

# Mindset Training and CSI intervention: Their effects on academic achievement, mindset development and student satisfaction.

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## 1 Introduction

Studies of personality tests suggest that certain traits or characteristics are permanent, innate and stable indicators of behaviour although many different traits may in fact underlie a common higher order concept (Judge et al, 2002). In the education sector there has been an increase in studies trying to establish links between certain personality traits and academic success. A key concern for educators is trying to ascertain the utility and validity of such measures. There is a plethora of personality studies and associated concepts in education concerning resilience (Sarkar and Flether 2014), and related concepts such as academic buoyancy (Martin, 2014), mindset (Dweck, 2012) bounceback (McGrath and Noble, 2011) and this dates back to established concepts such as Locus of control (Rotter 1966). It seems pertinent to explore whether these factors are tapping in to some higher order concept while at the same time acknowledging the importance of measurement and determining subtle yet key differences between the interventions.

Previous research involving mindset (Dweck, 2006) has suggested that students with a growth mindset will experience higher academic achievement than those with a fixed mindset. The growth mindset acknowledges the plasticity of intelligence and the idea that potential is limitless when fostered with motivation. The fixed mindset however argues that individual's abilities and talents are not susceptible to change therefore suggesting innateness to capabilities (Dweck, 2006).

Rotter (1966) argued in his locus of control theory that the individual with an internal locus of control believed that they had control, not only over everyday life outcomes, but their own achievements and subsequent rewards. In contrast, the individual with external locus of control believed that responsibility for their behaviours and achievements lay out with their control. In deliberating these concepts it appears they may be linked to other well researched aspects of personality such as attribution theory (Kelley, 1973) yet new studies continue to explore and add to these concepts with related but novel terms.

For example, Collie et al (2015) conducted a study exploring how academic buoyancy (a student's ability to be buoyant or persevere in the face of academic challenges and setbacks) is linked to achievement but in contrast to their previous studies on buoyancy

they explored the linking role of control as a means of linking the student's past experiences to achieve success. This was in part due to the fact that buoyancy scores are not always related clearly to achievement and there seems to be a complex relationship between the two that is perhaps mediated by other important factors. Control was identified as an important factor due to established theoretical work linking to the locus of control concept and attribution theory discussed above (Weiner, 2010) and empirical research suggesting that control is directly associated with achievement (Liem and Martin, 2012). No other studies had investigated the relationship between all three constructs (academic buoyancy, control and achievement) and their findings suggest control does play an important role in how buoyancy influenced achievement using a large sample of Australian high school students.

In previous studies we have identified control as an important factor for achievement in comparison to other measures such as confidence (Clayes et al, 2013). Yet as well as identifying important constructs it seems important to identify practical interventions that can help students develop. Mindset training has been shown to improve students' knowledge of intelligence (see above) and this relates to other important new studies identifying the importance of implicit intelligence beliefs and how this relates to student motivation and achievement. Renaud-Dube et al (2015) found a complex relationship between intelligence beliefs, persistence intentions and achievement and while they conclude it is worthwhile to promote incremental intelligence beliefs (similar to Dweck's notion of the growth mindset) it is interesting to note that only persistence intentions were related positively to academic achievement. They suggest that while incremental theories of intelligence are important, intrinsic motivation is independently linked to persistence intentions. Self-determination theory distinguishes between intrinsic and extrinsic motivation (Ryan and Deci, 2000) similar to the locus of control concept discussed above. This study replicates the complex pattern between self-theories of intelligence and achievement found by Collie et al above, although highlighting motivation and persistence instead of control. One could argue that the aspect of motivation being discussed in this study is very similar to control.

In light of these new studies we hope to explore the relationship between student beliefs and achievement. By comparing two different types of interventions, one based on Dweck's growth mindset (mindset training) and one related to locus of control (a CSI intervention) we hope to compare how these affect achievement and self-belief as measured through the use of two different surveys. A mindset questionnaire will be used to compare how student's knowledge of intelligence has been affected by the interventions and a locus of control questionnaire will also be employed. In addition, very few studies in this area have asked students what they think of the interventions being employed and to this end we hope to gather qualitative data to compare student responses.

From the research outlined above, it could be suggested that aspects such as mindset and locus of control tap into similar key themes. The aim of this study is to determine the effects of two different interventions: mindset training and a Crime Scene Investigation (CSI) based on locus of control. The impact of these interventions will be measured in terms of

academic achievement, change in mindset status and whether this differs from locus of control scores. In addition, student responses will also be gathered in order to explore how students experience these different types of interventions.

## **2 Methodology**

### **2.1 Design**

An independent measures design with two groups was employed. Each group received a different intervention representing each level of the independent variable; mindset training or locus of control exercises. The dependant variables measured were achievement in terms of graded unit exam scores, mindset scores and locus of control scores. Student responses to the intervention were also measured through a questionnaire utilising open ended questions.

### **2.2 Participants**

An opportunity sample of 34 HNC students was recruited. The students were studying Social Sciences at Perth College UHI. Participants were of mixed gender and a varied age group. They were representative of a cohort recently transitioned to higher education.

### **2.3 Materials**

A mindset questionnaire developed by Dweck (2006) was used to establish initial mindset levels. The interventions consisted of mindset training developed by Dweck (2006) and CSI, a locus of control intervention developed by Womack, Khalaf and Miller (2010) and adapted by Wilson (2014) in order to make it culturally relevant. Mindset and locus of control questionnaires were used to gather scores at the beginning and end of the intervention. A questionnaire was developed to gather student views of the interventions and this was employed at the end of the study (see appendices for all study materials).

### **2.4 Procedure**

The HNC Social Science Students were randomly assigned to different groups for classes at the beginning of the academic year so no further group division was required. All participants were given the mindset questionnaire to complete in order to establish a pre-intervention mindset score. The mindset intervention was then delivered to group one over the duration of two weeks. The second group received locus of control exercises including a CSI intervention over a two week period. Following the intervention period a post-intervention mindset questionnaire was administered to ascertain change in student mindset status. This study was conducted in conjunction with the students preparation for the graded unit exam and the marks achieved in the exam provided a between group comparison. A questionnaire was issued to ascertain perceived student satisfaction and whether they felt their respective intervention had influenced their behaviour or relationship with academic work. Additionally, a post-intervention locus of control questionnaire was administered in order to investigate the relationship between mindset status, locus of control score and achievement.

### 3 Results

An independent sample t-test was carried out to see if there was a difference in the marks received between the two groups. The group that received the CSI intervention received a significantly lower mark in the graded unit than the group who received the mindset intervention,  $t(32) = 2.7, p < .05$ .

Participants' mindset scores were measured at the start of study and at the end of the study. With both groups there was an increase in the mindset score between the measures being taken:  $M = 45.17 (SD = 14.76)$  to  $M = 48.50 (SD = 12.74)$  for the mindset group and  $M = 48.24 (SD = 9.63)$  to  $M = 51.18 (SD = 10.53)$  for the group with the locus of control intervention.

A Pearson's correlation was then carried between initial mindset score and mark achieved (Shapiro-Wilk confirmed normality,  $W(34) = .978, p = .713$  (mindset) and  $W(34) = .958, p = .215$  (Mark)), results showed a significant negative correlation  $r = -.424, p < .05$ .

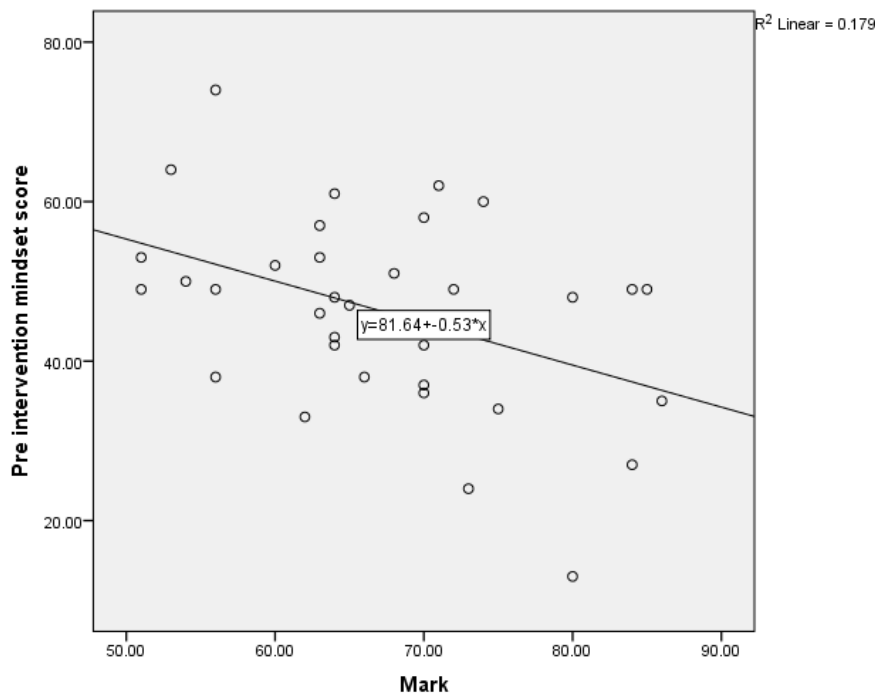


Figure 1: Scatter plot of Mark and initial mind set score.

Each group was also given a locus of control questionnaire to complete at the end of the study. The low response rate, 8 from each group, means that inferential analyses would not be productive. At a descriptive level the students who achieved the higher marks 4 out of 8 had an internal locus of control compared to only 2 in the low pass mark group. Those in the high mark group also had a higher mean values of locus of control ( $M = 71.25, SD = 12.74$ ) than the students in the low mark group, ( $M = 66.88, SD = 10.00$ ).

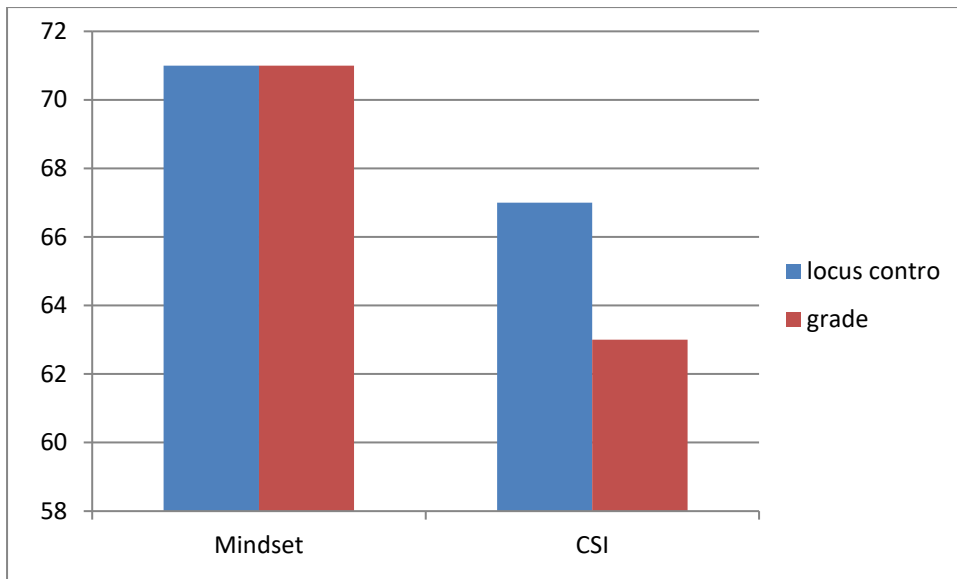


Figure 2: Locus of control scores and grade values by intervention

The quantitative results are summarised in Figure 3 below. While the mindset scores improved following the interventions in both groups (both groups increased their mindset scores by 3 marks following the intervention), it is the higher locus of control scores in the mindset group (71 in comparison to 67) that reflect the higher achievement scores in comparison to those receiving the CSI intervention (those in the mindset group achieved a mean score of 71 in the exam in comparison to the CSI group who achieved a mean score of 63). It appears that while both interventions are successful in terms of improving how students view intelligence, these scores do not relate clearly to measures of achievement (i.e. students in the CSI group achieved a mean mindset score of 51 and achieved a mean score of 63 in the end of unit exam in comparison to those in the mindset intervention who achieved a mean mindset score of 48 and 71 in the exam). The mindset intervention appears to be the most successful in terms of improving student grades.

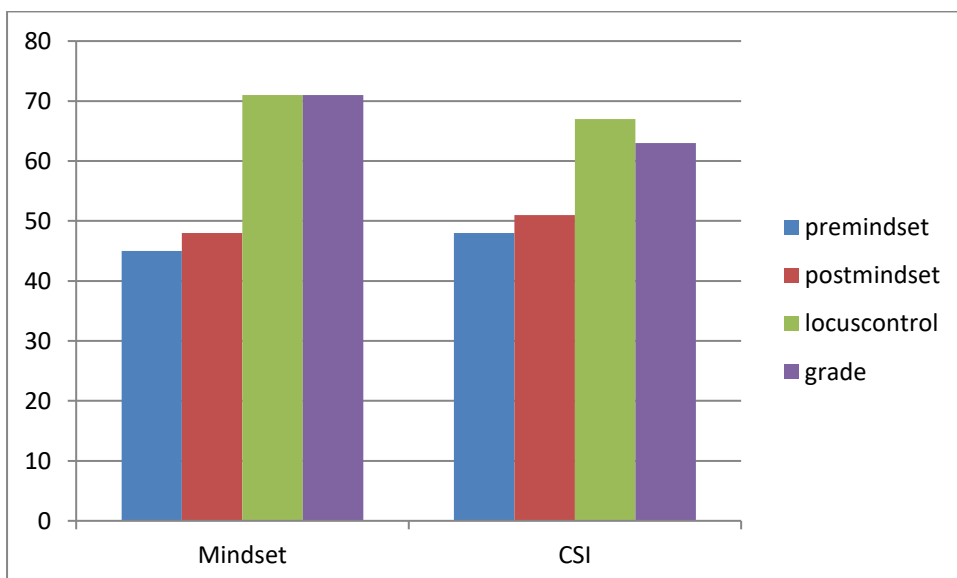


Figure 3: Test scores and grades by intervention

### 3.1 Questionnaire analysis

Responses to the open format questions in the questionnaire were collated and analysed. 23 students completed the questionnaire, 13 students who received the CSI intervention and 10 students from the mindset intervention group. The responses were analysed in terms of positive and negative comments to the questions being asked, and several questions were analysed in terms of dominant themes.

Overall, 16 out of the 23 students (70%) surveyed gave a positive response to the question “What did you think of the intervention you took part in?” and there did not seem to be a difference according to type of intervention received (4 negative comments from the CSI group and 3 from the mindset group). More than half of all students (52%) responded positively to the question ‘Have you applied this knowledge to your success in the course this year?’ Again, there was no major difference between the two groups as 6/10 mindset students stated they had applied knowledge and 6/13 CSI students. The other remaining question that could be considered quantitatively, ‘Do you feel you have a better understanding of internal and external factors that can help or hinder your success?’ was analysed and 83% of students responded positively to this question. Again there were minimal differences between the interventions as 10/10 mindset students responded favourably and 9/13 CSI students did. Therefore, it could be concluded from the summary of data relating to these three questions, that both interventions were well received by the students and there is a minimal difference between the two interventions. The responses to all questions will be explored further below.

The first question ‘What has helped you manage the workload in the course this year?’ was analysed in terms of dominant themes and it was found that many students mentioned ‘online resources’ and ‘lectures’ and this is illustrated by the following quotes:

*“Support from lecturers and learning resources online”.*

*“The ability to look over notes left on blackboard if required”.*

The second question asked the students what obstacles they encountered in managing their workload on the course this year and again several themes were identified including ‘managing workload’, ‘deadlines’ and ‘timekeeping’. Student comments illustrated these themes with responses such as ‘having things in on time or having time to look at articles and other resources’ and ‘making the deadlines of the assessments and doing these assessments while managing the work in class while also working’.

The third question asked students what they thought of the intervention (62% responded positively to this question-see above) and the following two questions (3a and 3b) asked whether there were any particular aspects that were deemed to be helpful or unhelpful. Not many students responded in detail to these questions but two interesting responses were ‘the idea that you can be as intelligent as you wanted to be’ for 3a) and ‘it may have been useful to do this at the beginning of the course’ for 3b).

The most interesting responses are found in relation to the last two questions. For question 5, 'Have you applied this knowledge to your success in the course this year'? Many students (52%) responded favourably and some provided interesting examples:

*'Yes in most subjects, I passed exam/assignments first time and I've learned how to use my time effectively.'*

*'Yes it makes you think of what's important and think about your priorities.'*

*'Yes, started to take more control over situations that could happen.'*

For question 6 'What would your advice be to students coming on to this course next year to help them achieve success?' almost all students provided suggestions (22/23) and some of these were particularly revealing:

*"Make a commitment to the course or don't do it at all. Making a half-hearted effort with attendance and revision will not end well when it comes to the graded unit."*

*"Keep focused and up to date with all work. Always check Blackboard."*

*"Give yourself time and if unsure ask. Always do reading and tasks set."*

*"Get work done earlier, even if it's just a bit. It makes life easier.'*

*"Keep on top of your work, and don't make excuses, and don't leave things until the last minute."*

## **4 Discussion**

The qualitative results from this study suggest that both interventions were positively received by students and the quantitative results suggest that they do make a difference in terms of self-ratings (mindset and locus of control scores) and actual achievement (those receiving the mindset intervention achieved a mean score of 71 in comparison to the group receiving CSI who achieved 63). The questionnaire responses revealed that students in both groups thought the intervention was good (70% responded positively) and many provided interesting examples of how they had applied the knowledge gained from the intervention (52% stated yes they had applied this knowledge). There were minimal differences in qualitative responses between the groups and a large majority (83%) of all students said they now had a better understanding of internal and external factors relating to success.

The results suggest that both interventions were well received by students but only the mindset intervention seemed to have a positive impact on achievement. The mindset scores did not relate to this difference but the locus of control scores did. Students in both groups increased their mindset score after the intervention but those receiving the mindset

intervention scored higher on the locus of control questionnaire. Interestingly, nearly all (22/23) students were able to offer good advice for future students with the majority highlighting similar themes of timekeeping, managing deadlines and keeping up to date with work. Therefore, while the intervention may appear to be successful we cannot rule out and indeed should explore further the possibility that students know what factors are crucial for success and the difficulty lies in translating this knowledge into action for success.

This relationship between knowledge and action is compounded by the fact that while student mindset scores improved in both groups, the group achieving the highest mindset score (an indication of awareness that intelligence is incremental and can be improved through hard work) actually achieved lower grades in the end of unit exam (this is supported by a significant negative correlation between these variables). This highlights an interesting discrepancy between knowledge and action found in previous studies (Clayes et al 2013 found that confidence scores were negatively correlated with success and Lawrie and Clayes, 2011 found that mindset gains were no guarantee of increases in achievement). While this study suggests that the mindset intervention was more successful in terms of achievement, this is not necessarily revealed by the change in mindset scores. Instead, the locus of control score was a more reliable indication of success. If the challenge is to identify what interventions and measure are most helpful in trying to increase and indeed predict success, then the findings of this study are rather mixed. The mindset intervention seems to increase achievement, but it is the score from the locus of control questionnaire that reflects this improved change in attitude.

These findings tie in with other research suggesting that control is the crucial component (Collie et al, 2015) but that incremental theories of intelligence are worth promoting (Renaud-Dube et al, 2015). While the mindset intervention was surprisingly more effective than the CSI intervention (based on enhancing knowledge of external and internal factors relating to academic success) it is interesting that this difference is only reflected in the locus of control survey scores. It may be that the mindset training is far more effective in teaching students not only about intelligence, but also in highlighting the important factors we have control over that can modulate success. Yet it seems the locus of control survey is a far more reliable indication of the students' knowledge regarding how much responsibility they are taking and this links well to self-determination theory and the importance of intrinsic motivation for enhancing student achievement (Ryan and Deci, 2000).

There are of course important limitations to this study. The small and restricted sample poses a problem for generalisability. More serious limitations include the fact that the interventions were delivered by different lecturers and the groups received teaching on the various subjects assessed from different lecturers. Therefore the results must be questioned in terms of validity as there may be many other reasons for the differences in scores, both from the questionnaires and the actual grades achieved. Nonetheless, this study does add value to the growing body of research in this area by attempting to decipher the complex relationship between students' intelligence beliefs and how this affects their achievement. By incorporating two measures (mindset scores and locus of control scores) we have found an interesting pattern that links well with other studies, namely that control



appears to be the crucial aspect in modulating student motivation and achievement (Collie et al, 2015). We have also provided some qualitative analysis that suggests students respond equally favourably to different types of interventions and have plenty of good advice for other students. Again, these findings corroborate our main conclusion that knowledge does not always relate well to action, as even those with good advice for others may not have applied this. The crucial aspect seems to be acknowledging the importance of control and the sensitivity of the locus of control survey in providing an accurate picture of student intentions. Asking students what they believe intelligence to be does not seem to predict academic success and knowing that hard work is required is not as valuable as acknowledging how much responsibility they take for success.

Future research should explore the benefits of mindset training for enhancing locus of control scores. In this study we did not compare pre and post locus of control scores so it would be worthwhile to see if these can be increased through the successful mindset intervention. We could conclude on a very positive note and suggest we have identified a successful intervention and a reliable measure, the key now is to combine these effectively to enhance student achievement.

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## 6 Appendix 1: Mindset questionnaire

Available from: <http://mindsetonline.com/testyourmindset/step1.php>, date accessed 15/12/11.

## 7 Appendix 2: Locus of Control questionnaire

Julian Rotter (1966) devised a locus of control personality test to assess the extent to which an individual possesses internal or external reinforcement beliefs. Terry Pettijohn, the author of Psychology: A ConnecText, has developed the following test based on Rotter's original idea. Indicate for each statement whether it is T (true) or F (false) for you. There are no right or wrong answers.

This survey will give you a general idea of where you stand on the locus of control personality dimension.

- |                                                        |   |   |
|--------------------------------------------------------|---|---|
| 1) I usually get what I want in life.                  | T | F |
| 2) I need to be kept informed about news events.       | T | F |
| 3) I never know where I stand with other people.       | T | F |
| 4) I do not really believe in luck or chance.          | T | F |
| 5) I think that I could easily win a lottery.          | T | F |
| 6) If I do not succeed on a task, I tend to give up.   | T | F |
| 7) I usually convince others to do things my way.      | T | F |
| 8) People make a difference in controlling crime.      | T | F |
| 9) The success I have is largely a matter of chance.   | T | F |
| 10) Marriage is largely a gamble for most people.      | T | F |
| 11) People must be the master of their own fate.       | T | F |
| 12) It is not important for me to vote.                | T | F |
| 13) My life seems like a series of random events.      | T | F |
| 14) I never try anything that I am not sure of.        | T | F |
| 15) I earn the respect and honours I receive.          | T | F |
| 16) A person can get rich by taking risks.             | T | F |
| 17) Leaders are successful when they work hard.        | T | F |
| 18) Persistence and hard work usually lead to success. | T | F |
| 19) It is difficult to know who my real friends are.   | T | F |
| 20) Other people usually control my life.              | T | F |

#### SCORING:

Give yourself 5 points for each question if you indicated **False** on questions:

2,3,5,6,9,10,12,13,14,16,19,20

Give yourself 5 points for each question if you indicated **True** on questions:

1,4,7,8,11,15,17,18

#### RESULTS:

0-15 Very strong external locus of control

20-35 External locus of control

40-60 Both external and internal locus of control

65-80 Internal locus of control

85-100 Very strong internal locus of control

## 8 Appendix 3: Qualitative data survey.

HNC Social Science Group:.....ID.....

- 1) What has helped you manage the workload in the course this year?
  
  
  
  
  
  
  
  
  
  
  
- 2) What obstacles have you encountered in managing your workload in the course this year?
  
  
  
  
  
  
  
  
  
  
  
- 3) What did you think of the intervention you took part in?
  - a) were there any particular aspects of the intervention you found helpful and why?
  - b) were there any particular aspects of the intervention you did not understand or found unhelpful and why?
  - c) any other comments regarding the intervention?

4) Do you feel you have a better understanding of internal and external factors that can help or hinder your success?

5) Have you applied this knowledge to your success in the course this year? If yes, how and if not, why not?

6) What would your advice be to students coming on to this course next year to help them achieve success?

## 9 Appendix 4

CSI / Locus of Control Exercise

Lesson by Pamela Womack, Paula Khalaf, Sharon Miller

Lone Star College

**Rationale:** Students enroll in classes with the expectation that they will pass, but sometimes life intervenes. This exercise is designed to help students think in advance about their resources, the consequences of their choices, their backup plans, and the back up plans to their back up plans. This activity is very empowering.

Instructions: Print the following scenarios onto card stock, one copy per group of 3-5. Below the scenarios are three graphics that you can cut apart and paste onto colorful card stock or construction paper for each group. Suggested instructions to the students, Part One: How many of you are familiar with the TV show, CSI (Crime Scene Investigation)? On that show, a team of investigators solves a mystery in about 60 minutes. Today, you are going to work in teams to look at typical situations that happen to college students. Although each of these could be devastating to academic success, in each case, there are proactive things the student can do in order to survive and thrive. The first thing your group will do is to sort these scenarios into three categories. The "suicides" are scenarios where the student's choices might kill his chances for success. The "homicides" are scenarios where someone else's choices might kill the student's chances for success. The "accidents" are no-fault scenarios that might kill the student's chances for success. Allow time for each group to sort their scenarios. Encourage discussion in the small groups and circulate as they work. Then, debrief by reading the scenario and asking a group where they sorted it. If another group put it into another category, encourage brief discussion. A scenario may fit into more than one category depending upon the reasoning, and that is a value of this exercise. Then, ask each group to pull out at least one scenario from each category and think of as many potential solutions as possible. Encourage students to use their syllabus, knowledge of faculty and campus resources, and ingenuity. For example, if Fran's car battery is dead, she can call her relative or a friend to take her to school. Perhaps someone in her class lives near her (a great opportunity to stress the importance of making connections to classmates). She can call a taxi, or may be able to walk, bicycle, etc. As each

group reports on their survival strategy, they post their scenario and solutions onto a large poster, which can be displayed in the classroom. Follow up instruction: Unsuccessful students tend to blame everyone else for their failures. However, successful students realize that there are options, resources, and best action plans to survive even the worst situations. Psychologists call that "locus of control." Having strong internal locus of control, knowledge of resources and thinking about potential problems in advance are key college and life skills. Follow up journal activity: Choose the biggest barrier to your success. Is it potentially a suicide, homicide or accident? What strategies will you use to survive and thrive?

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Arnie's friends call him to go clubbing the nights before classes, and he goes with them.

Barbara wakes up with high fever and serious congestion. She doesn't want to miss class, but she decides to stay home.

Diane cannot afford to buy the books for her classes.

Fran got ready for classes and climbed in her car, but the battery was dead, and the car wouldn't start. Everyone in her family had gone to school or work.