Building Bridge between Learning and Positive Emotion: How to Apply Emotional Factor in Instructional Designing Process?

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Positive emotions and Cognitive process

For millennia, emotional states[1] have been viewed as avoidable impediments to rational thinking (Ellis & Newton, 2000). Several reasons have been pointed out. The lack of consensus of the definition on emotion that tend to conflict with each other was suggested as a main reason (Price, 1998). Also the difficulty of research methodology such as direct observation of private internal emotional experience and the experiment setups which often hide away the true nature of real emotional experience were indicated as additional reasons (Gadanho & Hallam, 2001). Yet, even with those restrictions, the research on emotions has been conducted in various academic fields including politics, business administrations, economics, organizational science, computer science, and medical science

Except the case of medical science, the emotion related researches are mainly focused on the effect of emotion, especially positive emotions[2] on the cognitive process. Positive emotions are usually considered as "pleasant", but the others are considered as negative (Gadanho & Hallam, 2001). This series of researches have been providing the evidences that the positive emotions has a crucial effect on diverse cognitive processes such as information processing, communication processing, negotiation processing, decision-making processing, category sorting task and even creative problem solving process. For example, Isen and Baron (1991) summarized based on the program of empirical researches that "persons who are feeling happy are more cognitively flexible, more able to make associations, more able to see potential relations among stimuli than other persons in a neutral state" (Isen, Means, 1983; Isen & Daubman, 1984; ; Isen, Johnson, Mertz, & Robinson, 1985; Isen, Dubman, & Nowicki, 1987). In her Broaden-and-Build Model of positive emotions, Fredrickson (1998) identified four positive emotions such as joy, interest, contentment, and love, and further suggested that positive emotions broaden the scope of attention, the scope of cognition, and the scope of action. The theory holds that, over time, the broadening triggered by positive emotions builds a range of personal resources, including physical resources (e.g., physical skills, health, longevity), social resources (e.g., friendships, social support networks), intellectual resources (e.g., expert knowledge, intellectual complexity), and psychological resources (e.g., resilience, optimism, creativity) (Fredrickson, 1998). Forgas (1998) also found that person in a positive mood formulated action plans that were more cooperative and integrative, and achieved agreements of higher quality than did neutral or negative mood participants.

On the other hand, there are some other researchers who argue that positive emotion and negative emotion plays different role in cognitive process. Bolte, Goschke, and Kuhl (2003) insisted the positive and negative emotions are accompanied by qualitatively different information processing models based on the personality systems interaction theory (Kuhl, 2000). According to this theory, an increase in positive affect supports a holistic processing mode, which is characterized in memory by the activation of wide semantic fields, which include weak or remote association. In contrast, an increase in negative affect supports an analytic processing mode, which is characterized by a more restricted spread if activation to close associates and dominant word meanings. Furthermore, positive mood states have been found to impair some aspects of cognition, causing poor performance on tasks assessing memory, deductive reasoning, and planning (Oaksford, Morris, Grainger, & Williams, 1996; Seibert & Ellis, 1991)

Emotion in instructional design

In learning context, emotion has been regarded as a relatively less significant factor affecting on successful learning than cognition has, even though there have been some critiques insisting that cognitive theories lack an adequate conceptualization of the impact of motivation and emotional factors in learning (Csikszentmihalyi, 1990; Krapp, 1992). Emotion is not generally recognized by the disciplines that address the broad issues of understanding complex systems and complex behavior, especially in the presence of learning (Kort, Reilly & Picard, 2001). However, like other academic field, the issue of emotion has investigated without being highlighted.

In recent times especially, the research on emotion in learning context has been conducted actively from two different approaches. One approach has been focused on fostering affective dimensions of human learning and development by designing instruction on affective domain that is consisted of six different categories such as emotional development, moral development, social development, spiritual development, aesthetic development, and motivational development (Martin & Reigeluth, 1999). Emotion is proposed as one category of affective domains that needs to be developed properly. Emotional development includes understanding own and other's feelings and affective evaluations, learning to manage those feelings, and wanting to do so (Martin, 1999). Bloom (1964) had identified three domains of educational activities and described affective domain as five major categories includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. This series of studies is called as "instructional designing in affective domain". The studies on emotional that also have dealt with key questions mentioned above are in the same vein of research (Salvory, 1997).

The other approach of emotion related researches concentrated on how to moderate emotions that could arise during the learning course. These kinds of study, unlike the first approach, doesn't consider emotional development, but try to integrate learner's emotion states in learning context aiming at how to handle learner's unstable emotional aspects to be more appropriately maintained during entire learning course. Generally, in this scope of researches, emotions are assumed being scattered on some position from positive emotions to negative emotions (Astleitner, 2000; Astleitner, 2001; Kort, Reily & Picard, 2001). Astleitner (2000) suggested that there are five emotions needed to be considered in learning context, which are fear, envy, anger, sympathy, and pleasure. He added that instructional designer need to consider those emotions to optimize the leaner's emotion states during learning process. Kort, Reilly and Picard (2001) also proposed model relating phases of learning to emotions. They divided emotions into positive affect and negative affect according to the cognitive dynamics of the learning process. Therefore, all possible emotions will be allocated in four different quadrant, which are constructive learning - positive affect (e.g., awe, satisfaction, curiosity), constructive learning – negative affect (e.g., disappointment, puzzlement, confusion), unlearning – positive affect (e.g., hopefulness, fresh research), finally unlearning – negative affect (e.g., frustration, discard, misconceptions). This model assumed that there is a process of specific emotions and equivalent cognition in learning context and those emotions are derived from 30 different emotion states.

From the viewpoint of general emotion related research, the problems are twofold. First, it is not quite easy to figure out what emotions have to be considered in learning context. Second, it is also questionable how the emotions could be categorized to help instructional designer utilize emotions into actual designing of learning process. Regarding the first question, Ekman (1999) provided several characteristics that basic emotions have to contain in general. However, figuring out the basic emotions in learning context is not a main concern to an instructional designer, because not only basic emotions but also other related emotions can be possibly occurred during learning context. As mentioned previously, how to optimize learner's emotion states is the key question for instructional designer.

Considering the previous researches on the effects of positive emotion on the cognitive process, it might be one reasonable way to categorize the emotions into positive emotions and negative emotions, since it is quite obvious to differentiate positive emotions from negative emotions. As a matter of fact, this classification of emotion has been broadly used in the research area of motivation and emotion in learning context.

To clarify the definition of positive emotions in the learning context, we need to understand two facts. One is the context of positive emotion, and the other is the characteristics of positive emotion. First, the positive emotion has to be considered in the context of learning. Referring the emotion sets in learning context shows that there are several types of positive emotions such as confidence, intrigue, epiphany, enthusiastic, excited, hopeful, curiosity, enlightenment, thrilled, anticipatory, comfort, interest, insight, satisfied and calm (Kort, Reilly & Picart, 2001). Those emotions are assumed to be helpful for learner to concentrate on the learning. However, we have to be careful with saying that "All of these positive emotions that we can verbalize have to be considered in instructional designing process!", because again, we are faced with the critical question, what are the positive emotions. Thus, the characteristics of emotion also need to be taken into account in defining positive emotions. In designing robot learning context, Gadanho and Hallam (2001) described some of the characteristics of emotion in learning process. First, emotion have valence that is, they provide a positive or negative value. Second, emotions have some persistence in time that is, it is not allowed to have sudden unrealistic swings between different emotions, particularly when the emotions in question differ a lot. Finally, emotions color perception in that what is perceived is biased by the current emotional state.

Given those two facts, positive emotions are well understood as the emotions which help learner concentrate on the learning task, which does not swing to different emotion suddenly, and which can be affected

by previous emotional states. For example, when the learner is not familiar with the learning task or contents, he/she will probably feel confused or frustrated at beginning of the learning. This emotion states will be automatically changed to the anxiety, if the task is not optional but required step for the learning. However, if the learner is getting knowledgeable with the specific tasks or contents, he/she will feel comfortable and furthermore, be satisfied with what he/she is doing, finally be enjoy working on the learning tasks. Of course, these are reasonably explained well when only the learning context is considered. There might be a lot of different factors which affect the learner's emotional states such as instructor, classroom atmosphere, weather, and personal issues. However, if we only think about the learning context, which is the interaction between learner and learning task, positive emotions will be one of obvious predictors that can positively affect learner's motivation and even performance.

Two positive emotion states and instructional design

There has been several emotion states suggested in the research of motivation field. The researches on motivation have been conducted from diverse topics such as expectancy, control, engagement, interest, goal, attribution, value, self-worth, self-regulation, and volition (Eccles & Wigfield, 2002). Among those themes, intrinsic motivation-related topics are mostly covering the emotion issues. When individuals are intrinsically motivated, they participate in activity because of learning interest and activity enjoyment (Eccles & Wigfield, 2002). For example, Deci and Ryan (1985) proposed self-determination theory in which two perspectives on human motivation are integrated, one is the optimal level of stimulation and the other is basic needs for competence. Csikszentmihalyi (1990) also defined the intrinsic motivation with the concept of "Flow", which describes experience of fully engagement in terms of an emotional state. Keller (1983) also suggests some emotional aspect with his ARCS model. According to his ARCS motivational design model, attention included perceptual arousal and inquiry arousal. However, the other components of ARCS model contain also some degree of cognitive process. Among those theories and models, learning interest and flow has been thought as an important part of intrinsic motivation (Eccles & Wigfield, 2002). Since the motivation is considered as the combined construct between emotional process and cognitive process together, it is very difficult to differentiate the former from the latter. However both of the interest theory and flow theory put an emphasis on the emotional aspect of motivation. Interest also has been considered as one of the positive emotions in learning and life (Kort, Reilly & Picard, 2001; Fredrickson, 2001).

Learning interest

Among the various emotions that have been studied in learning context, the role of interest and its implications for learning was studied from the beginning of the 20th centuries (Dewey, 1913). Since then, there have been a relatively large number of new empirical studies concerned with both the influence of interest on learning and development and the origin and transformation of interests (Krapp, Hidi & Renninger, 1992). The studies conceptualized interest in a variety of ways based on research questions and methods they had used in psychological or educational setting.

However, most common assumption of the concepts is that interest is a phenomenon that emerges from an individual's interaction with his or her environment (Krapp, 1992). Based on the common assumption, psychologist considered the characteristics of interest as followings (Izard & Ackerman 2000). First, Interest motives exploration and learning, and guarantees the person's engagement in the environment. Second, Interest is the only emotion that can sustain long-term constructivist or creative endeavors. These two significant features of interest imply that interest and motivation has very strong relationship. For example, Keller's ARCS model (1987) contains the interest as one of the motivational aspects, attention.

In learning context, the issue of interest has been investigated under different name such as epistemic curiosity, perceptual curiosity, cognitive interest and emotional interest, Berlyne (1965) suggested distinction between epistemic curiosity and perceptual curiosity. According to his distinction, epistemic curiosity concerns enquiry about knowledge and is shown when one puzzles over some science problem. Perceptual curiosity concerns increased attention given to objects in the environment such as symmetrical figure. He concluded that curiosity related to work in school setting seems to belong more to epistemic rather than perceptual curiosity.

The concept of cognitive interest and emotional interest was proposed by Kintsch (1980). According to the cognitive interest, cognitive interest adjuncts such as explanative summaries, influence learner's cognition by promoting the reader are structural understanding of the explanation. On the other hand, emotional interest is explained by that the addition of interesting but irrelevant material to a textbook lesson energizes learner so that they pay more attention and learn more overall. However, the results of the two experiments about emotional

interest and cognitive interest show that emotional interest doesn't influence learner's actual learning performance. It is quite attractive because those two researchers tried to explain two similar concepts with two different names.

Lot of researches on interest in reading education field have showed that two viewpoints of interest are assumed, one is individual interest and other is situational interest (Krapp, Hidi & Renninger, 1992).

From the view of Individual interest, Interest is implied as a characteristic of person. It is specific to individuals, developed slowly, tends to be long lasting, and triggered by individual's predisposition. For example, learners who are interested in topic or an activity pay more attention and acquire more knowledge that participants without such interest. Therefore, it is extremely time intensive and effort consuming to design learning environment in terms of individual interest. Finding out every possible individual interest and defining it to design learning environment are huge challenge.

Situational interest is generated as a result of interestingness. It is caused primarily by certain conditions and concrete objects in the environment, triggered by environmental factors, possibility of prescription, elicited by certain aspects of a situation, and it is assumed to contribute to the interestingness of the situation.

In summary, individual interest is a relatively stable evaluative orientation towards certain domains, and situational interest if an emotional state aroused by specific features of an activity or a task.

The (Figure 1) illustrates the relationship between individual interest and situational interest. As described, individual interest also can be affected by two aspects, feeling-related valence and value-related valence (Schiefele, 1999). Feeling-related valences refer to the feelings that are associated with an object or an activity, for instance, involvement, stimulation, and flow. Value related valences refer to the attribution of personal significance of importance to an object to and activity. Since those two aspects are highly correlated each other, it is hard to say from which aspect the learner feel interested in. However, it is obvious that some learners do the activity because they like it primarily based on feeling, and others do the activity because they think the activity is important for other purpose. Most of the researches on situational interest have focused on the characteristics of academic tasks that create interest (Hidi & Baird, 1986). Following features have been found to arouse situational interest and promote text comprehension and recall: personal relevance, novelty, activity level, and comprehensibility.
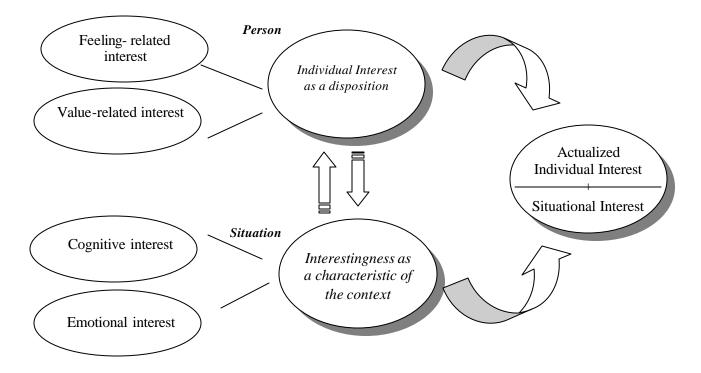

Figure 1. Individual interest and Situational interest

According to the distinction between cognitive interest and emotional interest, those are interest state derived by specific feature of a text. Therefore, both of cognitive interest and emotional interest will be counted as aspects of situational interest.

Flow

According to Watson et al (1988), positive affect refers to the extend to which an individual feels active, enthused and alert. It also reflects emotional states such as enthusiasm, drive, alertness, interest, joyousness, being self-determined, and therefore the ability of the individual to enjoy his or her surroundings, make use of and enjoy given opportunities (Konradt, Filip, & Hoffman, 2003). As already mentioned in the first paragraph of this paper, positive affect support cognitive flexibility, which means that person in a positive affect are superior in tasks requiring creativity in comparison to subjects being negatively aroused.

Flow is a state of experience which is characterized by an experience of intense concentration and enjoyment (Csikszentmihalyi, 1990). When people reflect on how it felt when they were in flow, they mention at least one, and often all, of these aspects: (a) sensing that one's skills are balanced by challenge, (b) engaging in a goal-directed activity, (b) receiving clear feedback, (d) feeling in control, (e) intensifying concentration, within a sense of (f) merging awareness, (h) disappearing of self-consciousness, (i) distorting the sense of time, and (j) perceiving the experience as intrinsically rewarding (Csikszentmihalyi, 1990).

In learning context, the term "flow" is used to refer to "optimal experience" events. The earliest writings on flow have signaled the expectation that flow is particularly important concept is an educational setting. It is also supported by the more recent researches showing that flow occurred more often during study and schoolwork than other daily activities (Massimini & Carli, 1988).

The flow state can be represented as a "channel" on a plot of challenge versus skills, separating the states of anxiety and boredom (Figure 2).
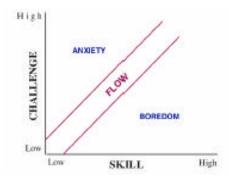

Figure 2. Csikszentmihalyi's original model of flow

According to this model, only a relative balance of challenge and skill is relevant to flow, not the absolute values. That is, if the challenge of a task decreases, it might become boring. However, if the challenge increases but one's skills do not improve to meet the challenge, then one might get into a state of anxiety. A learning activity might produce a progression up to the flow channel as new skills are learnt and greater challenges are sought on which to exercise those skills (Csikszentmihalyi, 1990). This model has been refined to include four, eight different states with the concept of channel.
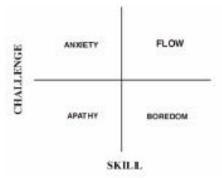
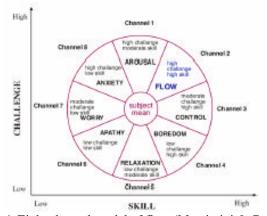*Figure 3*. Four channel model of flow (Massimini & Carli, 1988)

Figure 4. Eight channel model of flow (Massimini & Carli, 1988)

Recently, a series of researches have been conducted to apply the concept of flow in instructional technology field (Chen, Wigand, & Nilan, 1998; Chen, Wigand, & Nilan, 1999; Chan, Repman, 1999; Konradt & sulz, 2001; Konradt, Filip, & Hoffman, 2003). Since the concept of flow has been defied as a optimal experience, which is the balance of challenge and skill of learner, these studies tried to investigate how the learner's experience have changed while they are working on the tasks in web environment and hypermedia environment.

For measuring methods of flow, several approaches has been suggested and employed. First, ESM (Experience Sampling Method) was developed in which respondents were electronically paged about 8 times a day for a week to prompt them to a questionnaire (Csikszentmihalyi & Larson, 1987). A digital implementation of the ESM also developed and used in every day web activity (Chen & Nilan, 1998). To measure overall state of flow, FSS (Flow Status Survey) also has been developed and validated (Chan & Repman, 1999).

An ongoing issue in measuring flow is to find a method which makes it possible to measure flow independently from the positive states of consciousness such as happiness, concentration, control, lack of self-consciousness, and lack of distraction. One way was to use a measure of the balance between the challenge of an activity and the learner's perception of their own skill to do the activity. These two variables have been reported to be reliable indicators for measuring flow (Novak & Hoffman, 1997).

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[1]In this paper, the term emotion has been used to specify the feeling states which refer to specific states for the specific object. Mood usually refers to more general feeling states without any specific object. Affect refers to more stable, dispositional feeling states. However, researchers usually use the term mood and affect without clear distinction.

[2]The plural form of emotion (emotions) was used instead of the singular form of emotion (emotion), because there can be more than one positive emotion and negative emotion depending on the context. For example, Fredrickson (1998) chose joy, interest, contentment, and love as positive emotions. Ekman (1992) used the term "emotional families" to explain this.

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