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Critical incidents and language learning: Sensitivity to initial conditions

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Abstract

Critical incident theory has helped teachers to reflect on their teaching practice and elicit ways of improving it through identification of preconceptions and through reflection on the significance of unplanned incidents. This paper adapts these ideas to the perspective of language learners, in order to promote awareness and development of learning through conscious reflection. Recognizing that language learning is a complex, dynamic process, with numerous interacting and often unpredictable factors, the research incorporates aspects of complexity theory, according to which, apparently insignificant 'initial' events can determine the way in which global structures (e.g. learning) 'emerge' over the long term. Awareness of this concept can enable students and teachers to facilitate positive critical incidents and avoid harmful ones. In investigating the significance of 'sensitivity to initial conditions' in terms of language learning, this study invited graduate and undergraduate students to reflect on their learning over a semester and to identify critical incidents from their previous elementary and secondary schooling. Analysis of their responses led to the conclusion that sensitivity to initial events (critical incidents) does occur in language learning, but that the learner needs to 'notice' the incidents for triggering or realization to take place and to influence subsequent learning.

Keywords: Complexity; Critical incidents; Emergence; Noticing; Sensitivity to initial conditions

1. Introduction

In the drama of existence we are ourselves both players and spectators. (Heisenberg, 1958, p. 57)

Critical incident theory has been effectively employed by teachers and teacher-trainers as a means of improving teaching through reflection on classroom events (Farrell, 2008; Thiel, 1999; Tripp, 1993) and the identification and examination of these incidents has become part of 'reflective practice', a common component of many language teacher education programs, helping trainee teachers "to think about what happened, why it happened, and what else could have been done to reach their goals" (Cruickshank and Applegate, 1981, p. 553). This paper builds upon critical incident theory by introducing the concepts of 'sensitivity to initial conditions' (Byrne, 1998, p. 19) and 'emergence' (Larsen-Freeman, 1997, p. 154) from complexity theory (Waldrop, 1994), along with that of

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'noticing' (Robinson, 2006; Schmidt, 1995; Truscott, 1998). The investigation into critical events is carried out in this study from the point of view of the student, rather than the teacher, with the aim of promoting student autonomy, learning strategies and responsibility for learning. This student-centered view of the learning process and the learning environment views critical events, ideas and 'aha moments' (Koestler, 1967) from the learner's perspective, identifying the types of incidents that students find critical, and examining how these influence their learning development.

2. Critical incident theory

Farrell (2008) states that, "A critical incident is any unplanned event that occurs during class. […] if trainee teachers formally reflect on these critical incidents, it may be possible for them to uncover new understandings of the teaching and learning process." (p. 3). Brookfield (1990) adds 'perception' as a defining factor, seeing a critical incident as any "vividly remembered event which is unplanned and unanticipated" (p. 84), while Richards and Farrell (2005) state that such an event should "trigger insights about teaching and learning" (p. 113). Tripp (1993) takes a more "interpretative" approach. Acknowledging that "normal, everyday events" (p. 40) can be made critical, he emphasizes that they are not intrinsically so: "The point is that incidents only become critical because someone sees them as such" (p. 27). A critical incident (or event) is therefore not only an occurrence that has significant potential for influencing major change, but it is also perceived as such by the observer/participant. Such perceptions are important in language learning, since "learners hold their beliefs to be true and these beliefs then guide how they interpret their experiences and how they behave" (Griffiths, 2008, p. 121; cf. Farrell, 2009, p. 221). Because of this, critical events cannot be objectively identified, measured, or predicted, but are dependent on the awareness and willingness-to-observe of the observer.

> Critical incidents are produced by the way we look at a situation: a critical incident is an interpretation of the significance of an event. (Tripp, 1993, p. 8)

The perception of any incident is, therefore, responsible for the significance ascribed to it and this significance varies from observer to observer. Thus, the 'critical' occurrence is the 'noticing', which Schmidt (1995, p. 29) refers as "the conscious registration of the occurrence of some event" (p. 29). Koestler (1967) places such moments in a 'haha' (humorous), 'aha' (scientific), and 'ah' (artistic) trilogy of creation: "Gestalt psychologists have coined a word for that moment of truth, the flash of illumination, when bits of the puzzle suddenly click into place – they call it the AHA experience" (p. 185). Whatever the prior knowledge, expectancies and experiences which set off these moments, awareness of their existence can help learners to reflect on what are often seemingly minor occurrences, just as trainee teachers can be taught to "analyse critical incidents that occur while they are teaching" (Brennon and Green, 1993; Farrell, 2004 cited by Farrell, 2008, p.3). Such encouragement can be explicit and formal (Richards and Farrell, 2005; Thiel, 1999; Tripp, 1993), or implicit in the lesson materials (Finch, 2004a). In this way, language learners can be encouraged to discover "new understandings" about the learning process (Richards and Farrell, 2005), providing an additional dimension to the practice of reflection (Farrell, 2004, 2007, 2009). This focus is referred to by Tripp (1993) as "the original historical sense of the term, because it could mark an important change or turning point in this learner's biography" (p. 9). Critical incidents can therefore include events or realizations that occur outside the classroom, either as delayed reactions to lesson content, or as flashes of awareness that arrive in unexpected situations and locations, as a consequence of, or triggered by the learning process.

3. Chaos, complexity and language learning

> It seems that the tide of complexity is lapping at our feet as applied linguists, making it timely to consider how the assumptions and perspectives of our own field may be challenged by complexity. (Larsen-Freeman and Cameron, 2008, p. 5)

One of the major tenets of complexity theory is that it is "a science of process rather than state, of becoming rather than being" (Gleick, 1987, p. 5), offering an "alternative to the linear, reductionist thinking that has dominated science since Newton" (Larsen-Freeman, 1997, p. 142) and has been responsible for the "assumption that by studying influences on the process in a piecemeal fashion, and then aggregating the findings, we would be able to explain the

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whole" (Larsen-Freeman, 2007, p. 35). Van Lier (1996) suggests that "it is useful to regard the classroom as a complex adaptive system" (p. 38) in which "details are all that matters" (Gould, 1993) and that "it is fruitless to search for causal relations" (Van Lier, 1996, p. 38). Larsen-Freeman (1997) sees "many striking similarities between the science of chaos/complexity and second language acquisition" (p. 141), pointing out that "languages go through periods of chaos and order as do other living systems. Furthermore, their creative growth occurs at the border between these two" (p. 158). Complexity occurs at this border between order and chaos, and has been termed 'the edge of chaos' by Waldrop (1994, p. 198), when describing the capacity for learning that complex adaptive systems have when they are neither settled nor chaotic.

Eve et al. (1997), when discussing chaos in relation to the social sciences, describe three characteristics of chaotic systems:

> … there must be a non-linear operation; it must be iteratively carried out, that is, the operation is repeated with the output of one iterative cycle becoming the input of the next; and there must be sensitivity to initial conditions. (Eve et al., 1997, p. 144)

Language acquisition can be said to be a 'chaotic' process, in that it satisfies these three conditions. Firstly, "the processes involved in behavioral and social situations are non-linear" (Eve et al., 1997, p. 145; c.f. Larsen-Freeman, 1997, p. 152). Secondly, language lessons are iterative, in that the learning outcome of one lesson often becomes part of the input of the next, in a modified iterative cycle. Finally, this paper proposes that 'sensitivity to initial conditions' is also a characteristic of language learning. Known to many as the 'butterfly effect,' the concept of 'sensitivity to initial conditions' proposes that minor, (often unmeasurable) changes at the starting point of a process can produce startlingly different and unpredictable results: "A small perturbation in a system will produce very large changes in the results over time" (Eve et al., 1997, p 145). This concept is applied in this paper to the analysis of critical incidents, by proposing those events that seem insignificant when they occur can grow to have major implications in terms of the 'emergence' of effective learning. This latter term ('emergence') is another concept from complexity theory, describing the way in which global events and processes grow from the interactions of local 'connectivities' or systems. If we consider a tree, for example, we can view it as consisting of various subsystems (branches, leaves, bark, roots), which, as they interact with each other (and with other systems such as the weather, birds, insects and surrounding trees), produce growth. It is not possible to predict how cells will form or combine, but what can be said is that a structure will emerge that is typical of that species of tree (Finch, 2004b). If we look at the awareness of critical events as individual cells in this analogy, then the emergence of learning is sensitive to these initial conditions and dependent upon the way in which they interact with the learning environment.

Eve et al. (1997) point out that chaos is not 'chaotic' in the normal meaning of the term, but has observable properties such as 'attractors,' 'self-organization,' and 'emergence' (pp. 21, 22, 34) and "can lead to order and indeed to a form of stability that gives us an improved ability to forecast and even control the future. […] Chaos is first and foremost deterministic, and it is this determinism that is illuminating, not indeterminacy" (p. 144). Complexity, being 'life at the edge of chaos' (Lewin, 2000), also possesses these qualities and offers "a more encompassing, balanced, yet detailed-oriented, perspective" (Larsen-Freeman, 2007, p. 35), allowing us to view second language acquisition as a dynamic, complex, non-linear process that is open, self-organizing, adaptive, unpredictable, and sensitive to initial conditions (Byrne, 1998, p. 19).

> The educational context, with the classroom at its center, is viewed as a complex system in which events do not occur in linear causal fashion, but in which a multitude of forces interact in complex, self-organizing ways, and create changes and patterns that are part predictable, part unpredictable. (Van Lier, 1996, p. 148)

4. The study

Three instruments were used in this study, which took place in the English Education Department of a University in Korea. These instruments, which were used in three credit courses, consisted of a learning journal, an online survey about student learning experiences during the semester, and another online survey about critical events in elementary or secondary schooling. The medium of instruction in the university credit courses was English and the lessons took the form of blended learning, using lectures, online course software, and workshop-style group projects. 44 undergraduate and 30 graduate students were invited to participate.

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4.1. Learning journal

The learning journal[1] (Finch, 2004a) consisted of 15 sets of group activities focusing on educational issues, using adapted questionnaires from published research (e.g. CEQ, CLE, FCLAS, LIS, MIS, SILL), along with surveys and interviews. Each set of activities was followed by individual, written reflection on those issues or on anything else that the students perceived as meaningful. Rather than instructing students on methods of identifying and classifying significant events, this approach offered the opportunity to investigate learning and the learning environment on a continuous basis, thus raising awareness of the learning process. All meta-cognition and consciousness-raising was implicit in the group activities, rather than explicitly taught. In this way, it was hoped to promote spontaneous and original responses.

Forty-four graduate students taking a credit course in the Department of English Education were asked to reflect on their learning (and on learning in general) over the course of a semester, using the learning journal. In addition to this reflective function and to the development of writing skills which the journal promoted, it also served as context and consciousness-raising preparation for the end-of-semester surveys, which invited students to identify and comment on their interpretations of critical events that had occurred during the semester and during their previous schooling. It was not in the nature of the journal to identify critical events. Rather it was intended that students would become aware of and review their beliefs, opinions and perceptions regarding language learning and teaching and that during this process, they would begin to look back for the origin of their beliefs, being ready to 'notice' any critical events that they perceived as particularly significant in the emergence of their attitudes to learning.

4.2. Survey 1: 'critical incidents'

In the first survey used in this research, 44 undergraduate and 30 graduate students were asked to reflect on events (academic, emotional, interactional, social, and affective) which occurred during the academic semester and which they felt had significance for their future progress. This survey is part of the free *Moodle* course software (www.moodle.com), which was used in this study to make course information, resources and assignments available to students online[2], as part of a blended learning approach. The survey contains the following five questions:

1 At what moment in class were you most engaged as a learner?
2 At what moment in class were you most distanced as a learner?
3 What action from anyone in the forums did you find most affirming or helpful?
4 What action from anyone in the forums did you find most puzzling or confusing?
5 What event surprised you most?

Responses were classified according to observable trends and categories, indicating types of events that students considered significant.

4.2.1. Question 1: At what moment in class were you most engaged as a learner?

Responses to this question, which investigates how students related with the learning environment, can be broadly categorized according to the following topics: i) presentations ($n = 13$); ii) activities ($n = 11$); iii) discussions ($n = 10$); iv) assignments ($n = 7$); and v) groups ($n = 3$). While only three students thought that group-learning facilitated concentration, a larger number qualified this to include the first category (group presentations), the collaboration which took place because of them, and the benefits they gained from watching the presentations of other groups.

> … the moment I am [sic][3] engaged most, I think it was the short presentation, Our team members were really trying to be good. We had several times of meeting to complete the task and edit the whole materials…. Yes, it was really good. (Student 16, June 2009)

[1] This journal can be viewed online at: www.finchpark.com/books/lj/index2.htm.
[2] These resources can be viewed at: www.finchpark.com/moodle/.
[3] From this point, responses are presented 'as is', without comments on grammaticality.

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Other students identified the act of having discussions about tasks and assignments as meaningful and engaging.

> I was most engaged as a learner when I had a discussion with other students over one topic in class. (Student 31, June 2009)

Classroom activities were also identified as meaningful and engaging.

> During the activities, I felt that I was a learner. I was happy, and I can learn from other students by interacting. (Student 4, June 2009)

4.2.2. Question 2: At what moment in class were you most distanced as a learner?

This question raises the possibility that certain critical incidents might become negative initial conditions, eventually emerging as obstacles to learning. The main categories of response were: i) perceived weaknesses ($n = 14$); ii) presentations ($n = 10$); iii) failure to communicate ($n = 9$); and iv) listening to the teacher ($n = 6$). A further group ($n = 10$) indicated that they did not feel distanced. Perceived weaknesses formed the largest group for this question, suggesting that Korean students, perhaps due to traditional language-as-code teaching methods (grammar-translation, etc.), often have unrealistic learning expectations, seeing themselves as poor learners unless they have acquired the whole of the target language. However, a number of students saw these weaknesses as reasons for working harder.

> Owing to lack of my knowledge…, I sometimes couldn't understand what [the teacher] and other students said. I was sorry about that, rather, it encouraged and stimulated me to learn and study. (Student 21, June 2009)

Interestingly, the group presentations, which were identified as engaging in question 1, were also sources of distancing in this second question, largely because of poor preparation and presentation skills on the part of peers.

> I would say the moment when I am listening to a group's presentation. It was because they were not prepared well. (Student 12, June 2009)

Failure to communicate might be seen as an extension of the first group of responses (perceived weaknesses), in terms of communication and interaction.

> Actually, I did not speak English when I was with some familiar friends. This course is the only class that gives an opportunity to talk English to me. I appreciated the chance, but lost it sometimes. (Student 6, June 2009)

4.2.3. Question 3: What action from anyone in the forums did you find most affirming or helpful?

Returning to a positive focus, the main categories of response to this question were: i) cooperation ($n = 14$); ii) useful peer/teacher feedback ($n = 11$); iii) peer examples (role models) ($n = 7$); iv) positive attitudes ($n = 6$); and v) constructive feedback ($n = 3$). Cooperation and collaboration were given emphasis in the group-oriented and task-based learning environment of the course, and this was identified as a significant feature. The responses in this category are particularly interesting when the initial condition of friendly cooperation is seen as leading to the emergence of positive learning experiences and attitudes.

> When I asked a classmate for help to teach me a skill, the person kindly offered me help. (Student 48, June 2009)

Allied to this issue of cooperation were the next three categories (in order of number of responses), 'useful information from peers and the teacher,' 'peer examples' and 'positive attitudes.' It was apparently significant for the students that they were helping each other with information as well as skills, and those certain peers were providing positive input (initial conditions) as role models.

> The positive attitude of people inspired and motivated me. It was very helpful to do everything hard. (Student 3, June 2009)

> In every class, some people started to speak in English as soon as they came in the classroom. Thanks to them, most of the students [were] encouraged to speak in English. That was quite helpful. (Student 17, June 2009)

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4.2.4. Question 4: What action from anyone in the forums did you find most puzzling or confusing?

This question examines aspects that challenged students in terms of comprehension or rationale. Interestingly, the main category of response for this question was 'none' ($n = 21$). Other categories included: i) peer-problems and lack of commitment ($n = 15$); ii) misunderstandings ($n = 5$); iii) group problems ($n = 2$); and iv) lack of punctuality ($n = 3$). It is interesting here that the proactive cooperation and the positive view of presentations instanced in responses to questions 1 and 3 exist alongside problems in the same areas.

> I found groundless praise and encouragement not just puzzling and confusing, but irritating as well. Those bland praises often imply that they did not pay much attention to my work after all. (Student 2, June 2009)

4.2.5. Question 5: What event surprised you most?

The act of identifying an event as 'surprising' increases the chances of it becoming a critical incident (initial condition) from which positive learning attitudes might emerge. Categories of response included: i) course events ($n = 11$); ii) other students' work ($n = 10$); iii) personal achievement ($n = 8$); iv) class activity ($n = 7$); v) attitude change ($n = 7$); and vi) nothing ($n = 5$). The first group ('course events') concerns students' expectations and their surprise when these were challenged.

> At first, I am surprised with the style of this course. It is totally student-centered lesson. Because I'm accustomed to the traditional teaching method, I like to learn in a different environment. (Student 23, June 2009)

The second and third groups ('other students' work' and 'personal achievement') indicate positive learning experiences in terms of peer-work and individual work.

> The group presentation. It was amazing. Many groups were cooperating and showed great presentations. They look having great ability and potential. (Student 6, June 2009)

The impact of class activities has already been mentioned in responses to question 1. Of particular interest to the researcher in the responses to question 5 was an indication that positive attitude change was occurring.

> Writing the journal. I realized doing something regularly is really important to be good at something. I feel my attitude has changed that way. (Student 14, June 2009)

> I'm used to follow competition society, but through the course, I have changed my thinking about collaboration and competition. I have started to believe that positive effects of collaboration. I think it is most important to me. (Student 27, June 2009)

Looking at the responses to the five questions in the 'critical events' survey, it can be seen that an interactive, task-based, workshop environment allowed students to collaborate, to explore relationships and assignments together, to appreciate each others' efforts, and to reflect on their learning experiences. The course content was also meta-content, encouraging students to evaluate the processes that were occurring, with a view to promote heightened awareness and subsequent enhancement of learning. By focusing on their perceptions in the survey, it was hoped that students would become better, more efficient learners, more aware of the factors involved in learning, "What we observe is not nature itself but nature exposed to our method of questioning" (Heisenberg, 1958, p. 57).

A basic concept of sensitivity to initial conditions is that immeasurable differences at the start of a process can have largely differing repercussions later and it was noticeable that students completing the first survey did not have the distance to identify potentially seminal events. For this reason, the second survey was given, with the goal of discovering what sort of events were seen as significant over the long term.

4.3. Survey 2: 'critical events in school'

This second online survey encouraged students to identify events from earlier schooling, which they now perceived as significant, thus giving greater depth to the study and to the concept of 'sensitivity to initial conditions'. Question 1 dealt with elementary school, while Questions 2 and 3 substituted the words 'Middle' (Q2) or 'High' (Q3) for 'Elementary':

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> Q1: Can you remember any events when you were a student in Elementary school that changed your attitude to learning? These could be major events, minor events, or even seemingly insignificant events. Maybe these events occurred because of the teacher, the school, the weather, the subjects, your friends, etc…. What events stand out for you? How did they affect your attitude to learning?

Seventy students submitted answers to this survey, and their responses, which were analyzed using NVIVO8 data analysis software, identified a number of types of events or factors which had triggered 'aha' moments, or which had critically influenced them. Most of these categories dealt with "vividly remembered" events (Brookfield, 1990), but a significant number also identified events which seemed insignificant at the time and which gradually assumed greater importance. Of the possible 210 responses, the 174 "Yes" responses fall into the following main classifications:

1. Teachers: 75 entries
   - Motivational or new teaching methods: 22 entries
   - The teacher as a role model: 21 entries
   - Positive comments and praise for the students: 15 entries
   - Undesirable behavior by the teacher: 12 entries
   - Strict teachers: 5 entries
2. Personal ideas and events: 31 entries
3. Experience of success: 20 entries
4. Family: 16 entries
5. Friends: 11 entries
6. Stress: 8 entries

Most of the critical events concerning teachers were ongoing (rather than one-off) and had a lasting effect on the students. In this case, the noticing that occurred when looking back on previous schooling identified processes and long-term situations:

> I was a little pessimistic student. However, my homeroom teacher was very kind and care[d] about me. I was moved by her kind words and attitude. She changed my attitude to life as well as [to] learning. (Student 18[4], December, 2009)

> When I was a third grade student, my homeroom teacher was an English teacher. Thanks to her dynamic and interesting English classes, I got interested in English. (Student 21, December, 2009)

However, there were also a significant number of individual events, which were identified as generative. Three samples are offered here:

> There was a critical event: 1 day my parents took us to a Zoo in Daegu, where I saw my father talking to a blond-haired, blue-eyed looking foreigner in English: it was a very curious thing to a little girl. I asked my father later how he could communicate with the foreigner. My father told me that I can do that too if I study hard. So I did. (Student 1, December 2009)

> My father one day asked me, "How will you make your living when you grow up?" I thought to myself, "I can't sing well, I don't look that glamorous, but I am good at studying and learning new things". I studied really hard and my grades soared. This, I think, was one of the most critical moments in my life. (Student 44, December 2009)

> One day in 3rd grade in high school, I recognized that I spent most of my 19 years only for studying and my parents devoted their life only for my happ[iness]. (Student 3, December 2009)

In the first of these examples, the event of going to the zoo and seeing her father talking with a foreigner sparked curiosity, which then triggered the will to emulate and to achieve. In the second example, noticing is set off by a parent's comment, which is seen as a critical incident. In the third example, however, awareness comes 'out of the

[4] Student numbers in Survey 2 do not refer to the same students in Survey 1.

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blue' and we are given no hint of any causative factors. This would indeed seem to be an 'aha' moment. We can only speculate on the prior influences, experiences and expectations which lay dormant or which were interacting 'under the surface' before emerging at this moment.

These reflections support a sensitivity-to-initial-conditions/noticing/emergence-of-learning sequence, as can be also observed in the effects of isolated comments made by teachers:

> When I did not [do] good on my exam, my home teacher left me a message on my diary. It said, test is nothing to worry about and you have a whole life ahead of you. After I saw the message, I changed my mind […], exam was no longer burdensome to me. (Student 41, December 2009)

> 1 day my teacher said to me that "I thought you're better than that." I am 100% sure and know that he had no intention to hurt my feelings or discourage me on purpose. […]. However, I was seriously hurt by the innocent, short comment. (Student 49, December 2009)

> … my teacher came to me when I was studying and told me that I was doing a very good job. … This small incident actually encouraged me very much, and since 3rd grade, my grades really improved. (Student 45, December 2009)

Students here identify seemingly unimportant events which can easily be overlooked by teachers, but which can have disproportionate repercussions, depending on the noticing that occurs. The concept of sensitivity to initial events confirms that teachers need to beware of making negative comments or of using body language, which can be perceived as derogatory. It also suggests (as with the students who observed continuous positive attitudes in their teachers) that positive input, however small, can have extremely positive results.

It goes without saying that critical incidents can be negative as well as positive in terms of initial conditions and that negative input can lead to negative emergence. Some of the12 entries, which dealt with undesirable practices by teachers, mention corporal punishment, a practice which has since been banned in Korea. However, others focus on non-violent incidents, which impeded further learning:

> One boy bothered me almost everyday, so I got stressed and even I didn't want to go to school no longer. Finally, I decided to tell my teacher but she didn't do anything, so I was really disappointed about it. After that, I hardly talked with teachers. (Student 23, December 2009)

> … a new teacher came. She was not good at dealing with class management and teaching. … I started not to enjoy studying. She was so partial to the rich students. She didn't care for all the students. (Student 34, December 2009)

> My homeroom teacher told me that my score was not good enough to go to the university. I wanted to prove myself and to show him that I can do it. So after that, I struggled and got an almost perfect score at SAT. (Student 3, December 2009)

> I felt awkward now that I was memorizing words just because of the fear. (Student 29, December 2009)

Apart from the obvious effect of slapping and hitting on the part of the teacher, these and other similar entries show students becoming demotivated and giving up learning because a teacher treats them unfairly, ignores them, or instils fear in them. One student (above) is successful in disproving the teacher's negative comment by showing that he/she *is* good enough to go to university, but it would be dangerous to justify the comment on these grounds. The number of students taking such a positive attitude seems likely to be small in proportion to those for whom the comment could do severe harm in terms of their learning paths.

A further factor identified as critical in many of the categories is success. It is significant in these examples that the experience of success led to further success, as in Brophy's (2004) comment, "*The simplest way to ensure that students expect success is to ensure that they achieve it consistently*[5]" (p. 66).

> [My teacher] let me enter a kind of writing contest. I didn't expect to win any award so, I just forgot about the contest. However I've got an award and a gift a couple of weeks later. I couldn't believe that. Since then I've

[5] Italics in the original.

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> liked to read books and write about what I read. I really thank her for finding my talent. (Student 11, December 2009)
>
> When I got prize in writing diary, I was very glad. So till now I'm writing diary, which is very helpful to me. (Student 30, December 2009)
>
> When I was in Elementary school, nobody told me to study and I used to play all day long, then, one day, I became curious about certain subject (I can't remember what exactly it was.), so I started to look through books and spent several days reading books. What a surprise!! I got the first prize on the final exam when I was in sixth grade. From that moment, I came to love studying. (Student 54, December 2009)

While there is insufficient space to analyze the responses to this survey in depth in this paper, it is evident that events occurred in previous schooling, which the respondents saw as critical incidents. These incidents were the starting points (initial conditions) for significant changes in on their subsequent learning paths. A number of the incidents were apparently unexpected and unpredictable 'aha' moments of realization, rather than tiny sparks which set off a process leading to a forest fire. But if we consider these as sudden instances of emergence, then they can be seen as tips of icebergs, sitting on top of a mass of previous experiences and influence, all of which lead back to the initial critical incidents. Other observations identified critical processes, such as the ongoing positive attitude of a teacher who is seen as a positive role model. In this case, any one of a number of positive actions could make a critical impression and motivate the student. Finally, there were the negative incidents, often unrecognized by the teacher, which had deleterious results in terms of learning.

Results of this second survey confirm Van Lier's (1996) observation that lasting educational value is often recorded in affective, rather than logical terms:

> It is quite possible that the deepest, most satisfying aspects of achievement, and the most profound effects of education, both in positive and negative terms, are entirely unmeasurable … What if we held educators accountable for the quality of the memories they gave to their students, rather than for averages on national tests? (p. 120)

5. Conclusion

Research into the relationship between complexity and ELT is still very young, though it promises to throw important light on language learning as a complex, adaptive, dynamic, non-linear process (Larsen-Freeman and Cameron, 2008, p. 251). This study has attempted to apply the concept of 'sensitivity to initial conditions' to language learning, while promoting consciousness of this sensitivity and awareness of language learning processes on the part of the learners. It is inevitable that such a complex process as language learning will not progress in the same way, or at the same speed, for different individuals, and that acquisition of linguistic specifics (morphology, syntax, phonology, etc.) cannot be predicted. However, it is also a property of complexity that higher-order structures (language learning and use) 'emerge' out of the initial conditions, to which they are extremely sensitive. By researching students' perceptions of events, which they consider to be significant, therefore, and by helping students to be aware of the significance of such events, this research has attempted to chart a path for the emergence of positive and constructive learning in the future. As the analogy of the 'pebble effect' tells us, if we keep throwing pebbles down a mountain, there will eventually be an avalanche. We cannot predict which pebble will trigger the avalanche, but we can keep throwing them until it occurs. Similarly, it is proposed that by offering a stress-free learning environment and by being desirable role models, teachers can provide a wealth of positive initial conditions, any one of which has the potential to be 'noticed' at an appropriate time by individual students.

At this stage, this research is just beginning; it will be necessary to follow it up with interviews and further surveys with the participants on a longitudinal basis. However, it is surmised that even the initial awareness-raising that has occurred due to the attention of students being drawn to the concept of critical events, has, thanks to the 'observer effect' (or 'Hawthorne effect') the potential to help those students become more effective and informed learners. Just as the experimenter's presence impacts on the results of a study (Marshall, 2005), so it is proposed that this 'observer effect' will transform self-identification of critical events into significant conscious-raising for the learners, opening the door to further awareness and improvement of the learning process.

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