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A COMPARISON OF CONTEXTUAL EXPLORATION AND MENU NAVIGATION INTERFACE DESIGNS IN CHILDREN'S ARTS LEARNING WEBSITE

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ABSTRACT

Most of the children's websites nowadays have gradually transformed from data and text content to story and image focus, but menu list is still the principal guideline for the interface design. However, in view of different psychological characteristics between adults and children, can we break the structural criteria for children to freely explore the website? The present study created a children's art learning website to examine the question. Two different simulated navigation ways: Contextual Exploration and Menu Navigation were designed. The participants were enrolled from public elementary school in northern Taiwan. Their ages ranged from 10 to 13 years. A series of expert interview, participant observation and experimental questionnaire were adopted for the comparison of the findings, and qualitative and quantitative data analyses were performed. Both navigation ways are enjoyable, but the findings showed a mixed situation. The results of expert interview and questionnaire showed that the design of Menu Navigation may be superior to that of Contextual Exploration in the children's art learning website. However, we were not sure to this point according to the views of experts of children's education and the result of participant observation. Further studies are needed to corroborate these findings.

Key words: Contextual Exploration, Menu Navigation, children's art learning website

INTRODUCTION

Most of the children's websites nowadays have gradually transformed from data and text content to story and image focus, but menu list is still the

principal guideline for the interface design. However, in view of different psychological characteristics between adults and children, can we break the structural criteria for children to freely explore the website? Do children and adults have the same lost-in-space feelings in some particular website situation? Although the strong exploration feature is not accordance with some of the web design guidelines, are the principles of knowledge management properly adopted to the creative and experiential orientation in arts learning? Accordingly, the present study simulated an arts learning website for children to examine these questions. A series of expert interview, participant observation and experimental questionnaire were adopted. Two different experimental versions: Contextual Exploration and Menu Navigation were designed to experimental groups. Both qualitative and quantitative data analyses were performed for the comparison of the findings.

LITERATURE REVIEW

As we usher in the e-Age, children's education is getting more and more attention. Most of the websites nowadays have gradually transformed from data and text focused content to story-based design. Lynch and Horton (2008) indicated that without the interface and the "you are here" markers it provides, we would all have a lost-in-space feeling. However, Daigle and Furner (2004) suggested that education websites should pay attention to the importance of real-life, problem solving and authentic scenarios, as well as age appropriateness. Therefore, do we need a burden of buttons and links in website navigation?

At present, there are many different layouts for internet interface. One of the common types is

interactive menu buttons which located in someplace of the page. Lee, Lin and Wu (2004) has classified navigation interface into two categories: Traditional Frame Menu and Non-frame Menu. The latter could be differentiated into a variety of forms. It seems that the interactive menu design is still the main stream of web interface.

Relatively, this drives us to the perspective of user's experience in web navigation. Hoffman and Novak (1996) proposed that there are two kinds of user browsing model: Goal-directed and Experiential activities. The characteristics of Goal-directed activity are situational involvement and directed search. The browser generally is involved with a task. In contrast, the features of Experiential activity are intrinsic motivation, enduring involvement, and nondirected search and learning. The novice or inexperienced user is usually an experiential actor. So, what navigation strategies will children take when browsing the internet? Or what navigation ways can designers offer? As we know, there is no design that fits all, and design should be driven by knowledge of the target users (Markopoulos & Bekker, 2003). Research has tried to address the interests and capabilities of children in the web design.

Recently, studies has drawn attention to the children who are regarded as a special user group (Bruckman & Bandlow, 2003), but has ignored that how to create successful learning activities of children. This issue arises when we emphasize on having pleasure and fun with less usability and task-oriented activities (Blyth, Monk, Overbeeke, & Wright, 2003, Green & Jordan, 2002). Children differed from the adult users in the usability testing results. In the online activities, children mainly focused on entertainment, schoolwork, and communication, while adults use web for information retrieval and business transaction (Gilutz & Nielsen, 2002; Bernard, 2003). Hanna, Ridsen and Alexander (1997) reported that 10-year-old children may have extensive computer experience and be ready to critique software. Children ages 11 to 14 years are very easy to include in usability testing. Unlike adults, most of them are comfortable with computers and can be asked to perform specific tasks. They can actually enjoy a free exploration. In addition, younger children may feel uncomfortable with the tester

alone, but older children may be able to give reliable ratings about all aspects of the website. It is appropriate to schedule children for an hour of lab time. Even older children will become fatigued after an hour of concentrated computer use. Therefore, the participants in this study were recruited from 3rd to 6th grade students in primary schools.

Lee, Wei, Shi, & Qiu (1998) noted that methods of evaluation to website can be divided into expert evaluation and user evaluation. However, the evaluation about visual arts learning website was rarely discussed. In general, web evaluation criteria stress mostly on objective clarity, content accuracy and ease of information transmission (e.g., Laura, 1999; McDermott, 2000; Smith, 1997), and the criteria in visual arts learning website are knowledge-oriented, emphasize on usability and ignore the affective intention (e.g., Marschalek, 2002). Interactivity should be measured by interface features and be investigated how users perceive and experience these features. Usability, pleasure and interaction are crucial factors to be widely discussed in deciding the quality of a website (Tsai, 2007; Kuo, 2003).

Measure of attitude seems to be necessary in building an educational website. Chen and Wells (1999) argued that a new scale is needed for web and they developed a scale to measure attitude toward the website (AST). It is coming to be recognized as an important measure that the audience's affective response has been employed to assess the effectiveness of web site (e.g., Bruner II, Gordon, C., & Kumar, A., 2000; Stevenson et al., 2000). Accordingly, the present study suggested that it is appropriate to use these scales for assessing the effectiveness of children's arts learning website.

METHOD

In the present study, professional advices, observe records and experimental questionnaires were adopted to examine the difference of children's attitude between Menu Navigation and Contextual Exploration designs.

STIMULI

This study was conducted by using simulating websites that were designed based on two different navigation ways: Contextual Exploration and Menu Navigation. These two versions have different structure of browsing with the same information content, and both belong to Non-frame interface design.

Contextual Exploration

Users use a mouse to control a character to walk, explore and shuttle in the hierarchical structure of web pages. In this case, activities are ritualistic, hedonic, and not guided by menus, but by the browsing behavior itself of involvement in nondirected search and learning. However, exploration approach may easily bring about a space-losing problem. A "time-machine" button was designed to offer a panoramic map to search web pages optionally. (Figure 1 & Figure 2)



Figure 1. The Contextual Exploration design



Figure 2. The "time-machine" button

Menu Navigation

The interactive menu buttons are not placed in a fixed location of certain workspace. It looks just like a map. The browsing behavior is instrumental and utilitarian in nature, and result in direct searching and learning. (Figure 3 & Figure 4)



Figure 3. The Menu Navigation design-Homepage



Figure 4. The Menu Navigation design-Page

PROCEDURE

This study employed three main methods to address the research question raised above: expert interview, participant observation and experimental questionnaire.

Expert interview

The interviews with experts were conducted to obtain their professional opinions about the interface. Four of the experts who have more than eight years experience on children's art (1), preliminary education (1) and web design (2) were recruited to participate in the task. The experts browsed the interface individually and then were asked to

evaluate the simulated websites they had browsed, as well as discussed with the researcher. An open-ended question invited general feedback for this preliminary procedure. The length of each operation and interview lasted about two hours. The records were analyzed to identify professional opinions toward two navigation styles to triangulate student's browsing behaviors and responses to the questionnaire.

Participant observation

The second step was mainly conducted with observation record. A total of 12 participants were recruited from two public elementary schools in northern Taiwan. Their ages ranged from 10 to 13 years. Six of the participants were male and six were female in each group. The participants were selected and randomly assigned to browse one of the two websites: Contextual Exploration and Menu Navigation. Each participant spent approximately 40 minutes to freely surf the interface in a laboratory. The observation was a participant design with a verbal method of investigation that the researcher guided children to speak their feelings and ask questions about operating issues when they surfing the website. After the browsing task, one-on-one interviews were conducted by the researcher. Finally, the observation and conversation data were recorded in detail and then clarified to some important factors.

Experimental questionnaire

In this process, we used a reliable scale build by Chen and Wells (1999) to measure viewers' overall attitude toward a website (AST) in two different computer simulations. The scale includes 16 evaluation items: fun, exciting, cool, imaginative, entertaining, flashy, informative, intelligent, knowledgeable, resourceful, useful, helpful, messy, cumbersome, confusing and irritating. These criterion scale items were based on affection toward the website, which serves as an indicator of website effectiveness. The evaluation criteria were defined as the feelings an individual has toward a stimulus that can lead to relative preferences. All items were measured using seven-point bipolar *Likert* scale that ranged from "definitely disagree" to "definitely agree".

A total of 62 sixth grade students from an elementary school in New Taipei City were recruited to participate in this study. All participants were divided into two experimental groups with an equal number (N=31). Fifteen of the participants were male and 15 were female in the Contextual Exploration group, while 16 were male and 16 were female in the Menu Navigation one. Two groups were tested separately in the computer classroom. Each participant was given 30-35 minutes to browse with one website and complete the questionnaire in about 10 minutes. The total process of data collection lasted about one hour.

RESULTS

The assessments to the sites were all positive. As the expert said: The content and style were plentiful and rich from the perspective of the overall web pages, as well as the color, layout and character designs were very cute, and should be able to meet the child's needs. Nevertheless, the results of the three methods showed a mixed situation. Although the users' perception and the data obtained through the expert interviews provided some different outcomes, the Menu Navigation design may be the better choice of these two sites. Here, we described the results from these three methods.

First, the experts with design background were inclined to support that navigation must provide sense of location and landmark orientation. They preferred to navigate through menu lists to find information and thought the users may have a lost-in-space feeling without menu interface that indicates "you are here", In other words, users should feel comfortable when they explore websites and easily find out where they are. The elements of Menu Navigation allowed us to browse successfully through the complex web spaces, but the Contextual Exploration probably gave rise to a sense of getting lost in web space. Using the "time-machine" perhaps solved some problems, but the first-time users might still have some confusion. In contrast, the experts with non-design background partially agreed with this statement, and tended to approve nonlinear characteristics of Contextual Exploration. Creative navigation and metaphors do not always fail and

impose a burden on the user, especially to the children group.

Next, the result of participant observation indicated that the children participants were pleasure to navigate both interfaces and also interested in every unit page. Even felt a little bit confused, they would try to find a way out without losing patience. The browsing time of every participant generally lasted about 30-40 minutes. The data summarized also suggested that the attitude toward website was associated with three following factors:

1. Content of website: including design of text, pictures, games and the complexity of content.
2. Characteristics of student: including grade level and the abstract thinking and reading ability of students.
3. Participation of teacher: the description and operation involvement of teacher can enhance the learning interest of student.

Observation factor		Attitude of student
Content of website	Picture	Character, color and graphic design caused the students' attention and led to their willing to the browsing.
	Text	Children paid less attention to the pages with more text, and then quit easily.
	Game	Children were interested in game and played it enthusiastically.
	Complexity	Complexity of design had a direct impact for children's participation and attitudes.
	Interactivity	Children were more interesting in the higher interactive units.
Characteristics of student	Grade	Low-grade students showed a higher interest in graphics, games, and the entire learning website, and a lower interest in text.
	Gender	Girls seem to have a higher preference on the site; boys showed a poorer attitude toward learning.
	Abstract thinking ability	Children with higher academic performance, reading skill or painting ability seem to involve more in the text content.
Participant of teacher	Explanation	The description of the purpose and content of learning from the teacher made students produce a higher degree of preference.
	Demonstration	The demo of teacher reduced the browsing confusion of the student.

Table 1. The result of observation

Finally, the results of questionnaire evaluation were positive. Table 2 presents the mean score, standard

deviation, and the median of the evaluation items. As the nature of the learning site, the mean and median scores of informational evaluation factors, including "informative", "intelligent", "knowledgeable", "resourceful", "useful" and "helpful", were mostly higher than others, especially in the Navigation Menu site. The result was consistent with the general sense. The highest mean was in the "resourceful" item of Menu Navigation (M = 6.28, SD = .92), and the lowest mean was in the "flashy" item of Contextual Exploration (M = 4.87, SD = 1.31). All the means obviously were greater than the medium.

Evaluation item	Contextual Exploration		Menu Navigation		Significance of t test
	Mean (SD)	Median	Mean (SD)	Median	
Fun	5.17 (1.26)	5	5.75 (1.16)	6	.063
Exciting	2.10 (1.52)	5	5.38 (1.39)	6	.451
Cool	4.8 (1.55)	4	5.00 (1.53)	5	.795
Imaginative	5.60 (1.28)	6	6.03 (1.00)	6	.142
Entertaining	5.20 (1.63)	5	5.50 (1.44)	5	.444
Flashy	5.00 (1.31)	5	5.66 (1.23)	6	.047*
Informative	5.70 (1.48)	6	6.22 (1.57)	7	.119
Intelligent	5.67 (1.47)	6	6.09 (1.18)	7	.201
Knowledgeable	6.00 (1.11)	6	6.19 (1.26)	7	.537
Resourceful	5.43 (1.22)	6	6.28 (.92)	7	.003**
Useful	5.70 (1.06)	6	5.78 (1.01)	6	.758
Helpful	5.73 (1.20)	6	5.94 (1.05)	6	.477
Non-messy	5.23 (1.68)	6	5.81 (1.26)	6	.127
Non-cumbersome	5.87 (1.33)	5	6.03 (1.03)	6	.587
Non-confusing	5.70 (1.44)	6	5.90 (1.17)	6	.538
Non-irritating	5.24 (1.41)	5.5	5.72 (1.25)	6	.166

p < .05*, p < .01**

Table 2. Comparison of the attitude evaluation items of website

Two-way ANOVA were conducted with navigation way and gender as between-subject variables in each attitude evaluation items. Nonsignificant navigation way x gender interactions were found, except for the "exciting" item, $F(1.58) = 5.34$, $p < .05$, but nonsignificant main effects of navigation way were found. Furthermore, significant main effects of

navigation way were obtained in the “flashy” and “resourceful” items. The mean of Menu Navigation ($M = 5.66$, $SD = 1.23$) was significantly higher than that of Contextual Exploration ($M = 4.87$, $SD = 1.31$) in the “flashy” item, $F(1, 58) = 6.25$, $p < .05$, and the mean of Menu Navigation ($M = 6.28$, $SD = 5.47$) was significantly higher than that of Contextual Exploration ($M = 4.87$, $SD = 1.31$) in the “resourceful” one, $F(1, 58) = 9.01$, $p < .01$. This seems to be in line with the design experts’ suggestions that students may enjoy Menu Navigation more than Contextual Exploration. However, in the absence of statistically significant results in most evaluation items, no definite conclusion can be drawn. On the other hand, the median scores of all the evaluation items in Navigation Menu site were higher than those in Contextual Exploration. Hence, the design of Menu Navigation probably was the better idea in children’s art learning.

DISCUSSION AND CONCLUSIONS

The result of expert interviews indicated that the design of Menu Navigation may be superior to that of Contextual Exploration in the children’s art learning website. It is consistent with the web design guideline in literature. However, the experts with children’s art and primary education backgrounds remained skeptical on this point. They emphasized the importance of exploration ambiguity for arts education and suggested that logical structure is not the only consideration of art web design. On the contrary, the result of participant observation showed that the navigation way of Contextual Exploration did not bring navigation delay or browsing confusion among the children. It might be that the involvement of observer reduced the uncertainty feeling of children.

The finding of questionnaires was also partly consistent with the suggestion of the expert interviews that the navigation way of Menu Navigation was superior to that of Contextual Exploration. Although means of Menu Navigation were higher than those of Contextual Exploration in all the evaluation items, in the absence of statistically significant results, no definite conclusion can be drawn. Nevertheless, in the “informative” and “resourceful” items, the means of

Contextual Exploration were significantly higher than those of Menu Navigation. To some extent, this is in line with the suggestions of web design experts, but there is a discrepancy with the experts said: These two items are not part of the organization factors, but rather belong to the “entertainment” and “informativeness” aspects. Interestingly, the difference of navigation design might influence the users’ perception of content and style instead of that of web structure. On the other hand, from the perspective of median value, most of the scores in the Menu Navigation were higher than those in the Contextual Exploration. It also suggested that the Menu Navigation design may be ideal for children’s arts learning.

What factors have led to the result? Probably the Contextual Exploration design caused mental effort of children to be distracted to manage the exploration behavior, and hence indirectly affected the attitude of them toward the website. This finding is in accordance with the result of the previous studies that logic and hierarchy play an important role in website design. If we can understand the whole structure of site before browsing it, the learning will have higher efficiency. However, in the perspective of arts education, the consumption of some non-intellectual mental energy to engage in exploratory behavior in order to cultivate children’s intuition ability from situated learning is understandable, and does not conflict with our anticipation in this study. However, it should be considered to have the instruction by parents and teachers to complement the consumption of children’s mind in the case of Contextual Exploration in arts learning.

In addition, the result that the attitude evaluation of Menu Navigation seems to be better than that of Contextual Exploration goes against the hypothesis of this study in part. It may be subject to the influence of convenience sampling. It would be beneficial to replicate this study on larger and different populations. Besides, students’ characteristics may reflect different learning attitude of them in the media. We are hopeful that future research will provide more detailed findings. For example, it is possible that the key factor of interest in arts

learning site is the mental maturity and knowledge for the basics of art, rather than age. For the reason, future research perhaps could try to observe the browsing reaction of teenagers and adults. Furthermore, the Contextual Exploration site may have more attraction for the first-time users without basic arts knowledge, and students tend to rational or artistic thinking may show some differences in preference and accepted attitude to these sites. Finally, we found that the content design is also a main influential factor in the observation process and it need to be further explored.

In conclusion, both navigation ways are enjoyable, but the findings showed a mixed situation. The results of expert interview and questionnaire showed that the design of Menu Navigation may be superior to that of Contextual Exploration in the children's art learning website. However, we were not sure to this point according to the views of experts of children's education and the result of participant observation. It reminds us to always try to get rid of the principle constrains and explore more freely in interface design for the target audiences. More rigorous methods of these questions could be performed to confirm the relationship between participant attitude and interface structure in children's art learning website. Designers may gain insights into the role of exploration in the children' art learning process and integrate those into their designs.

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REFERENCE

- Bernard, M. (2003). Optimal Web Design. Retrieved December 15, 2003, from <http://psychology.wichita.edu/optimalweb/print.htm>.
- Blyth, M. A., Monk, A. F., Overbeeke, K., & Wright, P. (2003). *Funology: Form Usability to Enjoyment*. Amsterdam: Kluwer Academic Publishers.
- Bruckman, A. & Bandlow, A. (2003). Human computer interaction for kids. In J. A. Jacko & A. Sears (Eds.). *The Human Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications* (pp. 428-440). New Jersey: Lawrence Erlbaum Associates.
- Bruner II, Gordon, C., & Kumar, A. (2000). Web commercials and advertising hierarchy-of-effects. *Journal of Advertising Research*, 40(1/2), 35-42.
- Chen, Q., & Wells, W. (1999). Attitude toward the site. *Journal of Advertising Research*, 39(5), 27-37.
- Gilutz, S., & Nielsen, J. (2002). *Usability Websites for Children: 70 Design Guidelines*. Nilesen Norman Group. <http://www.nngroup.com/report/kids>
- Green, W. S., & Jordan, P. W. (2002). *Pleasure with Products: Beyond Usability*. London: Taylor and Francis.
- Daigle, D., & Furner, J. M. (2004). The educational software/website effectiveness survey. *International Journal of Instructional Media*, 31(1), 61-77.
- Hanna, L., Ridsen, K., & Alexender, K. (1997). Guidelines for usability testing with children. *Interactions*, 4(5), 9-14.
- Hoffman, D. L., & Novak, T. P. (1996). Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations. *Journal of marketing*, 60(3), 50-68.
- Kuo, Y. C. (2003). Guidelines on the interface design of children's website: usability, pleasure and interaction. National Taipei University of Science and Technology, Taipei, Taiwan.
- Laura, G. (1999). Evaluation net evaluations. *Searcher*, 7(2), 57-66.
- Lee, Q. R., Wei, P. X., Shi, Y. F., & Qiu, Z. Z. (1998). User Interface Design. Taipei: National Open University.
- Lee, S. Y., Lin, X. Y., & Wu, D. W. (2004). A study on presence format of ASP navigation interface design. *Proceeding of the 2004 Yagco Art and Technology International Symposium, Taiwan*.
- Lynch, P. J., & Horton, S. (2008). *Web Style Guide: Basic design principles for creating Web sites*. New Haven: Yale University Press.
- Markopoulos, P. & Bekker, M. M. (2003). On assessing usability testing methods for children. *Interacting with Computers*, 15(2), 141-149.
- Marschalek, B. G. (2002). Building better Web-based learning environments: Thinking in "3s". *Art Education*, 55(4), 13-18.
- McDermott, I. E. (2000). Internet instruction: Spreading the web. *Journal of Searcher*, 8(7), 72-76.
- Smith, A. G. (1997). Testing the surf: Criteria for evaluating internet information resources. *The Public-Access Computer System Review*, 8, 3.
- Stevenson, J. S., Gorden, C., Bruner II, & Kumar, A. (2000). Webpage background and viewer attitudes. *Journal of Advertising Research*, 37(2), 29-34.
- Tsai, C. H. (2007). A study on the aesthetics of web pages and the relative elements. *E-soc Journal*, 64. Retrieved June 15, 2007, from <http://www.nhu.edu.tw/~society/e-j/64/64-06.htm>.