initial stereotype values should be able to be changed by the user as required.

Country	Q26	Q27	Q28	Q29	Q30	Q31	Q32
Austria (AUT)	☺	☹	☺☺	😐	☺	☺	☺
China (CHN)	☺	😐	☺	☹	☺	☺	☺☺
France (FRA)	☺	☹	☺☺	😐	☺	☺	😐
Germany (DEU)	☺	😐	☺☺	😐	☺	☺	😐
Greece (GRC)	☺	😐	☺☺	😐	☺	☺	☺
India (IND)	☺	😐	☺	😐	☺	😐	😐
Ireland (IRL)	☺	😐	☺☺	😐	☺	☺	☺
Netherlands (NLD)	😐	☹	☺	☹	☺	☺	☺
Saudi Arabia (SAU)	☺	☹	☺☺	☹	☺	☺	😐
United Kingdom (GBR)	☺	☹	☺	😐	☺	☺	☺

Table 13: summary of responses for Questions 26 to 32, examining Hypothesis 4 (light grey = positive response, white = indifferent, dark grey = negative)

Hypothesis 4 states that "There is a cultural bias in the acceptance of openly acknowledged Adaptive Educational systems". Questions 26 to 32 were designed to

enable a study of this hypothesis. None of these questions studied have any significant differences due to culture. Table 13 below summarises the responses.

Generally the data gathered seems to be similar across all of the cultures investigated: all agree that the idea of an AEH is a good one (except for the Dutch who are uncertain), but that they should have control over the level of adaptation. It seems that no student would trust an AEH system fully to control their education, and that the adapted lessons should definitely be approved a teacher with obvious implications for the authoring load at the lesson authoring stage.

The response given to question 29, shows that both Chinese, Dutch and Saudi Arabian students would actually prefer a lesson to be altered from that originally given by the teacher (with the above conditions) and students from the other countries are indifferent. Again the conclusions for authoring here are plain, if a system were to implement cultural stereotyping to influence the initial stages of adaptation in the system – then it seems that students from China and Saudi Arabia would prefer the adaptation to occur straightaway, as long as they were assured of the quality and teacher approval. Compare this to students from Britain, India and Ireland who it might be best to give a generic non-adapted lesson as their initial introduction to the content – with adaptation being introduced at their request or at least with their approval. An investigation into the effect age has on responses to this question showed that older students are significantly more likely to prefer the teacher's original materials to be altered, when compared to younger students.

None of the cultures investigated were concerned about the type of personal data gathered, however it should be noted that a separate investigation of Q27's data showed a significant difference between younger and older students. Older students are actually concerned about this issue.

Hence in our investigation of Hypothesis 4, it seems that whilst there is a great degree of acceptance of AEH systems (with certain conditions), there is no significant difference between the countries analysed. This would seem to accept the hypothesis. This hypothesis identifies the 'openly' acknowledged adaptation – it may well still be advisable to conduct some form of adaptation even if the student would seem to desire otherwise. For example British students are indifferent to the fact that a lesson may or may not be altered – however an AEH system should ensure that the content is only provided in English.

For example, to address the authoring issues raised in Section 3 we can conclude that author A (creating content in a Dutch university for a distance learning course for a class that contains a majority of British and Chinese students) would only need to create content in English. This course content can be adaptive in nature as both cultures approve of the concepts behind an AEH system. However it is important that the Chinese students are given easy access to their user profile so that they can control the degree of adaptation. This can be done easily by highlighting (through colour, additional text or UI placement) of a 'user profile' access control.

Other more specific results for authors that can be inferred from this analysis are:

- Dutch students would prefer not to be educated in Dutch in an AEH, whilst it is impossible to say for certain the reasons behind this the popularity of speaking English within the Netherlands may be a factor.

- British and Irish students should generally always have educational materials presented in English.
- The other countries students are more flexible with respect to the language that they are taught in, giving the author more leeway when preparing content for them.
- As all of the cultures studied had students that were open to experiencing other cultures than their own, authors can feel free to include cultural references that are not part of a students home culture. Although obviously if this is done the author should be aware that they may not be understood (even if they are accepted). A simple example of this is the thousands separator in numbers: 1,000 for the UK and 1.000 for much of mainland Europe.
- As most countries accept the principle behind an AEH authors need not be concerned that an adaptive education may alienate some students, although in the case of the Dutch it may be wise to hide any open references to the fact that the learner is using an AEH.
- Authors of AEH systems (and possibly content) should make every effort to reassure the learners that any personal data gathered and used by an AEH is both necessary and secure.
- Authors of educational courses may well want to openly advertise that they are using an AEH when teaching in China, the Netherlands and Saudi Arabia as students from these countries would actually prefer to have the lesson a teacher created amended for them.

It is also important to note that within this paper the term ‘cultural’ has been used to synonymously mean ‘country’, this is not always the case and future work should consider this.

As can be seen from the above analysis, identifying these values will be of great importance to the AH/AEH communities, specifically for the authoring/creation of content. As with this knowledge it will be possible to author the required levels of content that pre-adapt the presentation of web based materials with only the student’s culture/country known.

This has the additional side benefit that it may simplify authoring as no additional questionnaires, no time consuming discovery process would be required, for either the student nor the author (in the creation of these questionnaires). Instead the student would receive content in a manner appropriate to their cultural background. However it is important for authors (and system designers) to note that students should be able to be over-ride these settings themselves.

This paper presents the first results from the CAE questionnaire designed to identify the cultural values of members of academia, and specifically how these values may influence the authoring process.

6 Future Work

As is obvious from this paper, there remains two hypotheses to investigate. In the future an examination of the relationship between Hofstede's cultural dimensions and the CAE questionnaire results will be undertaken.

In addition to this another goal is to gather more respondents to the CAE questionnaire. With more data it will be possible to identify the educational values of more cultures and be more certain of our conclusions. As was stated early in this paper there are 47 cultures that have responded to the CAE questionnaire, only 10 of which have passed the n>=4 barrier. Ideally this sample size limit should be increased and more cultures should be examined, however many more responses are needed before this can happen.

The next major stage in this work is to implement a cultural stereotype mechanism within an AEH system, it is planned to do this in MOT [Cristea, 03] and WHURLE [Moore, 01]. Once this is done a user study satisfaction will be made on the outcomes of this development.

Acknowledgements

The research leading to this paper was supported by the European Commission under contract FP6-027026, Knowledge Space of semantic inference for automatic annotation and retrieval of multimedia content - K-Space.

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