Cognitive Styles, Computer Attitude and Internet Use

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ABSTRACT

One of the challenges facing instructional designers is in producing e-learning systems, which take account of individual differences such as nationality, gender and more importantly from an educational perspective, cognitive learning style (Graff, et al, 2003) University students completed a computer attitude scale (Smalley, et al, 2001), a questionnaire based on CSI (Allinson & Hayes, 1996) and knowledge of internet use. Results are discussed in terms of the implications of the research on e-learning systems.

INTRODUCTION

Much research has been done showing the benefits of e-learning inside and outside of the classroom. In spite of the bulk of research conducted both on theory and practice, however, little is known about learner characteristics. When e-learning systems are not designed in consideration to learner characteristics and their differences, difficulties are bound to occur (Graff, Davies & McNorton, 2004). Differences between learners may be designed in terms of nationality, gender and cognitive learning style (Freedman and Liu, 1996; Liang and McQueen, 1999)

Cognitive Learning and Culture

Graff, et al (2004) admits that culture may be a key factor in the learner differences. The study indicates that it is also theoretically possible that individual differences may occur cross-culturally because of differences in cognitive learning style between individuals from different cultures. The topic on cross-cultural differences in learning style has been debated over the past decades. While some authors hinted that cognitive style and culture may not be related, others assert that there are cross-national differences in cognitive style. Allinson & Hayes (2000) found that managers from European and Latin cultures were more intuitive than their counterparts in developing countries and Arab countries. Furthermore, some research evidence shows that students in high school and university levels in East Asian countries exhibit more effective learning styles and academic performance than their western counterparts (Biggs, 1991; Kember and Gow, 1991). Graff (2004) indicates that one possible explanation for this difference can be accounted by differences in the approaches is studying between culture groups. Smith (2000) reported

such differences between Australian and Chinese university students. Turner (2000) also reported that learning approaches of students from the People's Republic of China studying at degree level in the UK approach learning with a culturally different learning style from British educated students.

Cognitive Learning and Gender

Riding (2000) conducted an investigation differentiating students according to analytic or wholist cognitive style criterion. The criterion is similar to the analysts-intuitive cognitive style difference. Riding reports that differences between learners tend to be small and non-significant. The findings however suggest that males tend to be more slightly more analytic than females.

Cognitive learning and attitude towards computer learning

One way of assessing and individual's approach to computer use for instruction is by testing an individual's attitude to this. (Graff. 2004) Several studies have explored individual differences in attitudes towards computers in the last few decades. For example, differences have been noted between attitudes to computer assisted learning and personality factors (Francis, Katz and Evans, 1996), self-image and locus of control (Woodrow, 1990; Katz, 1994) and risk taking (Offirt and Katz, 1990). Interestingly Abouserie, Moss & Barasi (1992) hinted that male students preferred using computers in their learning than females.

Accordingly, further exploration of individual differences in attitudes towards computers for instruction may reveal different approaches to computer use between the different types of learners. (Graff, 2004) Graff insists that it would appear to be useful if a study into individual differences in computer use for instruction will explore three major factors such as nationality, gender and cognitive learning style.

This research aims to replicate the findings of Graff, et al (2004) that suggests e-learning instructional design must take into account individual differences such as nationality, gender and cognitive learning style. One hundred university students completed the Cognitive Style Index (Allinson and Hayes, 1996), a computer attitude scale (Smalley, Graff and Saunders, 2001) and a questionnaire on their knowledge of internet use.

METHOD

Participants

Samples of 100 undergraduate Japanese students were used as subjects for this study, with age ranging from18 to 20 (mean age= 19.30). There were 56 males

and 43 females, with 1 not recorded. Instruments used for the study are the Computer attitude scale (2001), Cognitive styles index (1996) and a questionnaire.

Instruments

1. **Computer attitude scale (Smalley, Graff, Saunders, 1996)**

   Attitude towards computer use was assessed using the Jones and Clarke (1994) computer attitude scale for university students. The instrument consists of three subscales assessing he affective, behavioral and cognitive components of the respondents' attitude. The scale was later revised and updated using Smalley, Graff and Saunders (2001) using a sample of 100 samples. The results yielded Cronbach alphas for each attitude subscale of 0.76 (affective), 0.65 (behavioral), 0.71 (cognitive and 0.81 (total). Test-retest reliability of the revised scales is found to be satisfactory (r= 0.73, p<0.001>.

2. **Cognitive Styles Index (Allinson and Hayes, 2001)**

   The Cognitive Styles Index (CSI) (Allinson and Hayes, 1996) is a self-report designed to measure the whole/part-processing dimension of cognitive style. The instrument contains 38 statements, to each of which a respondent must indicate a true/uncertain/false response. The test identifies an individual's cognitive style as being either analyst or intuitive. The term intuitive is used to describe an individual who makes judgments based on feelings and who adopts a global approach to processing information, whereas the term analytic describes an individual who makes judgments based on reason, and who focuses on specific detail when processing information. With a theoretical maximum score of 76, higher scores indicate a more intuitive cognitive style and lower scores indicate a more analytic style. (Graff, Davies, Mc Norton, 2004) A self-made CIS was made patterned after the psychometric properties of the instrument reported in Allinson and Hayes (1996).

3. **Questionnaire**

   The questionnaire for this study consisted of 18 questions. The first part of the questionnaire measured knowledge of internet use. The scores ranged from 8 to 16. The second part of the questionnaire asked for information such as how easily respondents reported they were able to find information using the internet and whether they became lost, distracted or frustrated when doing so. A high score indicated high ease of use whereas a low score indicated low ease of use. The scores ranged from 8

to 40. In this study the ease of use scale ranged from 15 to 30, with a mean score of 20.11 The final part of the questionnaire asked participants to estimate the number of hours per week they used the internet.

PROCEDURE

The general design of this study, modeled after Graff, Davies and Mc Norton (2004), involved a comparison of computer attitude, internet knowledge and ease of use between students with different cognitive styles. Data collection simply involved completion of test instruments and questionnaires by students during a class.

RESULTS

1. Differences in computer attitude scores, internet knowledge and ease of use for cognitive style and gender

   For the purpose of data analysis, participants scoring in the lowest 25% and highest 25% on the CSI were labeled as 'analyst' and 'intuitive', respectively. Table 1 shows the means and standard deviations for cognitive style and gender on computer attitude scores. Table 2 shows the means and standard deviations for cognitive style and gender for scores in Internet knowledge, ease and number of hours of use.

Table 1 Computer Attitude Scores for Cognitive style and gender

Cognitive style	Gender	Overall	Affective	Behavioral	Cognitive
Analyst	Male	70.12 (17.06)	21.19 (3.14)	23.40 (8.79	22.45 (3.85)
	Female	73.15 (15.18)	24.38 (5.16)	22.21 (6.77	23.48 (4.36)
Intuitive	Male	84.70 (22.41)	25.56 (5.87	27.65 (7.17)	28.23 (7.22
	Female	80.33 (15.57	26.78 (8.10	24.31 (4.56)	25.40 (6.47)
All	Male	77.41 (19.74	23.38 (4.50)	53.05 (7.98)	25.24 (5.54)
	Female	76.44(15 .38)	25.58 (6.63)	23.26 (5.68)	24.44 (5.41)

Table 2 Internet Knowledge, Ease of Use and Hours for Cognitive Style and Gender

Cognitive style	Gender	Knowledge	Ease of Use	Hours of Use
Analyst	Male	4.44 (4.68)	21.10 (2.31)	5.46 (4.21)
	Female	5.61 (3.56)	20.61 (4.11)	6.54 (5.98)
Intuitive	Male	5.65 (5.10)	19.23 (3.00)	8.21 (7.88)
	Female	5.12 (4.88)	20.35 (3.29)	7.80 (5.68)
All	Male	5.05 (4.89)	20.17 (2.65)	6.84 (6.06)
	Female	5.37 (4.22)	20.48 (3.70)	7.17 (5.83)

A two way ANOVA was calculated to examine the effects of cognitive style and gender

On computer attitude scores (CAS) and scores on internet knowledge, ease and hours of use.

A significant main effect of cognitive style was noted for Internet use ($F_{1,76}=4.51$, $p<0.05$). An analysis of the means reveals that students with an intuitive cognitive style had greater self-reported Internet use than those with analytic cognitive style. The mean hours of use was noted at 8.00 Hrsp.w and 5.50 Hrs.p.w, respectively.

There was also a significant mean effect of cognitive style on computer attitude scores ($F_{1,78} = 4.54$, $p<0.05$). The effect was such that the intuitives had a higher CAS mean scores than the analysts, 82.52 compared to 76.40. Therefore students with analytic cognitive style demonstrated more positive attitudes towards computers. There was also a significant effect on the affective and cognitive CAS scores ($F_{1,78} =6.87$ and 5.64, respectively, $p<0.05$). No significant effects were noted on the interaction between gender and computer attitude or between gender and cognitive style.

Discussion

The aim of the study was to investigate individual differences in approaches to using computers among university students displaying different cognitive learning styles.

The findings of this study illustrate that analysts report a more favorable attitude to computer-based learning than intuitives. Furthermore, when the attitude scale is analyzed in terms of its subsections, significant effects were observed for the affective and cognitive subscales, with analysts reporting more positive affective and cognitive attitudes towards computer-based learning than students with intuitive learning style.

However, analysis of the time spent on computer reveals that students with intuitive learning style report greater

internet use than analysts. Typically those with intuitive learning style are more socially orientated than analysts and therefore the results are intriguing. It seems to indicate that intuitives spend more time engaged in isolating computer activity. (Graff, Davies, McNorton, 2004) Further studies would require an analysis of which particular computer-based activities analysts and intuitives engage, for instance, more isolating web-based searching and browsing for information or activities such as internet based interaction with others.

CONCLUSION

The above findings suggest that individual differences are evident in terms of attitudes to computer-based learning and Internet use and that these differences exist principally on the cognitive learning style. The results suggest that future design of web-based and computer-assisted learning systems need to take account of this difference. Furthermore, future study needs to analyze the relation between nationality of students in this study and the differences in cognitive styles, in order to confirm previous findings that cross-cultural differences in internet use and computer attitudes exists.

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