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ABSTRACT

This paper reports the results of a qualitative study investigating the dynamic operation of students' multiple motivational goals among the senior year cohort of a Catholic secondary boys school in Sydney, Australia. The study found that the relative salience of students' multiple goals, as well as the changing state of their ongoing academic motivation, varied dynamically across school contexts and across time. The study also found that key variables, influencing both the quantity and quality of students' academic motivation, also acted in dynamic ways in various school contexts and over time. One way to conceptualize this dynamism in students' motivation and its related motivational variables is to use a theoretical framework that explicitly addresses the operation of dynamic systems. This study proposes the Chaos Theory, in which dynamic elements are hypothesized to interact in unpredictable but describable ways, and provides an appropriate framework for examining students' motivation, especially in "real life" school and classroom contexts. The study concludes that chaotic perspectives may prove particularly appropriate for future investigations into students' motivation and the processes underlying and associated with this motivation. Thus, this study may act as a template for future studies seeking to explore dynamic perspectives with respect to students' motivation. (Contains 29 references.) (Author/MKA)

A chaotic look at students' motivation: Exploring the interface between chaos theory and goal theory.

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This paper reports the results of a qualitative study investigating the dynamic operation of students' multiple motivational goals amongst the senior year cohort of a Catholic, secondary boys school in Sydney, NSW, Australia. The study found that the relative salience of students' multiple goals, as well as the changing state of their ongoing academic motivation, varied dynamically across school contexts and across time. The study also found that key variables, influencing both the quantity and quality of students' academic motivation, also acted in dynamic ways in various school contexts, and over time. One way to conceptualise this dynamism in students' motivation, and its related motivational variables, is to use a theoretical framework which explicitly addresses the operation of dynamic systems. The present study proposes that Chaos Theory, where dynamic elements are hypothesised to interact in unpredictable, but describable, ways; provides an appropriate framework for examining students' motivation, especially in 'real life' school and classroom contexts. The study concludes that chaotic perspectives may prove particularly appropriate for future investigations into students' motivation, and the processes underlying, and associated with, this motivation. Thus, the present study may act as a template for future qualitative and quantitative studies seeking to explore dynamic perspectives with respect to students' motivation.

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Recent qualitative and quantitative studies investigating students' academic motivation have demonstrated that this motivation comprises a dynamic system of interacting goals, beliefs, affect, and intentions (Csikszentmihalyi 1996, 1990; Guastello, Johnson, & Rieke, 1997; Pintrich, Marx, & Boyle, 1993; Wentzel, 1991). Moreover, there is increasing evidence from these studies that this dynamic system may not (probably will not) act in a strictly linear, or stable, fashion. This, in itself, is not a surprising finding. Both practitioners and researchers are aware that the quality, and quantity, of students' motivation varies across time and learning environments. The non-linear nature of students' motivation is also consistent with other, related, studies which have demonstrated that students' overall social and academic development proceeds in non-linear, or chaotic, rather than strictly linear ways (Guastello et al, 1997; Jorg, 1998; Koopmans, 1998; Lutz, 1998; Van der Maas & Molenaar, 1992; Van Geert, 1997).

Despite this recognition, the vast majority of quantitative studies investigating students' motivation (including those emanating from within a goal theory framework) have investigated students' motivation using linear models, and linear measurement techniques. With respect to the later, even relatively sophisticated modelling and measurement techniques, such as Structural Equation Modelling (SEM) and Hierarchical Log-Linear Modelling (HLM), which allow for the incorporation of non-linear components (such as recursive paths) have, typically, been used to model linear relations. This situations is, again, not surprising given the recency and, to some extent, complexity of developments in chaotic (non-linear) modelling. In addition, linear models have been, at least partially, successful in describing elements of students' motivation (such as their goals, or purposes, for academic achievement), and relations between these elements (eg. Dowson & McInerney, 1998a, b).

Despite the above, linear models of students' motivation inevitably contain error (or 'noise'). This error is, typically, attributed to non-critical sampling or measurement irregularities. As such, for the purposes of making statistical inferences, it is often disregarded. Non-linear models, however, imply that this error may be more accurately ascribed to chaotic processes underlying, in this case, students' motivation (Koopmans, 1998; Lutz, 1998). That is, from a chaos theory perspective, noise is not seen as a random by-product of data collection and analysis procedures. Rather, it is seen as a integral part of a dynamic system and, therefore, a potential source of valuable information concerning the processes under consideration.

Qualitative studies investigating students' motivation, particularly from within a goal theory framework, have been much less prevalent than their quantitative counterparts (see Dodge, Asher, & Parkhurst, 1989; Dowson & McInerney, 1997; and Seifert, 1995; for some exceptions). However, neither have these studies, on the whole, explicitly investigated ways in which students' goals may be coordinated in chaotic ways. (It should be noted that the term 'chaotic', as it is used in this, and related, studies; does not mean 'without order'. Rather, it implies the existence of order within *apparent* disorder). This is not intended as a criticism of these studies *per se*. Rather, it is to point out that a potentially valuable perspective on the nature and operation of students' motivation has, as yet, not been explicitly incorporated into qualitative and, for the most part, quantitative studies of students' motivation.

The present study, in contrast, suggests that chaotic models and perspectives may more fully, and accurately, explain the dynamic nature of students' motivation. This particularly applies to the ways in which students' motivational patterns develop

in 'real life' school and classroom settings. As a result, chaos theory may provide a particularly appropriate theoretical framework within which investigations of students' motivation in actual school settings may proceed.

This need to examine the dynamic nature of students' academic motivation in 'real life' school and classroom contexts has been widely recognised in the literature. There have, for example, been many attempts to identify the most salient variables which interact to influence the development and operation of students' academic motivation. With respect to these variables, overviews, such as those by Ames (1992) and Blumenfeld (1992); have summarised an array of cognitive and affective components which may be associated with students' ongoing, goal-directed, academic behaviour and motivation. The problem, however, is not only to determine how these variables may interact to affect students' academic motivation. It also involves finding ways to conceptualise this interaction in ways which reflect its ongoing dynamism. Again, of particular interest is the changing configuration of these variables as they manifest themselves in the daily life of schools. There is a significant need, therefore, for school-based research into the nature of students' motivation which takes into account the dynamic nature, not only of students' motivation, but of the school contexts within which that motivation develops (Lemos, 1996; Roeser, Midgley and Urdan, 1996).

Purpose

Given the above, the specific objectives of the present study were to:
(a) demonstrate, from a theoretical perspective, ways in which chaos theory may inform, and enhance, school-based investigations into students' academic motivation, particularly those conducted within a goal theory framework;
(b) show how, using actual data from a longitudinal qualitative investigation, these theoretical perspectives may be applied to the study of students' motivation in school contexts; and
(c) demonstrate that students' motivation may conform to patterns predicted from chaos theory.

Research Setting

Participants

The participants in the study were students (n = 107) and teachers (n = 8) studying and teaching in a non-selective, Catholic, secondary boys school located in the northern suburbs of Sydney, NSW, Australia. The students were all in their final year of secondary schooling (Year Twelve). The participating teachers were all teaching the current Year Twelve students in various curricula areas. The participating students and teachers came from a wide cross-section of cultural, socio-economic, and academic backgrounds.

A senior year cohort was chosen for this study because, in New South Wales, senior students sit a state-wide tertiary entrance examination at the end of their senior year. Their performance on this examination determines their eligibility for limited places offered at universities. For this reason, senior students' motivation to do well at school is, typically, high (at least at the beginning of the school year). However, for the same reason, senior students often experience periodic 'crises' in their academic motivation during their senior year. These crises are due, anecdotally, to the

substantial pressure placed on them, both intrinsically and extrinsically, to maintain their academic motivation and performance for the whole school year leading up to their final examinations. Thus, senior students' motivation might, reasonably, be expected to display patterns of chaotic behaviour if, in fact, these patterns exist.

The School's Reform Program

The school in which the participants studied and taught has recently implemented a school improvement program specifically designed to enhance students' academic motivation and cognition. The program has been in operation for the past eight years. During this period, a variety of strategies have been employed to assist students to develop the kinds of adaptive motivational attributes (such as espousing a mastery orientation towards their academic achievement) described in the literature. The program has been very effective in raising the expectations of both students and teachers, and in encouraging the development of a productive academic culture within the school (Dowson & Cunneen, 1998). These improvements have led, in turn, to a substantial improvement in each senior year cohort's academic results (as measured by students' mean academic results on the standardised, state-wide, end of secondary school, tertiary entrance examination referred to above).

Despite this overall improvement, however, there have been noticeable variations in both the quantity and quality of students' academic motivation from year to year, and within school years. Moreover, it appears that these variations are largely unpredictable. Thus, strategies for motivating students which worked in one situation, or with one cohort; would fail to succeed in another. The present investigation, therefore, was driven, in part, by the desire of the school to explain these variations in students' motivation within the context of an, otherwise, highly successful program.. Initially, the investigation was directed towards evaluating the salience of a number of institutional and personal factors which, apparently but, prior to the study, anecdotally; interfered with the 'neat' development of students' motivation within the school improvement program.

Method

Interviews and Observations

As indicated by the above, this paper presents the results of a longitudinal qualitative investigation which assessed the development of senior students' motivation over the course of one academic year. The students and teachers involved in the study were individually interviewed, on a monthly basis, during the school year. This meant that, approximately, eight-hundred interviews, ranging from a few minutes to almost one hour in duration, were conducted. The interviews were designed to assess changes in both the quality and quantity of students' motivation across the school year and to determine salient factors influencing these changes.

The interviews were recorded in a series of field notebooks. Specifically, these notebooks recorded what both students and teachers said were students' difficulties relating to their study and ongoing academic motivation. In addition, the notebooks recorded observations of important processes, decisions, and events, which occurred both within and outside the school; which may have impacted upon students' academic motivation.

Analyses

Once the data were gathered, the categories, in this case changes in the quantity and quality of students' academic motivation and the variables which, apparently, influenced these changes; were inductively generated (Erickson, 1986). In order to assess the validity of the categorisation employed, randomly selected interview responses and observations were independently categorised by participants in the research. The degree of fit between the participants and the authors' categorisations acted as measure of the appropriateness of the categories. Modifications to the categories, based on these comparisons, were made where appropriate. An added degree of triangulation was bought to the initial analyses because the author (Dowson) is a university researcher familiar, but not intimately involved, with the school and its practices. Conversely, the co-author (Cunneen) is a teacher-researcher at the school, intimately familiar with the practices and 'atmosphere' of the school.

Changes in the *quality* of students' motivation were inferred on the basis of interview statements indicating changes in students' goal orientations across the school year, and across learning situations eg. with respect to different curricula areas, teaching practices, assessment tasks, etc. Changes in the *quantity* of students' motivation were inferred on the basis of interview statements reflecting substantial increments or decrements in students' positive attitudes towards their schoolwork. These attitudes were reflected, in particular, in the amount of schoolwork students reported they were undertaking at the time of each interview relative to previous interviews. The analyses also attempted to assess the impact of various observed external events, decisions, etc.; on students' ongoing academic motivation. These impacts were assessed on the basis of participants' responses to direct questions in the interviews. Finally, in addition to the above processes, data from the focus cohort were intentionally compared with interview and observational data gathered from previous cohorts. (Analyses of these data have been reported in previous studies eg. Dowson & Cunneen, 1997, 1998). This was done in to establish points of similarity and difference between the present cohort and previous cohorts. This, in turn, added depth and structure to the present analyses. All of this meant that, in total, data from over 800 students contributed in some way to the present study.

Theoretical Perspectives

Despite the inductive nature of the interview analyses, the study was, nevertheless, informed by a theoretical position which, consistent with chaos theory, alerted the researchers to the possibilities that:

> (a) relatively small differences in initial conditions relating to students' motivation could result in relatively large changes in both the quality and quantity of students' motivation over the course of the school year. For example, small differences in students' perceptions of the academic support they were receiving at school, at the beginning of school year, could lead to relatively large differences in their motivation as they year progressed. This hypothesis is analogous with hypothesising the exponential separation of points in phase space which has been demonstrated in dynamic physical systems displaying chaotic evolution (see Schuster, 1989).

(b) the dynamic system of students' motivation may be expected to demonstrate large qualitative differences as the system develops. For example, students' receiving a high degree of academic support may show either increasing motivation (due to the supportive nature of their learning environment) or decreasing motivation (if they perceive increasing academic support as an indication of a relative lack of ability on their part). This hypothesis is analogous with hypothesising the evolution of bifurcations (qualitative changes in the behaviour of quantities) in physical systems displaying chaotic evolution (see Schuster, 1989).

(c) the quality and/or quantity of students' motivation may display periods of stability interspersed with periods of instability. This hypothesis is analogous with hypothesising the evolution of intermittency in chaotic physical systems (see Schuster, 1989).

(d) Related to all of the above, students' academic motivation should be impacted upon by a variety of life events. However, the effect of these life events on students' motivation should not conform to strictly linear patterns. That is, (qualitatively) similar events may have very different effects on different students' academic motivation. This hypotheses is analogous with hypothesising that catastrophes (a.k.a. crises or perturbations) may have unpredictable effects in chaotically evolving physical systems (see Schuster, 1989).

Reporting Style

The results of this study are reported in a deliberately impressionistic fashion. They are not reported in the same way as positivistic evidence, nor are they intended to be so. As such they do not attempt to straddle research paradigms, an act which can destroy the quality of the evidence to be conveyed (Miller, Nelson & Moore, 1998). Moreover, in this case, the detailed impressions of the nature of students' motivation as it operated in one school are particularly informed by the co-author (Cunneen) who is a researcher-practitioner in the focus school. Adding to the impressionistic nature of the paper is the tentative conceptualisation of the processes investigated as being essentially chaotic, with salient elements implicated in students' academic motivation interacting in an unpredictable, but describable, fashion.

None of the above, however, should be construed to mean that the processes involved in analysing and reflecting upon the present data were in any way less rigorous than might be expected. Rather, the results, and the way they are reported, are the product a long process of data collection, analysis, reflection, collaborative discussion, writing, re-writing, and presentation of the results of this, and previous, related, studies (eg. Dowson & Cunneen, 1998, 1997, Cunneen & Masters, 1996). Through these processes the authors have developed a detailed and coherent understanding of the processes under investigation. Thus, the impressionistic method of presenting the results which follow has been deliberately chosen to convey meaning rather than to avoid fulfilling the expected standards of research and presentation.

Results

The interviews and observations indicated that motivational processes amongst the students were highly variable and rarely kept to linear patterns. Instead, there appeared to be a constant interplay between personal, interpersonal, institutional and other external factors; all of which impacted upon students' developing academic motivation.

Initial Conditions

In Chaos Theory, small differences in the initial conditions of a dynamic system may lead to profound changes as the system develops. This is in contrast to other (typically linear) systems where small differences in initial conditions may lead to little or no change as the system develops. In the present case, the initial conditions relating to students' academic motivation refer to particular characteristics of the students, their teachers and parents, and their school; and the ways in which these appeared to influence the development of students' academic motivation across the school year. Specific initial conditions which appeared to influence students' academic motivation included students' interpretations of their present academic performance in the light of their past academic history, their expectations of how they would 'feel' during the year, their ability to effectively manage their public personas, and their reactions to teachers' and parents' academic support.

What is more important, for the present study, however; is that relatively *small differences* in these variables appeared to have disproportionately large impacts on the development of students' academic motivation.

Interpreting Present Academic Performance.

Students' interpretations of their present academic performance, especially in light of their past academic history, appeared to be a particularly salient influence on students' academic motivation. One high-achieving student, for example, commented that:

> "Up until now [the beginning of the student's Senior Year] it's been easy to do well. I never really had to work at it. Now I really feel the pressure of having to do well all the time"

This comment was not atypical of a range of high-achieving students who, although having successful academic careers in their earlier years at school, had difficulty extending this history of success into their final year of school. Many of these students reported that the difficult nature of senior year work, the increasing competition between students, and the extra discipline required in comparison to early years; often caused them to "give up". For example, another excellent student, who had to be counselled by a teacher because, for the first time in his life, he scored a 'B' on an examination (rather than 'straight As') put it this way:

> "I used to be the only one who did any work, so I'd come first pretty easily. Now lots of kids work, so it's harder and I just want to give up."

These high achieving students also exhibited heightened emotional responses towards their academic performance. Teachers reported, for example, that high-

achieving students, who often expected to be interested in, and motivated towards, their school work; often expressed dismay at the apparent difficulty of "getting motivated to do study". This, in turn, in the words of one teacher, "made them tender, hypersensitive, and difficult to manage". High-achieving students also often engaged in "a search for meaning" in relation to their studies. They wanted to know what the "point of all the study I'm doing is". This often led, in the estimation of teachers "to 'over-analysis' which could cripple [high-achieving students'] attempts to study". In response to this, teachers often advised these students to "stop agonising and just go home and work". This advice, if not followed, however; meant that high achieving students may eventually become paralysed in their attempts to study which, ultimately, led to lower academic achievement.

Conversely, students who were not quite as high achievers in previous years, seemed to adapt more easily to the pressures of their senior year. These students still had more than adequate academic records, but were not, in the words of one "as brilliant as the 'real brains' [high-achieving students]". These less-than-highest achievers often reported having lower expectations of their success in their senior year. However, in the context of the school's academic program, which included the development of academic study skills, many of these students reported an increasing commitment to, and motivation towards, their study. Some students even expressed surprise at the effectiveness of the study skills they were encouraged to use. One student reported, for example, that:

> "I took your [the teacher/co-author's] advice and it really worked. I didn't think it would but it did."

This surprise translated into an increasing commitment to strategic study patterns, and improved academic results. Thus, relatively small objective differences in students' past academic history, as interpreted by students in relation to their present academic progress, appeared to lead to substantial differences in the quality of their academic motivation, cognition, and performance across the school year.

In addition to the above, the relatively small differences in students' past academic history (again as interpreted by them in their present situation), also appeared to make students more or less sensitive to changes in the goal orientations of their peers. For example, many students reported that they began the academic year with a strong desire to, in the words of one, "really understand what I'm doing". Thus, these students held, at least initially a mastery orientation towards the material they were expected to learn. However, impending examinations, the release of academic results, changes in topics or activities within subjects, and most importantly, *negative peer group responses to study*, could all act to undermine students' mastery orientations. Moreover, in these circumstances, students' mastery orientations may be actively replaced with a performance orientation towards achievement.

As indicated above, a students' developing adherence to a performance orientation could lead to profound decrements in academic motivation and performance. The interesting point for the present study, however, is that high-achieving students appeared to be more susceptible to pressures which may undermine their mastery orientations to academic work and achievement even though, objectively, they appeared more able than their less-highly achieving peers to sustain this motivation. One high-achieving student said, for example:

"I like the work and I know I can do it if I put my mind to it. But with all this pressure to succeed I just don't care about it any more. And it doesn't help that nobody else cares either. Now I just want to beat my brother [who had achieved a very high mark in a previous year] and that's all I care about".

On the other hand, less-highly achieving students, who reported that they were experiencing similar pressures, also reported the ability to maintain their mastery approaches to learning. One of these students said:

"I try not to worry about how I'm going to much, even when the pressure's really on. I just get on with it as best I can and hope for the best".

Thus, small objective differences in students' previous academic experience appeared to insulate them, or not, from the pressures which may cause a maladaptive change in goal orientation. The apparent consequences of this change became particularly noticeable with respect to students final academic results, with many students, who had previously had lesser academic results that their high achieving peers, actually achieving higher academic results than these peers.

Student Expectations.

Strongly related to the above, another key initial condition influencing students' academic motivation was their expectations of the requirements of study in their senior year. Here again, small differences in student expectations appeared to substantially influence their academic motivation. For example, despite widespread initial enthusiasm amongst *some* students regarding study in their final year, once the academic year had started many of these students reported a "sense of depression", with others reporting that their academic motivation "fell away rapidly in the first two weeks of school". Many of these students were surprised to find that they "never felt any real eagerness to do the work". They expected to feel "eager", but were unable to handle the "boredom" which came instead, especially in the face of the persistent need to complete assigned tasks. As a result, in the words of one teacher, many of these students "did much less work than they should have, and got lower marks than they expected".

Conversely, other students entered the year with lower, although not, apparently, *substantially* lower expectations. These lower expectations related not only to their potential academic performance, but also to their the ability to maintain their motivation towards school work, especially in the face of academic difficulties. For example, one student said:

"I never really think that I'll do all that well. I try hard, and I'll do all-right, but I'm not sure that I'll be able to stick at it, especially when the work is really hard. Sometimes I don't get the marks I want but I try not to let it phase me. I guess I don't aim to high so I won't be too disappointed if I don't get what I want".

Despite this somewhat negative appraisal, teachers reported that this student, and others like him, in fact demonstrated substantial application to their school work. This resulted in, in some cases, at least; excellent academic achievement. Thus, somewhat lower expectations of academic achievement, *and* academic motivation,

appeared to be *more* adaptive than higher expectations, even if these higher expectations were associated with greater *initial* academic commitment and motivation.

Managing Students' Public Personas.

In the context of a school program designed to enhance students' motivation, some students' demonstrated a disposition to *appear to be* motivated towards study. This disposition, in turn, appeared to be an important initial condition related to students' ongoing academic motivation and performance. Teachers reported, for example, that, for many students it appeared important that they act as if they were academically motivated and successful, without actually completing the school work which would demonstrate academic motivation and success. On occasion, this motivational 'feigning' would be directed towards avoiding punishment. However, more importantly, it also occurred, in various teachers' estimations, when students wanted to *convince themselves* of their own likelihood of success.

This motivational feigning would then, often, lead to an unfounded confidence amongst these students with respect to their future academic achievement. This unfounded confidence existed amongst some students to such an extent that teachers described these students as "living in fantasy worlds of future success, high incomes and glamorous occupations". Whilst for some the 'dream' would simply include a high income "somewhere", for others it would take on a particular focus such as "world fame in music or sport".

Teachers reported that such "unrealistic" students proved very difficult to counsel towards increased academic effort without "running the risk of destroying them in the process". Teachers also reported that the self-image of extreme sporting or musical fame was, occasionally, fed by some degree of athletic or musical success at the school level. However, this occurred:

> "without the realisation that there was a 'quantum leap' upwards from their limited success to the professional sporting or performance world".

Moreover, any negative comments by teachers regarding these students' sporting or musical "idols", contributed further to their [the students'] unwillingness to take academic advice. The expressed dilemma by teachers, thus concerned, in the words of one:

> "how to disavow unrealistic students of their dreams without sending them into despair".

As might be expected, these "self-deluded" students displayed poor academic motivation throughout the year, and poor academic performance in their interim and final examination results.

In contrast to the "self-deluded" students, teachers reported that other students would "deny loudly that they were doing any school work at all" when, in reality, they were "working at their desks for hours on end". One teacher reported, for example, that:

> "student group cynicism would determine that it was 'uncool' to be seen to be doing schoolwork. So, none would be *seen* [emphasis his] to be done. All study advice from us [teachers] would be rejected in public, but it would be acted upon privately".

This situation was complicated, however, because, despite the private work of some, other students would believe "that the publicly expressed group attitude was the truth". Thus,. teachers reflected, it was often the case that, out of a given group of students, some would perform much better than the others, having:

> "successfully disguised their efforts beneath cynicism for months on end, lying not just to the school but to their friends as well".

Thus, differences in students' management of their public personas, which was related to their ability to *privately* self-manage their academic work in response to the influence of negative peer reactions; appeared to be an important initial condition implicated in students' ongoing motivation and later academic success. What is probably of most importance for the present study, however, is that identifying students who would be 'self-delusional' or 'privately-studious' at the beginning of the year was very difficult. Neither of these two groups appeared to display very different behaviours or attitudes towards achievement initially. Rather, only isolated comments in interviews, and isolated behaviours in classrooms, might indicate differences between students in each of the groups. However, as the school year developed these differences became highly apparent. Thus, the initial differences between these groups, on this condition, were small. However, as the small initial differences developed, they had significant consequences for students' motivation and achievement.

Orientations Towards Work Avoidance.

Students' orientations towards work-avoidance, and their interpretations of teachers' reactions to work-avoidance incidents, also appeared to be an important initial condition related to students' ongoing motivation and achievement. Teachers reported, for example, that students' "stories" regarding incomplete school work often posed dilemmas for them. Student stories such as "the dog ate my homework" may be cliche, but were directly reported in this study. As a result, teachers often found themselves, in the words of one:

> "worn down by the necessity to judge the truthfulness of various stories, some of which appeared to be well documented and verified by outside agents, but who [the agents] may have unwittingly acceded to the 'scam'".

The choices for teachers in these situations were unenviable. To fail to accurately determine the truth, or otherwise, of an excuse offered for incomplete schoolwork was "to risk being seen as either heartless or a fool". Teachers reported that both of these descriptions had been applied to them and, in either case, a student's confidence in the teacher would be undermined. Moreover, the situation would be exacerbated if the story of an injustice, or "snow-job", was spread amongst the student body.

The main point for the present discussion, however, is that the willingness to expend effort in "fooling" (or attempting to fool) teachers, was very difficult to detect early in the school year. Using a retrospective analysis of students' interview statements did, as in relation to the previous initial condition, demonstrate isolated comments which might indicate that some students held a orientation towards work-avoidance somewhat greater than that of their peers. However, in the context of overwhelmingly positive comments from most students (including those who turned out to demonstrate work-avoidance behaviours) about their intentions for diligent work at the beginning of the school year, these differences were very small. Despite this, the work-avoidance orientation, as it developed, represented a important initial condition for students' developing academic motivation and achievement. Thus, students who displayed a work avoidance orientation also, typically, displayed steadily decreasing academic motivation and achievement across the school year, as well as an increasing "desperation", in the words of one teacher, "to circumvent the system in order to get marks without effort".

Student Reactions to Teacher 'Support'.

Related to the above, another important initial condition related to the development of students' academic motivation concerned students' reactions to teachers' academic intervention or support. Some students, for example, reported that:

> "it was good if teachers rang you up during the holidays to remind you of the work that needed to be done".

This confirmed teachers' opinions that "personal interest expressed by us is a great motivator". On the other hand, teachers also commented that other students would find such phone calls to be unwarranted intrusions into their privacy, and would "use them as an excuse not to do anything". For example, one student responded to a teacher's call in the following manner. After the teacher had asked him "how he was going" [with respect to his school work], the student said:

> "Well, I was about to start work, but you keep putting all this pressure on me so now I won't!"

The variability of student reactions to teacher support was also, apparently, related to subtle changes in teachers' roles. Teachers' roles could change subtly as various institutional, parental, and other expectations were brought to bear on their work. One teacher explained how the expectations placed on him by other members of the school community affected his students' reactions to his academic support. Originally this Coordinating Teacher's role had been to motivate and advise students with respect to their academic progress. Gradually, however, this role changed as increasing numbers of disciplinary actions were "foisted upon [him] by other teachers". Comments from other teachers such as "[student X] hasn't done his homework - again!"; indicated to the Coordinating Teacher that he was expected "to take on the role of an enforcer". Allied to this change was the repeated request to help "struggling students". Thus, the Coordinating Teacher's role also began to "include duties related to that of a remedial teacher". The teacher stated that, while such roles had their place, when combined with his original role as a student motivator they:

"caused overload and contributed to a loss of personal energy and confidence. It became too hard to move from the persona of stern disciplinarian to that of trusted adviser within short periods of time".

This change in role impacted upon students' motivation in various, unpredictable ways. One student, for example, reported that "when teachers pick on you it means they care". Other students, however, reported that, even advice on how to study meant that "teachers are always trying to tell you what to do instead of just letting you do it your own way". Thus, to one student discipline (which was now part of this teacher's role) was interpreted as 'care', to another, even apparently mild discipline was interpreted as a threat to individuality. Several teachers reported that, in the later case, students' task engagement would often: "drop to zero" (in the words of one).

One key point for the present study, implicated in the above, is that differences in students' reactions to teacher support, especially in the face of changing teacher roles, led to wide variations in students' academic motivation, engagement, and achievement. As importantly, however, (as with the initial conditions immediately above) only small identifiable differences in students' initial (beginning of year) reactions to teacher support developed, as the year went on, into much stronger reactions, with commensurately strong concomitant decrements in students' academic motivation and engagement. For example, at the beginning of the year, subtle differences in students' actions and behaviour, appeared to indicate those students which would later react negatively to teacher support. These behaviours included vacant stares in classes or assemblies, failure to make eye-contact with teachers, disengaged body language, argumentativeness, a predisposition to copy the inappropriate behaviour of others, and a belief that, in one teacher's words, "an 'I don't care' attitude would attract my attention". Thus, only relatively subtle initial differences between students might indicate much larger differences to come.

Students themselves also recognised that they, both consciously and unconsciously, engaged in these behaviours - particularly when their interest in school work was waning. Thus, when students displayed these behaviours it could be an early indication of declining academic interest. This declining interest was, in turn, linked to declining academic performance amongst students. However, an interesting point for the present research is that declining overall academic interest could also lead to *fixated* interest. Fixated interest occurred where a student became fixated on one aspect of a subject - such as becoming fixated on the types of bullets used in World War One. This fixation was pursued to the determent of, in this case, a more global understanding of the causes and outcomes of World War One, which was the main focus of the history subject the student was studying. Thus, a student could become an expert in the manufacture and use of bullets in World War One, without developing sufficient other understandings to pass the subject. The operation of fixated interest with respect to students' academic engagement may not be unlike the operation of 'strange attractors' in chaos theory. (In chaos theory a strange attractor occurs where a dynamic system becomes 'fixated' on a point to which it returns again and again).

Parental 'Support'.

Students' differential reactions towards parental support also represented a key initial condition which affected students' academic motivation. As the year progressed, for example, it became apparent that some students clearly valued and

respected academic support from their parents, whether this involved parents helping students with work or, even, offering incentives to study such as end-of-year holidays. These students also, often, reported wanting to achieve at school in order to meet the expectations of their parents for their (the students') academic success.

Other students, however, clearly did not value parental academic support as much as others. Some students considered parental academic support as irrelevant or, even, counterproductive. These students mentioned, for example the "heaps of pressure" they were experiencing from their parents "to do well at school". Parental 'support' could also be particularly discouraging to these students if it contained 'mixed messages'. It was not uncommon, for example, for teachers to report comments by parents such as the following:

> "I don't know why he [the student] doesn't do any work. We're at him all the time, got him a desk, and an encyclopaedia. But he just does nothing. Of course I didn't do anything at school, mucked up all the time, hated poetry, and maths, couldn't see the point of any of it, and I've done all-right. But I tell him, don't you play up like I did. You do your study."

The important point for the present study, however, regards not so much the quality of parental support students received. Rather, it concerns that fact that differences in reactions to parental support appeared to account for substantial differences in students' academic motivation *regardless* of the quality of that support. For example, some students reported that their parents, in the words of one student "nagged them all the time about their schoolwork". Parental "nagging", however, was interpreted by this, and other, students as meaning that "they [parents] care about how I'm going". For other students, however, even apparently positive parental support, such as offers to assist with homework, or attempts to vary family routines to fit in with study routines; meant that students would do less school work "just to show them that they can't push me around". Thus, students' reactions to parental support appeared to be as variable and unpredictable as students' reactions to teacher support.

Moreover, as with students' reactions to teacher support, students reactions to parental support were not highly differentiated early in the school year. Rather, early in the school year, almost all students appeared to appreciate their parents support, as evidenced by their interview comments and active participation in early parent-teacher-student nights. However, as the year progressed, negative and positive reactions to parental support became more profound, and appeared to discriminate highly those students who sustained their academic motivation and engagement in learning and those who did not. For example, one student who was particularly offended at his parents', apparently, positive academic support (ie. offering to assist the student with their homework) said:

> "I don't really care any more. The can try to help me all they want but I'm sick of them being at me all time. I wanted to do the work to start with [at the beginning of the school year] but now I'm just fed up with the whole thing."

As might be expected, students who eschewed parental support often displayed decreasing academic motivation, a decreasing desire to please their parents through their academic achievement and, typically, lower academic results at the end of the year.

Summary of Initial Conditions.

It appears, from the above, that relatively small initial differences amongst students with respect to some key variables may lead to relatively large differences in both the quantity and quality of students academic motivation, and in the quality of their subsequent academic engagement and achievement. To this extent, it appears that the chaotic perspective of recognising that small initial differences in systems may lead to large resultant differences as systems develop is not incompatible with the present data.

Bifurcations

In chaos theory, bifurcations refer to large, fluctuating, 'chaotic' changes in the quality of dynamic systems which may result as these systems evolve. In the results above, growing differences were noted as the dynamic psycho-social system comprising students' motivation developed. However, amongst some students, these differences further developed into profound and erratic actions and reactions which proved highly consequential for their ongoing academic motivation and achievement. Thus, these bifurcations may be seen as the next stage of development of the dynamic system comprising students' motivation if the differences, noted above, were further developed. In the present study, various student characteristics and institutional changes, especially as they developed in the face of ongoing academic pressure, led to erratic changes in students academic motivation and performance across the school year.

Academic Focus: 'Single-mindedness' and 'Party Animalism'

An example of how developing initial conditions could result in erratic changes in students' motivation and achievement follows. At the beginning of the school year, some students reported a single-mindedness of purpose towards their study which appeared to set them apart from other students. This single-mindedness clearly helped them resist, particularly, the social pressures which de-railed the study intentions of others. However, teachers reported that this single-mindedness could cause conflicts within the school in that it would cause students to act in a manner interpreted as "selfish" or "idiosyncratic" by some staff. For example, staff reported several instances of single-minded students abruptly withdrawing from sporting or other extra-curricula, commitments in order to become "monastics" [with regard to their study].

Also related to this single-mindedness were, what were perceived by teachers to be, excessively legalistic approaches towards the awarding of marks. This was particularly true when some students, other than the single-minded students, may have received special consideration with respect to their marks in order, for example, to account for the difficulty of an assessment task. Teachers reported that single-minded students were often highly reluctant to accept such considerations, and their excessive emotional reactions towards these considerations (including sullen or destructive behaviour) often resulted in strained staff-student and student-student interactions within the school community. These negative interactions could, also, have long term consequences regarding perceptions of fairness within the school, and could result in the alienation of both single-minded, and less single-minded, students due to ongoing perceptions of favouritism or discrimination. Thus, single-mindedness amongst students was closely associated with a strong performance orientation

towards academic work (ie. a focus on marks and relative performance amongst students) as well as a pre-disposition towards erratic emotional responses in the face of encountered difficulties. These emotional reactions often resulted in large fluctuations in students' application to schoolwork, and subsequent decrements in their academic performance. Moreover, as indicated, these reactions could also have long-term consequences for inter-personal relationships within cohort as a whole.

Interestingly, single-minded students also, often, followed highly idiosyncratic work pattens. These included working all night (sometimes with the aid of pharmacy drugs), or using a limited range of approaches to study (such as summarising a text book), in a highly intensive manner (eg. summarising a *whole* text-book). These strategies were followed even if they were not always the most appropriate ones to use in a given situation. Despite this, the diligence with which single-minded students adhered to these approaches and habits sometimes, at least, ensured their success, Thus, one teacher said "it's not the way I'd do it but they make it work for them". So, there appeared to be a contradictory pattern of motivation evident amongst the single minded students. On the one hand their efforts may stem from a performance orientation whilst, on the other they may be simultaneously driven by an emphasis on effort, which implicates a mastery orientation. Whatever the case, it appeared that the single-mindedness of some students led them, both emotionally and cognitively, into idiosyncratic, and erratic, modes of application to study.

The opposite extreme to the single-minded students were those students who reported a pre-disposition towards maintaining extensive social activities across the school year . For example, one student reported surprising his parents by his low academic results in the middle of the year, especially considering the amount of time they (his parents) had "forced him to stay in his room studying". As the interview progressed, however, the student admitted that:

> "I don't do much in there, just sit about, listen to music and look through books a bit. I know all the stuff you [the interviewing teacher and co-author] say about study, but I just can't get started when I'm there."

The co-author followed this response with the question: "What do you think about when you're there?" The student responded: "Oh, nothing much, just going out and that, parties and things."

Some background knowledge regarding the social milieu in which this student operated sheds some additional light on this seemingly vague response. This student was one of a group of fanatical party-goers who attended parties either with or without an invitation. Collectively, these students had a well developed network of 'informers' who told them where and when parties were on. The pressure to attend these parties was such that it constituted, in the words of one teacher "a night life sub-culture, revolving around cars and parties". Within this 'sub-culture' attendance at parties was virtually compulsory. Moreover, not only were these "events of the night" a distraction from study in themselves, but so was the extensive planning associated with them. This planning included identifying clandestine rendezvous, sharing information, and precisely timetabling arrivals and departures so as to attend as many functions as possible in the one night. After these nights were over there were also long series of post-mortems, and occasional legal problems, to be discussed and concluded. Thus, while this student only "thought" about parties in his room, these thoughts really constituted an entire world which gave shape to his life.

The point for the present discussion, however, is that this pre-disposition towards maintaining a night-life, which contrasted with the single-minded students described above, had direct and ongoing implications for this student's, and others' like his, academic motivation and achievement. For example, teachers reported that the 'party-animals' exhibited highly only shallow cognitive engagement in school work. They "did only what was required of them", "did it [work] only to keep out of trouble", and "were just going through the motions". Thus, when work was due, these students would complete it, reluctantly. At other times, however, they would display little or no engagement in school-work at all.

In contrast to their actual application to school work, the party-animals would often "fake an interest in schoolwork" whilst at school. As might be expected, this 'fake' interest did not translate into effective, independent study habits outside the classroom. Rather, these students' sporadic attempts at study would continue regardless of any interest show in the classroom. Thus, this interest expressed within the classroom, in teachers opinions, often implicated other reasons than a desire to complete school work in an effective manner. Alternative reasons proposed by teachers included a desire to be personally recognised by teachers or, even, an attempt to get teachers to do school work for them ie. by attempting to elicit answers to set homework questions. Teachers also reported that the "party-animals" often tried to cheat on their schoolwork, not so much by copying other students' work (although this was sometimes the case); but by trying to "beat the system". 'Beating the system' included strategies such as reading 'crib notes' rather than the full text of a novel, "trying to find an 'angle' which would avoid doing work", and choosing the easiest options with respect to assignments. In addition, all of this "effort to avoid effort" was often accompanied by "self-delusion" (in the words of one teacher) Thus, the party-animals really believed that they could 'beat the system', and were genuinely shocked when their examination results were much lower than they had anticipated.

All of the above implicates a breakdown in the coherent operation of the party-animals' academic motivation and cognition. Also, whereas the single-minded students appeared to experience 'breakdowns' (or bifurcations) in their academic motivation and achievement due to self-imposed study structures, the party-animals experienced the bifurcations with respect to, in part, externally imposed social structures. Whatever the case, however, both groups displayed erratic motivational and cognitive processes, which developed in intensity across the school year.

Ongoing Work Pressures.

Another source of bifurcations in students' motivation resulted from the ongoing pressure of schoolwork during the year. The incessant nature of school work during the senior year, even its psychological ubiquity ("it's always there") was often mentioned by students as a drain on their physical and psychological energy and motivation. This was compounded if students had made, what they considered to be, inappropriate subject choices ie. choosing subjects which, as it turned out, did not interest them. More importantly for the present study, however, is that, as the pressures and obligations of their final year at school unfolded, many students found that their need for distractions from the pressure of work increased. One described it the following way:

> "Once I fell behind - you were right when you said 'Don't fall behind!' - because it was really hard. I looked over my shoulder at all the work I had to

do and went 'Oh no!'. I had no big relationship, but just seeing girls was a distraction. A lot of times I'd do anything to get school out of my mind."

For other students, distractions were technological rather than inter-personal. With the increasing availability of information technology, the opportunities for student distraction increase. Some students, for example, reported their intention to use the Internet for research purposes, but found themselves, instead:

"aimlessly wandering through cyberspace, or in chat rooms which absorbed large chunks of my time".

One victim of this technological availability said:

"It's easy to put things off. It's incredibly easy to put things off when your on the Internet. It's [school work] easy to do it once you get started - it's just getting started when there's other things to take up your time."

The point of these reports for the present study, however, is not so much what students may do to distract themselves from the pressures of school work. Rather it is to say that these pressures, especially if they operated over a substantial period of time, lead to significant volatility in students' application to school work. Many students reported, in the words of one: "simply getting sick of the whole thing [academic study]". Another excellent student said "I just got sick and tired of it [school] after thirteen years and that went over into study."

This psychological fatigue was often related to physical fatigue. When, a group of students who had just received their final, end of year, results were interviewed about what got in the way of their motivation for study they all responded strongly that: "Sleep was the biggest thing." The pressures of having to attend school, and be involved in all that was required of them, simply tired them out. They were, in the words of one "sick of it in Term Three and lacked the energy to go on."

Teachers reported that, in order to deal with these decrement in students' motivation, the school tried to provide "a break from the normal routine of study through planned 'time out', career days, and retreats". Many students welcomed these breaks as "excellent times to clear my head". Conversely, other students noted that "it was hard to get started again after I had been allowed to 'wind down.'". Thus, for some students, the breaks "were beneficial in restoring energy and motivation", for others the breaks emphasised "how pleasant life could be away from work". It seemed, then, that even strategies designed to decrease the occurrences of motivational bifurcations amongst students may, in fact, enhance them in others. Thus, as initial conditions play out they can have increasingly significant effects on students' motivation and, once these bifurcations have occurred, they may be difficult to counteract or control.

In addition to the above, motivational bifurcations may also result in changes in the quality of students' motivation. For example, many students reported that they started the academic year with a mastery motivation towards their study ie. "wanting to do the work be cause I was interested in it". As the year progressed, however, these same students reported "just wanting to get the work done" and "not caring about whether I really understand it [the work] or not". Thus, the outcome of sustained

academic pressure on many of these students was to affect a change from a mastery orientation towards school work to a performance orientation.

Institutional Changes and Influences.

Not only were processes associated with the development students' motivation apparently chaotic *within* the institutional framework of the school, but many teachers reported that the school itself existed within an increasingly unstable environment open to intervention by governments, the judiciary, and statutory bodies. This trend towards increasing government intervention may be a world-wide phenomenon. However, teachers in the study reported that the scope and pace of educational reform and intervention in New South Wales had led them to feel "overloaded by the burdens of [policy] implementation" placed upon them. The experience of teacher overload in the face of educational reform is illustrated by one apposite example narrated by a teacher in the present study.

> "In 1996, a new English syllabus for NSW schools was being discussed at both government and school level. While the consultation phase for this syllabus was in progress, proposals for changes to the Higher School Certificate were also being discussed. Not only did the two consultation processes add to an already crowded school schedule, they were, potentially, mutually exclusive. Proposed changes to the Higher School Certificate could make changes to the English syllabus redundant before they were even implemented!"

This apparent lack of coordination at governmental level significantly impacted upon teachers' enthusiasm for change. Thus, whilst teachers in the study recognised that government interventions may be well-intentioned, they also noted that the resultant decline in teacher morale may do far more damage to schooling than the 'problem' which the intervention was designed to fix. Furthermore, the processes associated with government intervention, including "endless rounds of consultation"; could produce burn out amongst teachers in the *development* stage of interventions, leaving little if any enthusiasm left over for later stages of implementation. Thus, what was meant to increase teacher involvement in educational change ie. teacher consultation; had, in many cases, the opposite effect.

At the time of writing, both innovations above were still being pursued, along with various local level reforms and initiatives which further impact upon teacher morale. Teachers again reported that local initiatives, such as "renovations, new courses, staff development, and timetabling"; all absorbed their time and energy. What is most important for the present study, however, is that the energy and enthusiasm which was absorbed in these reforms was, almost of necessity, redirected away from initiatives directly impacting upon students' academic progress and motivation. One teacher put it this way:

> "I just don't have the time to make the work interesting. I don't make the work as 'user friendly' as I should. I'm much more likely just to go into class and tell them [the students] to copy out the text-book. And my time is so limited that I don't have the time to talk with the students, or to make links between the subject [of study] and the real world".

As a result of the above, teachers and students reported that students' interest in a given subject would decline, as would *students'* creativity and willingness to do extra work. Conversely, student alienation and frustration would increase. This, in turn, would often lead to student management problems which would further drain the "psychological energy" of teachers. It was inferred from comments such as these that changes at the institutional level could, directly, lead to changes in teachers' orientations to their work and, indirectly, lead to significant changes in students' motivation over time. In this way, institutional factors could combine with the ongoing pressure of school work, and students' approaches to school work, to produce fluctuating patterns in students' academic motivation, cognition, and associated behaviours.

Intermittencies

In chaos theory intermittencies refer to *regular* fluctuations in the behaviour of systems, interspersed by periods of calm, which appear to be an inherent feature of the system itself. In the present study. intermittencies in both the quantity and quality of students' motivation were noted. These intermittencies differed from the bifurcations above in that bifurcations implicated profound, long term, chaotic behaviour in the operation of students motivation and associated cognition. Conversely, intermittencies implied shorter periods of instability followed by periods of stability.

Most students in the study reported repeating variations in their academic motivation and application across the school year. Some students, for example, would start work early in the school year, then their motivation and workload would decrease, but they would return to work later in the year. These variations were often related to the proximity of students' examinations. One student said:

> "I didn't really realise how important it [regular application to schoolwork] was until half way through [the year], and then I thought 'Oh no! This is it!"

As indicated in chaos theory, intermittencies may implicate very large, although relatively short-lived fluctuations in systems. One student described a situation where, in a period of low academic motivation, he was so determined to avoid any commitment to study that he threw away all his university entrance papers. Later, on the last day that applications to university could be made, he decided that he really did want to go to university and had "to rush around to have a another set re-issued with the four pm. deadline looming". Teachers in the study also reported their perception that many students "preferred to leave the realisation of the importance of study until the absolute last minute - literally". "Study for these students", reflected one teacher, "involved an unpleasant loss of innocence and freedom, a delaying of adulthood".

Extreme mood swings, associated with motivational intermittencies amongst the students, were also very common. One teacher reported that:

> "students often oscillated between over-confidence and despair, with a brief stopover at nihilism".

During 'low points' in students' academic motivation students and teachers reported that students would often be resistant to any attempts to motivate them. Students sometimes lapsed into depression commenting that "nothing seems to pick

me up any more." For these students motivational intermittencies were, also, often associated with decrements in their personal sense of worth, which substantially effected their application to study. Students who reported that they had a group of supportive friends would often, however, report that these friends would help them help them "get back into a routine of work and the mood would pass". If students did not have such a group with which to identify then the student could, in the words of one teacher, "lose touch with the work altogether".

Motivational intermittencies, and their associated mood swings, meant that some students sought support from friends outside school. Such friends, students reported, often lived locally, but could also be met in extra-school sporting teams, or through paid work. Both teachers and students reported that these peer groups exerted a particularly negative influence on students' academic motivation. Friends outside of school were often working, therefore had independent incomes, and also had the freedom to go out at night. These attractive elements of the working lifestyle could exert a corrosive effect on a student's motivation which was particularly influential during periods of stress.

In response to these pressures some students ended up working long night and weekend hours, in the company of others who had left school, in order to earn enough money to maintain the same kind of lifestyle as their working peers. This, in turn, led to further intermittencies in students' motivational profiles. As students "attempted to lead two lives at once", they became even more susceptible to motivational fluctuations, particularly in the face of increasing academic pressures. This is consistent with chaos theory which suggests that the strength and occurrence of intermittencies may increase a the effect of outside influences, related to these intermittencies, similarly increase.

Variations in Teacher Motivation.

Related to the above, and to the previous discussion regarding bifurcations, intermittencies in teacher motivation often led to intermittencies in student motivation. For example, in order to counteract intermittencies in student motivation, the school, in addition to the examples cited above; implemented a series of motivational speeches which were, often, associated with study skill sessions. Students reported that "the motivational speeches helped a lot". However, at least one teacher reported that:

> "[as] these speeches were generally delivered in a charismatic, 'heroic' style they wore me out. Added to this, I have taken on extra duties which had make it difficult to mount the fiery passion which had marked my earlier efforts. While I might have been able to maintain the level of intensity had these other duties been decreased, it was only through taking on such things as public relations, or the networking of ex-students, that my career could develop. There was no pay or status incentives to remain as a teacher at my level beyond eight years, and a certain degree of burn-out in response to some difficult students had become obvious".

As indicated, variations in teacher motivation (such as he above) could lead to corresponding variations in student motivation. The teacher above noted that the overall effectiveness of his input, in terms of observable increases in students' motivation, had decreased over time as his own motivation and energy had decreased.

Instead, students motivation and subsequent application to their schoolwork was much more susceptible to variations than it had been when the teacher was at his "heroic" best.

Catastrophes

For many students experiencing motivational difficulties there was an identifiable intervening event, or catastrophe, between the intention to execute, and the actual execution, of academic work. One student, with demonstrated academic potential, described such a situation as follows:

> "My motivation was there, but I just couldn't do it. At the beginning of the year it was, 'I want to sit down [and get on with my work].' But, as the year went on I wanted to do other things. A big thing was turning eighteen, and I got my [driver's] license. That was big. I just wanted to go out all the time because I had the car. That's what happened to John [not his real name]. He was all keen in Year 11, got his desk and his things all ready, got extra books, was going to do really well; then he got his car and that was it. It was the biggest thing in his life, you know."

Motivational catastrophes could take many forms. In any given year, teachers reported, in addition to 'regular' academic difficulties, the school may well have to deal with issues relating to youth suicide, drug abuse, bullying, truancy, theft, vandalism, family traumas, staff-student 'clashes', even building renovations. Any or all of these issues may affect students' academic motivation and may, additionally, be compounded by unwelcome, and unwarranted, media interest. Thus, when the institutional life of the school was described by teachers, a long series of these "one off" events occur and re-occur in their discourse. One teacher reported, for example, the case of a potentially valuable program designed to enhance students' mastery approaches to study by extending the classroom curriculum into a variety of outdoor activities. This program, however, was severely undermined by the "endless compromises which had to be made due to unpredictable weather". Legal concerns hampered the use of alternative venues and activities until, eventually, the program was cancelled. It was "simply too much trouble to maintain" in the face of the associated compromises. Thus, while the program was worthwhile and well intentioned, it withered in the face of unpredictable events and circumstances surrounding it.

Another incident, related by a teacher, also typifies the type of everyday catastrophes which may influence students' motivation.

> "A group of scared young men called me to their aid saying they were going to be attacked by, what they said was, an ethnic 'gang'. It seemed like a clear case of bullying [by the 'gang'] and the boys were escorted home. Later, when I approached the 'gang', however, it became apparent that the students involved had been calling the 'gang' "wogs". The original boys later responded that the 'gang' had been calling them "poofters". Eventually I brokered a peace between the gang and the students in which certain claims for damages were met. At this point the father of one of the students came forward and demanded a reinvestigation [of the incident] upon threat of legal action. At this

point I said 'You can sort it out yourselves, or you can accept my decision, but I can't do any more.' Peace broke out".

The teacher went on to reflect that a number of issues were apparent in this case including the nature of determining 'truth' in a school conflict situation, the drain on school and personal resources over twenty hours of interviews and negotiations, and the potential for permanent enmity between all parties: students, teachers and parents.

For the present discussion, however, the issue of how this event would influence the academic motivation of students was critical. One surprising outcome of the incident related above is that the school environment actually became more "peaceful" after the incident. Thus, a catastrophe which might have been expected to cause, perhaps prolonged, disruption; actually appeared to calm the school as an institution. As a result, students' motivation towards their school work also appeared to increase. Students reported that the incident had increased their trust in their teachers (particularly the teacher involved). This led to students consulting more widely with their teachers regarding their school work, and being more willing to implement study advice given by teachers during these consultations. Thus, a catastrophe which might have been expected to undermine students' motivation and engagement in learning, in fact, increased it. This type of unpredictable reaction to catastrophes is discussed further below.

The Chaotic Nature of Reactions to Catastrophes.

The interviews and observations, conducted over the period of the study, indicated that there were many potential catastrophes which could influence students' academic motivation. However, an important point for the present study was not only that there were many catastrophes reported, but that reactions to these catastrophes were also variable. Teachers reported, for example, that an event (catastrophe) which galvanised one student into action, such as the death of someone close to the student; may well trigger near-complete emotional collapse in another. For example, one student reported that:

> "I got into a bit of trouble with the police, and my parents got really upset, and said that they didn't trust me. And that hurt a lot, so I'm working just to prove to them that I can do it, that they can trust me not to let them down. I've learnt my lesson. It's just not worth all the trouble, and it really hurt them."

One teacher commented that, while this response was heartening:

> "it was only after a great deal of trouble that this student was able to change his pattern of behaviour. And there would have been other students who would have reacted to the warning [from the police] with the proud boast: 'They let me off!'. Then they'd come back to school and do nothing but tell their friends how lucky they were".

Thus, a given event could not be relied upon to produce a predictable response amongst students. Moreover, the resultant motivational and cognitive effects of students' responses to events could be equally unpredictable. The examples above indicate, for instance, that a given event could promote a strong social orientation

towards academic learning and achievement (ie. wanting to achieve in order to regain parental respect). Conversely, the same event could undermine students' engagement in work significantly.

Similarly, students reported that peer pressure could motivate achievement at the highest level or, almost completely, discourage it in other circumstances. In addition, teachers indicated that the formation of these influences, as well as students' reactions to them, may be well beyond the control of the school. For example, the small catastrophe of social invitations could have various, unpredictable, effects on students' academic motivation. In the words of one student:

> "You can get phone calls on Saturday night saying 'Let's go out and drive' when you should be doing that last chapter [of your homework]."

Some students reported that they were able to resist such invitations, and it seemed to at least one teacher that "a certain strength of character may be a prerequisite for academic success". Displays of such strength, however, were not always socially appealing. One highly successful student was widely known for his responses to phone invitations. In the words of one teacher, "When rung up he'd say 'I'm busy - f... [deletion ours] off!' Then, he would hang up". Other students reported using more subtle strategies to avoid social distractions, such as enlisting their parents to intercept phone calls. Still others, however, would acquiesce to the invitation and "loose not just a nights' study but, in some cases, their entire academic focus". For these students, a single invitation was "the straw that broke the camel's back".

The point of the above for the present study is that (a) catastrophes of all shapes and sizes could manifestly influence students' motivation and (b) students reactions to catastrophes appeared to be as important as the catastrophe itself in determining students' ongoing academic motivation, engagement, and achievement.

Tentative Predictions

Once the chaotic nature of students' motivation had been recognised, it became easier to map future changes in students' motivation. For example, on the basis of responses given in two or three interviews, some tentative predictions as to the pattern of a given student's motivation over the coming months could be made. These predictions deliberately included chaotic elements, such as the expectation of intermittencies in students' motivation, and non-linear responses to catastrophes. Whilst not always entirely accurate for all students, these predictions nevertheless proved to be a valuable guide to the development of students' motivation across the school year. Moreover, by not assuming that students' academic motivation and engagement would remain stable across the school year, even amongst students with stable past academic histories; the alertness of staff to potentially large variations in students' motivation was increased. In particular, staff alertness increased even in the absence of proportionately large events which may cause large variations in students' motivation. Thus, staff reported becoming more responsive to small changes, events, or differences which may, especially over time, significantly impact upon students' motivation.

Increasing staff alertness, however, did not always mean that staff were able to dealt with students' motivational fluctuations as they (the staff) would like. For example, teachers noted, it could be tentatively assumed that students who displayed at least some negative reactions to teacher support could be expected to react badly to catastrophes when they occurred. Moreover, for these students even relatively minor

catastrophes could be expected to lead to strong emotional reactions. So, for example, one student, identified early in the study as being potentially 'at risk', who received only slightly less than he expected to receive on his mid-year examinations, nevertheless dropped out of school completely and failed to finish the year. Thus, it appeared possible to predict, particularly, decrements in students' academic motivation and cognition based on relatively minor indicators. However, this did not mean that when the event (such as a 'drop out') occurred that teachers were necessarily more able to counteract its negative effects. Nevertheless, at least some prediction, which may go unrecognised within a framework which did not account for the potentially major effects of relatively small initial predictors, was able to be made.

Discussion

The above results implicate several important features of students' motivation which have not, as yet, been widely investigated in the literature. In particular, the susceptibility of students' motivation to the operation of a variety of chaotic elements is an under-explored aspect of students' motivation. Moreover, it seems reasonable to assert that these chaotic elements are so salient to the ongoing operation of students' motivation that, in the present school context at least, the whole system of students' motivation may be rightly characterised as 'dynamic'. (The term 'dynamic' is used here as it is used within chaos theory ie. to describe systems displaying *apparently* chaotic behaviours which, nevertheless, contain an underlying, albeit non-linear, order.) The discussion which follows deals, more generally, with issues relating to how the findings of the present study implicate a dynamic system of student motivation. It also examines the implications such a conceptualisation has for our present understandings of students' motivation, and future research investigating this motivation.

Coping with Chaotic Motivational Patterns

On key finding of the present study is that students' motivation was rarely static, with even high achieving, mastery oriented, students being subject to powerful mood swings which effected their overall academic achievement motivation. Moreover, all students in the study reported various 'crisis points' in their school work. At these points, the desire to 'drop out' would be strong, and would be accentuated if the opportunity for, at least, temporary distraction was present. On occasion, the school could offset students' desire stop school work, especially if a trusted staff or peer counsellor was available. Nevertheless, student perceptions as to what constituted a trusted counsellor were, in themselves, chaotic. Thus, what was interpreted as 'wisdom' by one student was interpreted as 'foolishness' by another; and what was interpreted as 'support' by one, was interpreted as 'repression' by another. Again, this complexity in students' responses cannot be isolated from school-wide factors which may influence these responses. This may be particularly true where, as in the present case, the explicit intention of a school is to formulate programs designed to enhance students' academic motivation and cognition.

Whatever the case, however, the important point for the preset discussion is that students' motivation appeared to be anything but linear or stable in its operation, with the possible exception of relatively brief periods of calm between motivational intermittencies. The overwhelming perception of both students and teachers is that

students motivation, especially in 'real life' school contexts, is highly variable in its operation.

Chaos in Everyday School Life

The above comments lead to a discussion of the nature of students' motivation in everyday school life. Despite the recognised importance of students' motivation in ensuring their academic success, we really know very little about how to enhance student motivation where it is deficient. Moreover, very little is known about how to reduce unhelpful fluctuations in either the quality or quantity of students' motivation over time. It may well be the case, for example, that developing intrinsic interest within a mastery oriented framework, is an important precondition of appropriate academic cognition and, subsequent, achievement. But what if, for a variety of *changing* reasons, a student, entering a learning situation with minimal intrinsic interest, is not able to be encouraged to pay sufficient attention to grasp even the basics of a learning topic, let alone to determine whether the topic is of continuing value or interest? Similarly, cognitive and metacognitive training strategies, designed to improve the quality of students' cognition, are of little value to students whose motivational approaches to learning, as evident in their deficient attentional and study habits, are so poor that they are unable even to begin to appropriately address material to be learned.

Compounding the problem of how to appropriately enhance students' motivation is that dilemmas, such as the above, occur within the social and institutional contexts of schooling. These contexts may well, and often do, contain features which work against the development of adaptive patterns of motivation. How can, for example, students develop mastery goals when the dominant focus of their peers, parents, and/or school; is the achievement of a certain grade on a competitive exam so that they may gain entry into university? The problem of motivating the unmotivated, or inappropriately motivated, student is not, then, a simple, linear process. Rather, it implicates a complex mixture of variables which ebb and flow in their importance across various sites, times and individuals. Moreover, while there may be some broad likelihood of success with certain strategies, it remains the case that what may work to enhance the motivation of students at a given time, in a given location; may fail dismally when implemented elsewhere.

It became apparent, then, during the interviews and observations in the present study, that a clear understanding of students' motivational processes could only be developed with explicit reference to the interrelated personal, inter-personal, and institutional dynamics of everyday school life. Thus, components affecting students' motivation could not be analysed discreetly when they occurred in a dynamic (in the words of one teacher, "messy") system comprising students' motivation. In this system, it also appeared simplistic to assume that distinct relationships between identifiable variables may be accurately forecast to apply to all students in all possible situations; or, even, to most students in most situations. Rather, students' individual responses varied within a network of peer and institution variables which were, themselves, constantly changing. The findings of this research are, thus, congruent with other recent research into school processes which characterise these processes in terms of their unpredictability and vulnerability to varying influences (Scott, 1999, Hoermann, 1997). In such contexts, outcomes rarely match expectations.

Re-Conceptualising Student Motivation

The above implicates the broader issue of how students' motivation, as it operates in 'real life' school contexts, can be more effectively conceptualised in the academic literature. When the teacher's story concerning the 'gang' incident (reported in the Results above), was narrated in a recent graduate seminar, the organising professor smiled and mentioned that it was a "one-off". There were, however, a number of other working teachers in the seminar. They shook their heads, and said "No! That sort of thing happen all the time." The discussion moved on, but the practitioners' impressions remained. Schools, and the events surrounding them, act in chaotic ways and this dynamism is not always factored into the academic discourse regarding schools and students. In contrast to much of the academic discourse, it is the 'one-offs' which constitute a substantial component of the daily reality of schools. Thus, while it may be academically inconvenient to take the effects of isolated school issues and events into account, to ignore them completely is to court failure. This applies to both the effective analysis of school processes, and to any research-based interventions designed to be implemented in schools.

Related to this is the fact that positivistic traditions in educational psychology have assumed that it is possible to conceptualise what occurs in schools in terms of discreet variables which can be isolated, manipulated and evaluated. In the unpredictable world of the school, however, the use of purely 'scientific' terminology and methodologies presents the danger of missing some of the drama and impact which single, or isolated, incidents may present. Thus, an apparently isolated incident, which in terms of a large population may not be statistically significant, may, in the world of a school, be the most significant event of the year. Such incidences may influence people's actions and attitudes in a manner disproportionate to their number of occurrences. For example, it may not be statistically significant to mention one student's opinion out of a thousand. However, if that student later committed suicide then his, or her, influence would extend far beyond what mere numbers could represent. Nor could the grief and guilt surrounding such an incident be successfully conveyed in purely 'scientific' language.

A re-conceptualisation of students' motivation is also warranted with respect to the operation of students' multiple goals, as well as to students' motivation in school contexts in general. Recent literature has focussed on the fact that students may hold multiple goals with respect to their schooling. If this is the case, however, then it seems reasonable to assert that students will not hold all these goals with equal strength. In other words, if goals are the reasons or purposes students espouse for their academic achievement, what are the relative strength of these reasons? The present study supports the view that students may hold multiple goals with respect to their schooling, and that these goals will be differentially responsive to both internal and external variables. So, for example, students in the study commonly reported being both mastery and performance oriented towards their study. However, as indicated in the results, when "the pressure was on" some students became more performance oriented. This is not a new finding. What is a new finding is that students, particularly under pressure, may also become more socially oriented (as with the student who wanted to make up for his legal indiscretion), more task-oriented (as with the single-minded students), or more work-avoidance oriented (as with the 'party-animals' who feigned interest in their school work in order to "get the teacher to do it [work] for them"). Thus, consistent with chaos theory, when a system (in this case a psychological system of goals) is under stress it may react in unpredictable ways.

As a result of the above, any re-conceptualisation of students' motivation should account for the ways in which students' multiple goals, as their multiple expressions of reason for academic achievement, exist with changing relative strength to each other. It should also account for the ways in which this changing relative strength (or salience) of goals is impacted upon by a series of institutional, personal and interpersonal factors which also change across time. Given this, there seems little choice but to conceptualise the system of students' goals as a dynamic system. Such a dynamic system, however, consistent with Chaos Theory, is not just one that changes. Rather, it is one that changes in an apparently disordered fashion yet with some underlaying order. The concept of order within apparent disorder means that we may predict that students' motivation will operate dynamically, and thus, changeably. However, we can also predict that these changes will be recognisable as instances of types of chaotic motion (such as intermittencies, catastrophes, etc.).

Thus, if we are to understand the operation of students' multiple goals in dynamic intra-personal, inter-personal, and institutional contexts; then we must find ways to conceptualise this dynamism in academic discourse. To date, such a dynamic conceptualisation has been missing, despite the fact that earlier goal theory studies, both implicitly and explicitly, referred to this dynamism (see, for example, Dodge, Asher, & Parkhurst, 1989). One reason why such studies are not now so prevalent may be due to the lack of a theoretical framework which specifically allows for such dynamism. Moreover, it may well be that our research methods, both quantitative and qualitative, may not allow (or, at least, have been used) for a full investigation of dynamic psycho-social systems. Rather, present methods often give snapshot views of dynamic systems. These snapshots are relatively easy to analyse, but ignore the drama of a 'motion picture' view of motivation. We argue (polemically and deliberately) that research into students' motivation must, by whatever creative means, reclaim the motion of students' dynamic motivational systems. Only then will our research begin to most accurately reflect the 'messy reality' not only of students' motivation but of schools in general. Only then might we reasonably expect teachers, and even students, to read our summaries and deliberations on their dynamic lives.

Summary

This study is important for the following reasons. First, it indicates that chaos theory or, at least, chaotic perspectives, can be fruitfully applied to the observation and analysis of students' motivation. This is especially true where students' motivation is examined in actual school contexts. In doing so, the potential for chaos theory to provide a more explanatory and, perhaps, more predictive model of students' motivation has been highlighted.

Second, the study shows that chaos theory can be effectively combined with goal theory to enhance the application of both to problems related to students' motivation. Specifically, chaos theory enhances the application of goal theory by highlighting the diversity of ways in which goals may be combined and pursued by students. Goal theory, on the other hand, provides a theoretical framework within which insights from chaos theory may be applied to students' motivation. Thus, the present study extends the application of chaos theory within educational psychology which, of itself, has been a notable trend in some recent studies (eg. Guastello et al, 1997; Koopmans, 1998).

Third, related to the above, this study indicates that phenomena evident in dynamic physical systems may be replicated, both empirically and metaphorically,

within dynamic psychological systems. Evidence from other studies suggest the same (eg. Guastello, 1997; Lutz, 1998; Jorg, 1998). Thus, chaos theory, combined with goal theory, provides new theoretical and methodological directions for future studies investigating students' motivation.

Conclusion

This paper has attempted to address the dynamics of students motivation as they occurred in one school. In doing so, it continues the process of developing an understanding of how theoretical models of student motivation may be more effectively applied in the 'messy' reality of schools. We argue that, only by acknowledging the everyday, chaotic, realities of students in schools; can we begin to properly understand these motivational dynamics and, hence, establish effective protocols for enhancing students' academic motivation, cognition and achievement.

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