Thinking Style Diversity and Collaborative Design Learning

Antonio P.Volpentesta[1], Salvatore Ammirato[1], Francesco Sofo[2],

[1]Department of Electronics, Computer Science and Systems, University of Calabria
via P. Bucci, 42\C, 87036 Rende (CS), ITALY
{volpentesta, ammirato} @deis.unical.it

[2]Faculty of Education, University of Canberra ACT 2601
AUSTRALIA
Francesco.Sofo@canberra.edu.au

Abstract. The paper explores the impact of structured learning experiences that were designed to challenge students' ways of thinking and promote creativity. The aim was to develop the ability of students, coming from different engineering disciplines and characterized by particular thinking style profiles, to collaboratively work on a project-based learning experience in an educational environment. Three project-based learning experiences were structured using critical thinking methods to stimulate creativity. Pre and post-survey data using a specially modified thinking style inventory for 202 design students indicated a thinking style profile of preferences with a focus on exploring and questioning. Statistically significant results showed students successfully developed empathy and openness to multiple perspectives.

Keywords: thinking style, project-based learning, collaborative design.

1 Introduction

This paper introduces a Project-Based Learning (shortly, PBL) experience approach for collaborative product design learning. It is a methodological aid to develop the ability of students, coming from different engineering disciplines and characterized by different thinking style profiles, to collaboratively work on a PBL experience in an educational environment. The basic idea is that creativity is favored by knowledge spillovers and synergies of many student designers working in a process performed by a virtual group and a team coordinated by a teacher who plays the role of concept design manager. The virtual group works on generating ideas and solutions (in a divergent phase) that are successively evaluated by a team in a collaborative section (in a convergent phase) where a critical thinking method is applied.[1] The outcome of

[1] According to Furst et al. (1999), we define a *group* as a "collection of individuals whose contributions to a product or a process are additive and can be collated and presented by a group manager as the result of group effort. Performance evaluation and accountability for a group will occur at the individual rather

the hypothesis tested and reported in this paper is that project-based learning (PBL) experiences increase the overall diversity of student self-reported thinking style preferences. Much of the literature on style of thinking maintains that styles are relatively fixed and difficult to change. Such variation, apparently in contrast with the literature in the field, is deeper analysed and results are reported and discussed as well

2 Theoretical Background

It is widely recognized that a collection of differently skilled designers can, in principle, go beyond individual knowledge and reach new concept ideas because design problems are understood from different perspectives (Ivanitskaya et al., 2002; Alves et al., 2006). For this reason, many manufacturing companies are embracing collaborative concept design approaches in the early stages of their product design process that often require participation of individuals from different disciplines, e.g. electronics, software, mechanical, industrial and management engineering, in sharing knowledge, performing design tasks and organizing resources. Collaborative concept design refers to intensive collaboration among designers, who strive for and create a shared understanding of the product concept[2] (Volpentesta and Muzzupappa, 2006).

There exists a body of research literature suggesting that thinking style diversity between individuals involved in a collaborative work is fundamentally responsible for tension leading to conflict but at the same time provides the most effective creative solutions, (Kirton, 2006; Dorthy and Swap, 2005). Under an educational perspective one problem is to establish if and how experiential collaborative learning might affect thinking style (or rather thinking style preferences) diversity between student designers.

Design is both a practice and a way of thinking; experiential design in education gives an opportunity to engage learners in design as an activity and explicitly guide their intellectual process. Moreover, when student designers work collaboratively, not only do they learn technical content but they also develop intellectually in order to communicate their creative ideas and collaboratively apply that content in meaningful ways (Atman et al., 2008).

PBL is one of the more effective ways for students to learn design by experiencing design as active participants; it is a form of experiential learning where design

than the collective level"; we define a *team* as a "collection of individuals who interact more extensively than group members to produce a deliverable, who are evaluated based on the team outcome, and who are accountable as a team (instead of or in addition to individual accountability) for team outcomes"; we define a *virtual group* (or *virtual team*) as a group (respectively, team) whose members are geographically, temporally, and/or organizationally dispersed and brought together across time and space by way of information and communication technologies to accomplish an organizational task.

2 In literature (Mamykina et al., 2002; Ulrich and Eppinger, 2003) a *product concept* is defined as a description of the form, function, and features of the product and is usually accompanied by a set of specifications, an analysis of competitive products, and an economic justification of the project; c*oncept development* is defined as the first phase in the product development process where the needs of the target market are identified, alternative product concepts are generated, and a single concept is selected for further development; c*oncept design* is defined as the work (task clarification, hypothesis formulation, solution searching,…) done, on a product concept by designers in the concept development phase in order to determine a product concept architecture.

projects are used as vehicles to motivate and integrate learning and it has turned out to be a major innovation in design pedagogy (Kolodner et al, 2005; Luxhol and Hanses, 1996). As a matter of fact, PBL experiences give student designers opportunities to improve their ability to work collaboratively, their communication skills and their design thinking, that is, how they think and embraces the heart of the design process by highlighting the creation, assessment, selection, and realization of ideas, (Ulrich and Eppinger, 2003; Dym et al., 2005). The attention to style of thinking comes from a keenness to optimize human use of intellectual and creative abilities within many work and life contexts. Adaptability leads to enhanced success so that optimizing performance may result from matching thinking style to the environment. Research findings on thinking styles provide a deeper understanding of the different ways in which people focus to make sense and use of the world. Different variables can have a coercive effect on one's style of thinking including one's family and workplace (Baker, 1968). The result of this is that people may choose to live and work in contexts that suit their style of thinking (Torbit, 1981; Sternberg, 1988). From the literature it is reasonable to conclude that thinking style impacts on performance.

Designers' creativity and diversity play a crucial role in collaborative processes. This is readily apparent when one considers that most creative pursuits in industry involve many individuals with various competencies working together to develop a product concept that cannot be created by a single individual alone (Mamykina et al., 2002) and that using creativity leverages the intelligence of different designers to tackle the complexity and uncertainty of a product concept generation[3]. Many researchers have looked at the issue of diversity as playing a key role in the collaborative development of a new product concept. Types of diversity frequently studied relate to gender, ethnicity, years of experience, technical discipline, Myers-Briggs type, and communication media (Hammond et al., 2005; Agogino et al, 2004; Reilly et al, 2002), but very few studies have specifically regarded thinking style diversity between designers engaged in product concept generation.

Thinking style bridges many domains including cognitive, affective, psychomotor, physiological, psychological and sociological realms. Style of thinking is first and foremost both cognitive and affective in essence. It is cognitive because information is processed; it is affective because one's feelings are involved in one's preferred way of thinking such as welcoming or avoiding various aspects such as authority, conformity, structure, ambiguity, reflectivity and impulsivity. In a more integral sense, style of thinking is 'affective' first and foremost since it refers to preferred thought processes, to the most comfortable ways of thinking. Thinking style has psychomotor and physiological dimensions because one's nervous system and senses are involved in how information is preferred to be perceived and processed. It is psychological because the choice includes preferential interaction of one's personality with the context. To the extent that the context is social, then style is also sociological because it is contingent on preferred crossing points with others. It is therefore evident that style of thinking is a social whole-person preference involving more than the brain alone but also one's creative sense of intuition and feeling. Style of thinking

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3 According Farid-Foad et al. (1993) and Martins et al. (2003) we define creativity is the capacity to produce new and useful ideas, or the combination of existing ideas into new and useful concepts, to satisfy a need in a specified organizational context.

is independent from intelligence and there is some unexplained variation in the theory of intelligence (Sternberg, 1997). Style and ability may be at times confused as people may be thought to be incompetent because of lack of ability where in reality it is an inappropriate use of their ability in their preference for the way of thinking. Only a portion of performance is attributed to intelligence, the rest is due to one's preferences for thinking and dealing with information and situations. Contemporary theories of thinking styles have been suggested to explain some of the variation. The theory of reality construction is a general theory that under-emphasizes the principles of societal or mental self-government (Sternberg, 1997) and focuses on dimensions of dependence, inquiry, multiple perspectives, autonomy and imagery (Sofo, 2005). The Thinking Styles Inventory (TSI) emanates from a theory of how people create their reality through their thinking and measures reported preferences for stylistic aspects of intellectual functioning. Inventories based on interviews have been used for comparative analysis in the fields of adult education, cognitive functioning and learning styles since a long time (Zhang and Stenberg, 2006). The name of the theory of reality construction emanates from constructivist theory, the idea that people actively construct their reality from their social interactions which are based on personally preferred ways of thinking. Interpersonal responses or interactions are based on how people like to think about problems. Sofo's (2005) theory of reality construction is a meta-cognitive perspective that underpins 5 styles of thinking. Some of these styles (Exploring, Independent and Creative) may be referred to as divergent thinking reflecting Zhang's (2002) category 1 thinking (Creative) while the Conditional and Inquiring categories are examples of convergent thinking and are similar to Zhang's category 2, concrete thinking. The styles also fit nicely into Zhang and Sternberg's (2005) intellectual styles model. The fives styles refer to how a person likes to accept, make sense of, and react to information, people and tasks. The theory maintains there are at least five mental styles (see Table 1) used in combination as a profile of styles in social interaction and in problem solving within different contexts. The relative response scores on each of the five styles produce a thinking style profile relevant to the particular individual.

Table 1. Summary of the five thinking styles on the TSI (Sofo, 2008).

1.	Conditional	Accepting what others think and say without questioning them
2.	Inquiring	Asking questions to improve understanding of message or information
3.	Exploring	Looking for alternatives and difference
4.	Independent	Allocating priority to one's own thinking
5.	Creative	Thinking in pictures to get a sense of the whole

A person with a particular preference in one circumstance may have a different inclination in another situation which means that people may be flexible and adaptive in their thinking. This also suggests that style of thinking is at least partly socialized because the environment can influence the style that a person prefers to use (Sternberg, 1997). It follows that the key assumption relevant in the development of the measurement of Sofo's theory is that people can be located within a blend of thinking preferences, ranging from conditional to creator, dependent on the characteristic mode in which they solve problems, create or make decisions. All thinking styles are potentially useful. The challenge is to utilize a style that works best for a person in each situation. A situation is dominated by the demands placed there by outside influences such as the law, social expectation, issues of safety and expediency. Other influences may include and demands of a profession, how those in charge of a situation expect subordinates to behave and pressures that individuals may impose on themselves.

De Bono's (1990) six colored hats method is a critical thinking method of organizing thinking patterns so that a person who is thinking can adopt a specific thinking style at any time, instead of having to try to combine all thinking styles at once. Multicolour printing is a useful analogy to explain these six thinking styles. Each color is printed in a separate step and in the final step, all the colors are combined. By analogy every person has the capacity for critical thinking by combining the expert use of all six styles of thinking (Johnson et al., 2007) used this method to design product concepts who reported a comparative study on the results of a competitive design project undertaken simultaneously by two multidisciplinary new product development teams.

3 The PBL approach

Following the constructivist approach an educational environment is a (virtual and physical) microworld where students and teachers meet to work together, interacting with each other, using a variety of tools and sources of information that allow them to search for learning objectives and activities in order to solve problems. Different studies have shown that the setting-up of an educational environment within a classroom of student designers is the prerequisite for conducting a PBL experience (Dym et al, 2005; His and Agogino, 1994).

The educational environment should be constructed of at least four components (Volpentesta et al, 2008):

1. *Information sources:* Online and offline learning materials (books, encyclopedias, teacher's notes, digital libraries, etc.), lab software reference guides, people analysis documents.
2. *Technological infrastructure:* An integrated set of ICT tools which enables educational modalities, like manipulating and constructing symbols, accessing and searching for information, asynchronous and synchronous interacting with students and teachers, delivering immediate feedback and reports of student or team performance to the teacher.
3. *Simulation:* The implementation of a model of real situations by creating a learning context which drives the student to analyze, integrate, synthesize and apply basic knowledge for solving problems.
4. *Strategy:* A structured set of pedagogical activities that serves as a guide, a feedback sources and promotes learning.

For conducting a PBL experience, the following roles are taken into consideration in the educational environment:

1. *Concept Design Manager* (CDM), played by teacher;
2. *Creative Designer Group* (CDG), formed by some students in the classroom;
3. *Evaluation Designer Team* (EDT), formed by all students in the classroom.

Members of the CDGs, that may be geographically dispersed, are required to work independently on the creative problem solving task. To better carry out their tasks, student designers can use the available ICT tools and information sources. Members of the EDT interact face to face and work together in collaborative sessions to evaluate ideas/solutions developed by CDG members. To better manage and control activities and students performance within the educational environment there should be restricted to 20 students interacting at a time.

The PBL experience comprises a cascade of four stage-gates consisting of defining concept visions, functional schema, functional layouts and construction solutions for a digital mock-up of an innovative product (e.g. a device).

1. The first stage generates product concept visions (cs_i) in response to a request forwarded by the CDM to the student designers.
2. The second stage receives as input cs_i and generate functional schema fs_i related to each of them. The purpose of a functional scheme is to define the functional structure of the product, i.e. macro system components and their interactions.
3. The third stage receives as input fs_i and gives out functional layouts (fl_i) each of which specifies the preliminary layout ,i.e. mutual position of each sub-systems and their possible volumes, and principle solutions for each subsystem.
4. The fourth stage generates some constructive solutions (cs_i) with respect to selected fl_i.

Each stage is composed by five sequential steps developed as follows (see Table 2). In step 1, one or more requests for proposal (ideas or solutions) are transmitted by the CDM to the classroom. Each request contains the specification of the concept vision (for the first stage) or of one of the successful proposals selected by the CDM as output of the previous stage (for the stages after the first).

Table 2- Steps and roles in each stage**.**

Steps in each stage	Roles
1 Launching call for proposals	CDM
2 Generating ideas/solutions	Each designer in a CDG
3 Collecting ideas/solutions	CDM
4 Evaluating ideas/solutions	Designers in the EDT
5 Ranking and selecting ideas/solutions	CDM

In step 2, “generating ideas/solutions” the requests are received by way of input; for each of them a CDG can be formed, thus each CDG consists of the student designers who autonomously choose to work independently on the same request for proposal. The output of this step is the set of original ideas/solutions that can be submitted by each student designer to the CDM. In forming a CDG, teachers neither define the group composition nor select a known leader. This is for two main reasons: first, many students do not possess the experience and skills required to be part of a successful team/group; second, as engineering educators, we are committed to furthering the educational growth of all our students in our course, not just the few talented ones who already possess the skills to succeed. Generating ideas and solutions is a divergent thinking activity aimed to stimulate creativity of independent student designers in order to obtain the larger number of innovative proposals. Such proposals are thus collected by the CDM during the “Collecting ideas/solutions” step 3 and assessed in a collaborative session, “evaluating ideas/solutions”, by the EDT. To stimulate convergent thinking during this session, the EDT evaluates proposals collected by the CDM using De Bono's (1990) *six thinking hats method* and to submit such evaluations to the CDM. During the "ranking and selecting ideas/solutions" step 5, the CDM, on the basis of the evaluations of the previous step, ranks the proposals and selects the most suitable ones for successive development (the next stages) or for final teacher-student evaluation.

Each evaluation step consists of a collaboration session performed by the EDTs and is based on the De Bono's "six colored hats" method. In the application of this method we consider six colored sub-sessions. During each of them all members of an EDT metaphorically wear a hat of the same color of the sub-session. These hats indicate the type of thinking being used by EDT members and the type of contribution they are required to give (Volpentesta et al, 2008).

4 The survey

The paper deals with the following research questions:

1. Can a PBL experience affect the diversity of student self-reported thinking style preferences?
2. Can the students involvement in some design situations induce a variation in some components of the self-reported thinking style preferences?

In order to answer these questions, we conducted a survey research on a sample of 202 students designers attending blending learning classrooms. Such sample was surveyed using a version of the Thinking Style Inventory (Sofo, 2008) specifically tailored to collaborative product design learning, the *CD-TSI*. The purpose of conducting the survey was to analyze the self-report of student designers with regard to changes in their thinking style preferences following the PBL experiences. To do so, pre-delivery and post-delivery data were collected and reported for each student in attendance.

Three PBL experiences where designed according to the proposed PBL approach; each experience consisted of selected activities developed over the course of a week-long intensive course and delivered to blended (virtual and traditional) classrooms of students designers. Surveyed students were all enrolled in engineering degree programs delivered at University of Calabria:

- a classroom of 12 students attending the "Industrial Design" course held in 2007/08. Such experience started from a proposal to generate a concept for "an innovative bookcase for a living room" (Volpentesta et al, 2008);
- a class of 110 students, divided in 6 classrooms of no more than 20 students each, attending the "Computer Aided Design" course held during 2005/06. The experience was based on the design of "a household electrical appliance for differentiated waste disposal" (Volpentesta et al., 2007);
- a class of 80 students, divided in 4 classrooms of 20 students each, attending the "Computer Aided Design" course held during 2004/05. The experience was based on the design of "an innovative vehicle to be used exclusively in shopping centers, airports or campuses". Main characteristics of the methodology and the depicted scenario are presented in Volpentesta and Muzzupappa (2006).

Each classroom has been regarded as an educational environment where product concept design has been developed; the teacher played the role of CDM and concept buyer/user, while students acted as CDG/EDT members.

4.1 The Concept Design – Thinking Style Inventory (CD-TSI)

The fifty items on the CD-TSI require respondents to think about their ways of designing during ten typical design situations (see Appendix 1). The situations proposed to respondents are strictly connected with the stages of a design process (questions 2, 4, 5, 9), with the approach of designers to collaboration (1, 3, 10) and with each personal way of designing (6, 7, 8). Without reflection about their own personal designing processes, subjects would not be able to complete the inventory. In each situation, the meta-thinking process is structured for respondents since they need to reflect in a comparative mode on their ways of designing. Respondents are asked to rank order their preferred ways of designing, pitting five alternative thinking behaviours against each other on each of the ten proposed design situations to determine their overall designing style profile. Each item has five alternatives using a likert-scale from 1 to 5 where 1 signifies designing behaviour that is 'least like me' and 5 signifies 'most like me'. Each of the five alternatives on each of the ten items must be ranked in order of preference. The set of the five sums of values on each column of the inventory (the scores) represents the thinking style profile for each student in the sample. Calculated scores for each individual can be interpreted according to instructions established by Zhang and Sternberg (2006) to identify patterns of thinking styles for individuals and groups. The CD-TSI was indirectly validated by relying on the validity of the Sofo's TSI (Sofo, 2005): a PBL test experience was preliminarily conducted on a classroom of 30 students gathering data with both the CD-TSI and the Sofo's TSI; students' profiles turned out to be similar in both cases.

5 Results and Discussion

In order to address the research hypothesis, pre-experience and post-experience means were calculated for students' thinking style profiles and then statistically analysed through ANOVA techniques and relative standard deviation (shortly RSD, i.e. the standard deviation expressed as a percentage of the mean). The use of such techniques is largely consolidated in scientific literature in the field (Sofo, 2008; Sternberg, 1997).

ANOVA data show no statistically significant differences between the pre-experience and post-experience means on the five thinking styles thus confirming the null hypothesis at 95% confidence level. Table 3 indicates pre-experience and post-experience mean values for each component of the thinking style profile. Standard deviations and range of given values are reported in Table 3 as well. To measure the degree by which data tend to spread from the mean, the RSD is reported as measure of dispersion for each mean value.

Table 3 – Pre and post experience descriptive statistics for CD-TSI

		Conditional	Inquiring	Exploring	Independent	Creative
Pre-experience	Mean	25.500	33.500	34.333	28.750	27.833
	Standard Deviation	5.962	6.142	3.798	5.101	7.530
	Range	18	21	11	19	25
	RSD (%)	23.38	18.33	11.06	17.74	27.05
Post-experience	Mean	26.750	33.833	32.500	30.000	26.917
	Standard Deviation	8.946	7.791	5.760	6.223	8.372
	Range	25	24	21	19	22
	RSD (%)	33.44	23.03	17.72	20.74	31.1

The result indicates similar average profiles for both the pre and post-experience data. The thinking style profile of the design students can generally be described as a high preference for seeking multiple perspectives and asking questions (exploring and inquiring preferences had the highest means). The scores on preferences for independence and creativity were also similar while the least preferred thinking style was the conditional style which means that students least prefer to conform to existing models and principles when doing design work.

However overall results of statistical analyses of pre and post-survey data show an increase of diversity of thinking style preferences in terms of relative standard deviation from the mean value of each thinking style in the CD-TSI (this seems to affirmatively answer the first research question).

For what regards the second research question, analyses has been conducted on all items of the CD-TSI in order to reveal possibly changes in the preferences of thinking styles during particular design situations. In this sense, ANOVA tests reveal a change in the preferences of thinking styles reported by students engaged in PBL experiences. Statistically significant differences were found on 5 of the 50 CD-TSI items tested and related to two of the ten proposed situations. The two situations are: "How do you think when clarifying a design task?" and "How do you think when debating and evaluating ideas/solutions?" ANOVA confirms that these differences are significant at $p<0.05$ (see Table 4).

Table 4 – Differences in thinking style preferences (pre and post experience).

How do you think when…				
Situation	**Thinking preferences**	**Pre-experience Mean value**	**Post-experience Mean value**	**Sig.**
clarifying a design task?	I define and offer my personal idea on the task (independent)	4.17	2.09	.03
	I accept others' proposals (conditional)	2.01	3.74	.0164
debating and evaluating ideas/solutions?	I offer my personal evaluation (independent)	4.42	1.75	.049
	I ask questions to better understand idea's meanings and others' evaluations on it (exploring)	2.17	3.73	.0248
	I tend to be affected by others' evaluations (conditional)	2.33	3.42	.031

The close clustering of significance in interesting since statistical significance occurs at both ends of the design process, the clarification and evaluation phases. The academic instructors emphasised the critical importance of the beginning and concluding phases of design stressing that they are the critical moments or tipping-point opportunities for significant creativity to occur. In particular De Bono's (1990) six thinking hats strategy was employed consistently during these stages of the simulations to ensure an emphasis on multiple perspectives.

The obtained results don't necessary imply a change in student thinking style profile, but they show that a PBL experience where students act as real designers during a collaborative design project can contribute to increase the awareness in their thinking styles. In this sense, results are not in contrast to what is said in literature ("thinking styles are relatively fixed and difficult to change").

6 Conclusion

In this paper we have investigated the impact of PBL experiences on thinking styles of students engaged in collaborative product design. Results show that a PBL experience can help the meta-cognitive process of highlighting personal thinking styles during design. Our initial exploratory study gives optimism for the education of design students as it points to some success in teaching openness to multiple perspectives and the cultivation of an open mind as the basis for creativity. A future study could evaluate the creativity of the design products of students who have experienced creative simulations with the products of a control group.

6.1 Acknowledgements

The authors thank Prof. Maurizio Muzzupappa for his meaningful contribution in designing and conducting the PBL experiences.

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Appendix: Concept Design Thinking Style Inventory (CD-TSI)

Situation: "How do you think when…"	1	2	3	4	5
1 formulating a design problem?	I prefer to apply known and proven principles and models	I need to follow a question- driven approach	I consider many options in formulating	I likes to be different, I prefer my own approach	I prefer a heuristic approach rather than an algorithmic one
2 searching for a concept vision?	More likely to build on ideas of others, less interest in being original or inventive	I focalize on questions about objectives and requirements of the product	I enjoy dealing with several ideas at once, I divide attention between competing visions	I prefer to search a concept vision alone, less consulting with others on views	I value originality, I likes to play with ideas and to be imaginative
3 clarifying a design task?	I tend to reveal "facts" rather than possibilities that can be created form them	I ask questions about task's objectives, constraints and limitations	I like to investigate all possibilities already on the table	I define and offer my personal ideas on the task rather than to be affected by others' view	I need to visualize possible task's output through sketches and preliminary drawings
4 designing product functionality?	I prefer to work on well defined and well understood product functionality	I inquire into main functional aspects of the product design	I look for functionality with respect to many different use contexts	I rely on my intuition and my problem solving skill	I look for original and unusual product functionality
5 designing product shape and geometry?	I focus on past experience relying on similarities with known artefacts	I ask "what if?" questions to come up with design proposals	I feel comfortable raising alternative shapes and geometries	I tend to minimize distractions to cope with difficulties in designing	I look for original and unusual shapes and geometries
6 retrieving knowledge for a design task?	I rely on other designers' knowledge to complement mine	I inquire into which and where useful knowledge can be	I consider multiple reservoirs of expertise that can be tapped	I rely on knowledge "inside my box" which can be accessed by myself	I am challenged to reject the use of routine knowledge and what is obvious
7 looking for perspectives or use contexts?	I value views and opinions of others, I rely on others' contributions	I question proposals and assumptions other designers rest on	I prefer to explore many ideas to depict different use scenarios	I focus on creating a personal perspective on the base of some usage scenarios	I broaden my thought process, even if it could be more easily distractible
8 searching for product experience/emotions?	more focused on others' emotional/experiential issues	I inquire which feelings strongly influence our perceptions	I investigate various emotional reactions influenced by the product	less interested in dealing with others' emotional/experiential issues	I value unusual emotional reactions
9 searching for a solution to assemble product components?	More likely to change my solutions to suit different situations proposed by others	I ask questions correlated with performance in obtaining design solutions	I try to explore many different solutions in designing components interfaces	Less likely to change or adapt my solutions to situations proposed by others	I follow side thoughts and I increase the tolerance for minor difficulties in designing interfaces
10 debating and evaluating ideas/solutions :	I tend to readily accept the first plausible option	I feel comfortable when all objections and questions are answered	I prefer to consider the full range of options	I look for good reasons to defend my position and possibly persuade others	I like to imagine ideas/solutions within future use context