

**THE UNIVERSITY OF CALGARY**

**Extended Time Limits On University Examinations**

**by**

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## **ABSTRACT**

Research was conducted to determine whether students without identified disabilities would improve their performance on course exams when provided with extra time. Students in three classes, differentiated by the type of exam questions employed (multiple choice only, problem solving only and combined multiple choice and problem solving) were involved in this study. A total of 770 students participated in this study. Students were given 50% extra time on the mid-term exam(s), but completed the final exam under normal time limits. It was hypothesized that students would increase their performance when given extra time on problem solving exams, but there would be no difference on multiple choice exams. A comparison of students' mid-term grades (extra time) with their final grades (normal time) showed that students did not increase their exam performance when given extra time. Students' grades from the present study (extended time limits) were also compared to students' grades from last year's classes (normal time limits). This comparison showed that this year's students performed significantly better than did last year's students. It was also hypothesized that there would be no relationship between students' exam completion time and their grades. Analyses supported this hypothesis, showing no significant relationship between students' exam completion time and performance.

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## **CHAPTER ONE**

### **Introduction**

In postsecondary education, most students' efforts and concerns are geared towards achieving good grades. The grades obtained by a student can have far-reaching and serious consequences. Students' grades may determine whether a degree is obtained, financial support is awarded, or postgraduate studies are entered. Students' grades are often determined by course exams (Parr, Levi & Jacka, 1996). Exam performance is accepted as a measure of students' abilities. However, it is questionable whether course exams are a valid measure of ability. The time constraints placed on students during exams may prohibit them from showing their true ability (Parr, Levi & Jacka, 1996). If the objectives of a course specify development of quick performance, then it is reasonable that speed should be a component of the exam (Parr, Levi & Jacka, 1996). However, most courses are focused on producing students who have an understanding of the material presented. The objectives of most courses center on the development of knowledge, not speed. Despite this fact, exam time limits are often determined by convention or past experience, introducing the possibility that the time limits imposed result in exams that measure speed of performance, rather than ability.

The effect of time limits on exam performance has been particularly questioned in relation to students who have a learning disability. It has been argued that students who have a learning disability show a deficit in information processing that restricts them from displaying their potential on traditional exams (Barga, 1996; Munger & Loyd,



1991; Speece, 1987; Swanson, 1987, 1993). To negate the disadvantage which their disability causes, students with a learning disability are often given extra time to write exams (Brinckerhoff, Shaw & McGuire, 1993). Students with a learning disability are generally given 50% extra time to complete exams. Extended time on exams is provided so students with a learning disability have an equal opportunity to demonstrate their knowledge (Brinckerhoff, Shaw & McGuire, 1993; Stewart, Cornish & Somers, 1995). However, some professors have argued that this extra time gives students with a learning disability an unfair advantage, rather than an equal opportunity (Parr, Levi & Jacka, 1996; Runyan, 1991). Some professors contend that normally achieving students are discriminated against because they too would benefit from extra time on exams (Parr, Levi & Jacka, 1996; Runyan, 1991).

On a survey conducted by Parr and colleagues (1996), faculty reported that approximately 35% of students do not complete exams in the time allocated, and these students would prefer more time to complete their exam. From their study Parr and colleagues concluded "...considerable emphasis is still placed on speeded examinations with little or no thought given to the contaminating effects of examination speededness on examination performance." (p.16). Allowing students with a learning disability extra time on exams may not be a fair practice if normally achieving students do not have adequate time to finish the exam. If exams are intended to be a measure of students' knowledge, ample time should be allowed for all students to complete the exam. The concern that granting extended time to students with a learning disability

disadvantages other students would subside if all students were given adequate time to display their knowledge in the first place.

To resolve the controversy over the fairness of the extended time limits granted to students with a learning disability, it must be demonstrated that students generally would not benefit if provided this accommodation. Firm conclusions about the effect of extended time limits during course exams on the performance of students, in general, cannot be drawn because research has found mixed results. Studies have been conducted concerning the achievement of students with and without learning disabilities in relation to extended time limits. Some studies found that students with learning disabilities benefit from extended time limits on exams, but students in general do not (Alster, 1997; Centra, 1986; Hill, 1984; Perlman Borger, Collins, Elenbogen, Wood, 1996; Runyan, 1991, Wild, Durso & Rubin, 1982; Wright, 1984). Other research reports that students in general benefit from extended time limits on exams (Halla, 1988; as cited in Runyan, 1991; Onwuegbuzie & Daley, 1996; Onwuegbuzie & Seaman, 1995; Powers & Fowles, 1996; Rawlings & Carnie, 1989; Schnipke & Pashley, 1997). From these studies, it is difficult to determine whether students in general would benefit from extended time limits when completing course exams.

The purpose of the present study was to determine whether students, in general, benefit from the extended time limits which students with a learning disability are often given on exams. If students, in general, increase their performance with extended time limits, then it is apparent that they, too, would benefit from the extra time provided to students with a learning disability. However, if students, in general, do not increase

their performance when given extra time, then one can conclude that these students are given ample time to process information and display their knowledge on exams.

This study investigated whether students, in general, benefit from the extra time provided to students with a learning disability on exams. It compared the performance of students in general on problem solving and multiple choice exams under normal time constraints and extended time limits. In addition, this study investigated whether there is a relationship between the amount of time that students take to complete an exam and the grade they receive.

## **CHAPTER TWO**

### **Review of Literature**

The focus of this study concerns the fairness of accommodations on university exams. This study seeks to determine whether students in general improve their exam performance when given the extra time accommodation provided to students with a learning disability.

#### **Power and Speed Exams**

Given the focus of this study, it is important to recognize that there are two types of exams, namely power and speed (Powers & Fowles, 1996). Power exams have questions of varying difficulty, give students enough time to try all questions, and are intended to measure students' knowledge and skills. In contrast, speed exams measure the rate at which students work. In comparison to power exams, speed exams are comprised of simpler questions that can be answered by all students if they are quick enough to reach the end of the exam. Some exams may have components of both power and speed exams, such that students are required to display their knowledge quickly.

Generally, the exams used in university courses are intended to be power exams. Professors use exams to measure students' understanding of the course material. If students are not able to show their understanding in the time provided, then the exam is a speed exam and measures the rate at which students work, rather than their knowledge of the course material. Unless an exam length is seriously misjudged, it is expected that students in general are able to reach all questions, and thus, are

given an adequate opportunity to display their knowledge on course exams. In contrast, for students with a learning disability university exams, which are intended to be power exams, may actually become speed exams due to the difficulties these students experience (Munger & Loyd, 1991).

Power exams may become speed exams for students who have a learning disability because of the information processing difficulties these students experience. If the difficulties these students experience cause them to rush to finish an exam, then the exam is not a power exam, but a speed exam. Students with a learning disability experience an inherent alteration in the way information is processed, often resulting in these students performing slower than students without a learning disability (Wong, 1991). Students with a learning disability may experience poor short-term memory related to problems with rehearsal, organization, and elaborative processing of information. They may also suffer from long-term memory difficulties caused by their use of less exhaustive searches for retrieval cues, and a lack of self-checking strategies in the selection of retrieval cues. When faced with time limits, students with a learning disability may have problems registering information, accessing memory, and/or gathering and reporting information (Anderson, 1994). The processing difficulties which students with a learning disability experience may cause them to have trouble reading and/or understanding questions, writing answers, and organizing thoughts under time pressure (Brinckerhoff, Shaw, & McGuire, 1993).

The slower processing of information by students with a learning disability has been investigated through empirical research. Research has found that students with a

learning disability show a longer response time than students without a learning disability, and this is due to a slower pick-up of information by the central processing system (Richards, Samuels, Turnure & Ysseldyke, 1990). These authors concluded that students with a learning disability may attend to rapidly presented information but it is likely lost or disordered before it can be processed. In a study investigating the information processing of students with a reading disability, Speece (1987) found that 76% of these students showed deficits that negatively affected their speed of processing information. Students experienced such difficulties as concentration problems, attention deficits, reading problems, and slow processing of printed information. Likewise, in a study investigating the performance of students with a learning disability on mathematics tasks, Alster (1997) found that students with a learning disability had slower processing and retrieval of information, and lacked automaticity of skills.

### Extended Time Limits

Students with a learning disability are often provided with extended time limits on exams to allow them an opportunity to adequately display their knowledge, despite their processing problems (Parr, Levi & Jacka, 1996). It is reasoned that students without disabilities are given adequate time to display their knowledge, as they do not experience the difficulties that students with a learning disability experience. However, some professors and students are concerned that the extra time provided to students with a learning disability gives them an unfair advantage, rather than an equal opportunity (Houck, Asselin, Troutman, & Arrington, 1992; Parr, Levi & Jacka, 1996;

Runyan, 1991). Although students without a learning disability do not have the same information processing difficulties as students with a learning disability, there may be other conditions that cause students without a learning disability to require extra time on exams. If students in general are not given enough time to complete their exams, then they would benefit from the extended time limits provided to students who have a learning disability.

Studies investigating the effect of extended time on the performance of students in general have found contradictory results. Some studies support the position that students with a learning disability, but not students in general, benefit from extra time when writing examinations. However, research has also found that some students without a learning disability increase their performance with extra time on exams. The following is a review of the research concerning the effect of extended time limits on the exam performance of students, followed by a discussion of the limitations of this research.

#### Extended Time Does Not Benefit Students In General

Research has compared the performance of students with and without a learning disability in relation to extended time limits. Some of these studies have found that only students with a learning disability, and not students in general, benefit from extended time limits (Alster, 1997; Centra, 1986; Hill, 1984; Runyan, 1991, Wild, Durso, Rubin, 1982; Wright, 1984). In a study investigating the effect of extended time limits on the performance of students with and without a learning disability on the Scholastic Aptitude Test (SAT), only students with a learning disability increased their performance

with extra time (Centra, 1986). Even after growth in students' ability, practice effects, and errors of measurement were taken into account, only students with a learning disability showed an increase in their performance. This study found that the score gains increased as additional time was spent on the test. Centra (1986) concluded that the additional time provided reduced the effects of the students' disability, by providing them time to answer more questions.

Other studies have investigated the performance of students with and without a learning disability on a standardized reading test, the Nelson-Denny Reading Test (Hill, 1984; Runyan, 1991). On this test, normally achieving college students performed better than students with a learning disability under timed conditions. Yet, under extended time conditions students with and without a learning disability performed similarly. Students with a learning disability, but not normally achieving students, increased their performance when given extra time.

Alster (1997) investigated the performance of college students with and without a learning disability when provided with extra time on algebra tests. Students were given two short algebra tests, one with a 12-minute time limit and the other without a time limit. Students with a learning disability scored significantly lower than students without a learning disability in the timed test condition. However, without a time limit, the scores of students with a learning disability did not differ significantly from the timed or untimed scores of students without a learning disability. Alster (1997) concluded that students with a learning disability are not able to perform up to their potential under the time



constraints imposed on exams, while students without a learning disability are able to show their potential on timed exams.

Research has also been completed that focuses on the effect of extended time limits on the performance of students without a learning disability. Wright (1984) studied the effect of increasing the time limit of a 70-minute College Level Academic Skills Test to 80 and 90 minutes. This study concluded that students were able to complete the test items in the time normally provided, as there were no significant improvements in test scores when extra time was given. Similarly, Wild, Durso and Rubin (1982) found that on subtests of the Graduate Record Examination college volunteers did not increase their scores when provided with extended time.

Taken together the studies discussed indicate that students in general are able to perform up to their capacity under normal time constraints. These studies show that the performance of students without a learning disability on standardized tests and college algebra tests does not increase when provided with extended time. However, the research discussed indicates that students with a learning disability improve their performance with extra time. These studies support the present practice of providing students with a learning disability, but not students in general, extra time when writing exams. This conclusion must take into account the limitations shown by these studies. First of all, most of these studies were conducted in a laboratory setting using standardized tests. The Alster (1997) research was the only study that was conducted outside a laboratory. However, the measures used by this researcher were not actual

course exams, but were short tests. Thus, it is possible that these findings may not generalize to actual course exams.

### Relationship Between Exam Completion Time and Performance

The studies discussed above, indicating that students in general do not require extended time limits to complete exams, are supported by research investigating the relationship between exam completion time and performance. If a relationship between exam completion time and performance is found, such that those students who take a longer time to finish an exam perform better, then it would appear that students who stay longer seem to use the time to increase their exam performance. However if no relationship is found, then it would seem that students who stay longer do not increase their exam performance, thus the benefit of providing extra time is questionable. Most recently completed research has found no relationship between exam completion time and performance (Bridges, 1985; Herman, 1997; Kennedy, 1994; Lester, 1991; Owuegbuzie, 1994; Wierzbicki, 1994). Wierzbicki (1994) divided college students into groups of early, middle, and late finishers on a timed psychology test. This study found no consistent linear or curvilinear relationship between order of completion and performance. Likewise, Bridges (1985) and Lester (1991) found that on course based exams undergraduate students showed no linear or curvilinear relationship between completion time and performance. In addition, Kennedy (1994) found that college graduate students showed no linear relationship between completion time and performance on research methods exams. It seems that those students who complete an exam quickly and those who take more time do not perform significantly different

from students finishing in the middle. These studies refute the suggestion that the rate of finishing an exam is related to how well students will perform on the exam. The research discussed suggests that providing extra time on exams will not benefit students in general.

### Extended Time Benefits Students In General

The conclusion that students in general do not benefit from extended time limits on exams must take into account the contradictory findings presented in the research studies discussed next. Studies have been completed which show that normally achieving students benefit from extra time on exams. A study of the performance of students with and without a learning disability on standardized tests (GRE and Nelson-Denny Reading Test) found that students with and without a learning disability both increased their performance when given extra time (Halla, 1988 as cited in Runyan, 1991). Powers and Fowles (1996) also investigated the effect of extended time limits on the performance of students completing the GRE Writing Test. These researchers questioned whether extended time limits would be more effective depending on students' test-taking style (fast vs. slow). This study found that extra time was equally beneficial for both students who consider themselves slow, and those who consider themselves fast. Regardless of their test-taking style, students without a disability benefited from the extra time provided. Onwuegbuzie and Daley (1996) also found that students in general increased their performance when given extra time on a statistics exam. These researchers found that students in the untimed condition performed

better than students in the timed condition, regardless of their level of exam or study coping strategies.

Studies also show that subgroups of students within the normally achieving population benefit from extended time limits. Research has found that certain subgroups of students benefit more from extended time limits than students in general. Onwuegbuzie and Seaman (1995) investigated the effect of extended time limits on the performance of high and low anxious students on a graduate statistics exam. When the exam was timed, high anxious students used maladaptive strategies that caused them to perform inaccurately. Yet, when the exam was not timed, the high anxious students used more adaptive strategies, and performed as quickly as the less anxious students. These authors concluded that high anxious students had the same ability level as low anxious students, and were capable of performing at the same rate, when there is no time pressure.

Another subgroup of students that may benefit from extended time limits, are students whose first language is not English. Using a computer-administered reasoning test, Schnipke and Pashley (1997) found that students whose primary language is not English (nonprimary speakers) were affected by time limits to a greater extent than students whose primary language is English (primary speakers). Nonprimary speakers tended to respond slower to items at the beginning of the test and faster to items towards the end of the test. It seems that the time limit imposed caused nonprimary speakers to rush near the end of the test, indicating that these students would benefit from extended time limits.

Research has also examined the differential effect time limits may have based on students' personality type. Rawlings and Carnie (1989) studied whether introverted and extraverted students would perform differently in timed and untimed conditions of a test. These researchers investigated students' performance on four tests derived from the Wechsler Adult Intelligence Scale subtests (Arithmetic, Information, Digit Span, and Picture Arrangement). This study found that when the tests are timed, extraverted students perform better than introverted students. Yet, when the tests are not timed introverted students, but not extraverted students, increase their performance. These authors conclude that the resting level of arousal for introverts is higher than that for extraverts. Thus, increases in arousal, such as that produced by time limits, adversely affect the performance of introverts relative to extraverts. The results of this study suggest then that imposing time limits on exams may disadvantage introverted students.

Students in general may not suffer from the same information processing deficits that seem to cause students with a learning disability to require extended time limits on exams. Yet, it seems that there are other conditions (e.g., primary language, level of anxiety, personality type, etc.) that may cause students without a learning disability to require extra time to adequately show their ability on exams.

#### Review of the Research Concerning Extended Time Limits

The research concerning extended time on exams shows mixed results. Some studies find only students with a learning disability, and not students in general, benefit from extended time on exams (Alster, 1997; Centra, 1986; Hill, 1984; Runyan, 1991,

Wild, Durso, Rubin, 1982; Wright, 1984). Studies also fail to find a relationship between the exam completion time and performance of students in general (Bridges, 1985; Herman, 1997; Kennedy, 1994; Lester, 1991; Owuengbuzie, 1994; Wierzbicki, 1994). However, other studies find that normally achieving students improve their performance with extra time (Halla, 1988 as cited in Runyan, 1991; Onwuegbuzie & Daley, 1996; Powers & Fowles, 1996). In addition, some studies find that various subgroups within the normally achieving population benefit more from extra time on exams, than normally achieving students in general. These studies find that highly anxious students, students whose first language is not English, and introverted students all benefit from extended time limits (Onwuegbuzie & Seaman, 1995; Schnipke & Pashley, 1997; Rawlings & Carnie, 1989). These contradictory findings make it difficult to draw conclusions about the benefit of extra time on exams for students in general.

It is also difficult to draw conclusions from the studies discussed due to the methodological limitations of these studies. The studies discussed are limited by the setting in which the testing took place and the type of exam employed. Many of the studies discussed employed standardized tests in a laboratory setting, rather than actual course exams (Centra, 1986; Hill, 1984; Powers & Fowles, 1996; Rawlings & Carnie, 1989; Runyan, 1991; Schnipke & Pashley, 1997). It is questionable how well the findings from these studies will generalize to actual exam situations. It is possible that in an actual exam, students may behave differently due to the personal relevance their performance takes on. Only three of the studies reviewed were administered in a college course, all of these studies using mathematics exams (Alster, 1997;

Onwuegbuzie & Daley, 1996; Onwuegbuzie & Seaman, 1995). Thus, it is not known how well these findings will generalize to other types of exams. For example, would students generally benefit from extra time on multiple-choice exams? No studies have investigated this. In addition, none of the studies gave students the amount of extra time (50%) that students with a learning disability are generally given. Most studies, including those administered in an actual course, gave students unlimited time to complete the exam. Due to scheduling and other logistical concerns, it is often not possible to provide students with unlimited time to complete an exam. When investigating whether students in general should be provided with extra time to write exams, the amount of extra time that will be given in an actual course exam should be provided, so that the research findings may be generalized. The extended time accommodation provided to students with a learning disability should be given to students in general to investigate the fairness of this accommodation.

### Summary

To summarize, it is difficult to draw firm conclusions about whether students in general would benefit from extra time to write exams because of the contradictory results found amongst studies. Furthermore, it may be challenging to generalize the results of previous studies to actual course exams because many studies were conducted in laboratory settings using standardized tests rather than actual course exams and none were multiple choice, a common exam format. In addition, no study provided students with the actual accommodation (50% extra time) that students with a learning disability are provided.

### Present Study

The present study investigated whether students without identified disabilities, general students, benefit from the extended time limits that students with a learning disability are given when writing exams. This study extends previous research by studying students' performance in actual course exams, using two different types of exams (multiple choice and problem solving), and giving all students the amount of extra time that students with a learning disability normally receive. The present study compared the performance of students in general under normal time constraints and extended time limits. If students in general increase their performance when given extra time, then educators must consider that the extended time granted to students with a learning disability may be unfair.

This study investigated the effect of extended time limits on two different types of exams: multiple choice and problem solving. Previous research concerning the effect of extended time limits on problem solving exams shows mixed results. Some studies find that students increase their performance on problem solving exams when given extra time, while other studies show no benefit. Meanwhile, no previous research has investigated the effect of extra time on multiple choice exams. Given the contradictory results associated with problem solving exams and the lack of research related to multiple choice exams, the present study bases its hypotheses on the nature of these two types of exams. Problem solving exams generally require synthesis of knowledge, thus it is possible that students may improve their performance with extended time limits because they will have an opportunity to check and edit their work. Meanwhile,



multiple choice exams generally require factual recall of information. It is argued that multiple choice exams will not be influenced by extended time limits due to the fact based recall of information that is typical of most multiple choice exams. Given the nature of multiple choice and problem solving exams, this study expected that students in general would benefit from extended time limits on problem solving exams, but not on multiple choice exams.

The present study also investigated whether there was a relationship between the time it takes students to complete an exam and the grade they receive. Previous studies have found that there is no relationship between students' completion time and performance. However, this question is investigated in this study because it may provide additional information about whether students benefit from extended time limits.

Hypotheses. This study presented three hypotheses.

- 1) It was hypothesized that students will perform better on problem solving exams when they are given extended time limits.
- 2) It was hypothesized that students' performance on multiple choice exams will not increase under extended time limits.
- 3) It was hypothesized that there will be no relationship between exam completion time and performance.

## **CHAPTER THREE**

### **Method**

#### **Participants**

Three large undergraduate classes at a university in Western Canada were selected to participate in this study. Courses were chosen based on the type of exam questions employed, the number of exams, the time of day classes met, and the willingness of instructors to participate.

#### **Type of exam**

Participating classes used one of the following types of exam questions: problem solving only, multiple choice only, or a combination of multiple choice and problem solving. Classes within the Faculties of Science and Engineering were chosen for this study because these classes tend to use multiple choice and/or problem solving exams. Of the three classes participating in this study, two were from the Faculty of Science and one was from the Faculty of Engineering. The engineering class had exams that consisted of problem solving questions only. One of the classes in the Faculty of Science used problem solving and multiple choice questions, while the other class used multiple choice questions only. Through discussion with the professor of the multiple choice only class, it was determined that this class was representative of typical multiple choice exams, in that it tested students' fact based recall of information. None of the participating classes were first year courses. The two science classes were three hundred level courses, while the engineering class was a five hundred level course. Although classes in the Faculties of Science and Engineering were used in this study, it

is expected that the results will generalize to other faculties. Even though the content of exams in different faculties varies, the processes that students must employ are similar. For example, in problem solving exams regardless of the exam content students must follow similar steps to complete the exam, including among others, identifying the problem, identifying relevant information, and planning a course of action.

#### Number of exams

Classes selected had at least two exams, a mid-term and a final. One participating class (combined multiple choice and problem solving questions) had one mid-term exam and a final. The other two participating classes (problem solving questions only and multiple choice questions only) had two mid-term exams and a final.

#### Time of Day

Classes chosen to participate in this study met during the day, thus reducing the probability of part-time or continuing education students, and increasing the homogeneity of the students in the different classes.

#### Number of Participants

The total number of students who participated in this study was 770. The multiple choice only class had 330 students, the problem solving only class had 63 students, and the combined multiple choice and problem solving class had 377 students. Students with disabilities who already received accommodations on exams (i.e., extended time, private writing space, etc.) received their usual accommodations and were excluded from this study.

In summary, the subjects of this study were undergraduate students enrolled in one of three classes. The three classes were distinguished from one another by the type of exam questions employed (multiple choice, problem solving, or combined multiple choice and problem solving).

### Materials

The exams prepared by instructors were used in this study. Instructors were directed to prepare their exams as they normally would have, without this study taking place. It was requested that instructors write their exams as though students would be given the time limits that would have normally been imposed. Instructors were asked to refrain from making changes in the content, or increasing the length of their exams. Instructors were asked to use the same type of questions and test similar content as exams from previous years when students were not given extended time limits.

### Procedure

The researcher met with Department Heads within the Faculties of Science and Engineering to discuss the study and obtain guidance as to which faculty members taught classes that would be appropriate for this study. Professors in the Faculties of Science and Engineering who taught the type of classes that met the criteria for this study were approached to participate through a letter of invitation. Please see Appendix A for a copy of the letter that was used. This letter explained the following: the purpose of the study; the responsibilities of the professor; procedures of the study; and assurances of anonymity, confidentiality, and freedom to withdraw. After reading the letter of invitation and meeting with the researcher, professors were asked to

indicate their willingness to participate by signing and returning an informed consent form. A copy of the consent form can be found in Appendix B.

Once appropriate classes were identified and instructors agreed to participate, details of the proposed study were included in the course syllabus for each class. Information in the course syllabus explained the following: the purpose of the study, procedures of the study, and assurances of anonymity, confidentiality, and freedom to withdraw. Please see Appendix C for a sample of the information contained in the course syllabus. Participating faculty indicated on their course syllabus that all students were allowed extended time to complete the midterm exam, or the first two exams when the course employed three exams. Extended time limits allowed students a maximum of time and a half of the time limits normally imposed. For example, if the midterm was usually written in two hours, students were allowed up to three hours to complete the exam. Extended time limits were not given on the final exams.

Information that was provided on the course syllabus served as an informed consent form; however, students were not asked to provide written consent for their participation. Rather, students were informed that they were free to leave the exam whenever they finished. So, if students did not wish to participate in the study, then they simply left the exam whenever they finished, or at the end of the normal time limits. However, there were no students who chose not to participate in the study.

On the midterm exam, or the first two exams when the course employed three exams, the time students took to complete their exams was recorded, by the researcher or other persons administering the exam (research assistants or instructors), on a listing

of student identification numbers. The time that students took to complete their exams was used for study purposes only. Students' grades, identified by student number only, were provided by the course instructors. The researcher recorded these grades and the amount of time students took to complete their exams. Students were not provided with extra time on the final exam, so only grades, not the amount of time taken to complete the exam, were recorded for final exams. Once these data were recorded, each student was assigned a subject number separate from his or her student identification number. Assigning subject numbers ensured anonymity and confidentiality by prohibiting the data collected to be connected to individual students.

Although previous research identified that some subgroups of students (i.e., ESL) may be affected by time constraints to a greater extent than students in general, this study did not explore this possibility. This study chose instead to focus on students in general by studying courses with a large student enrollment.

Instructors also provided the researcher with students' grades (without any student identification numbers) from previous exams in the same course. These grades were used to determine if students in the present study, who received extended time limits, performed better than students in previous years, who completed a similar exam without extended time limits.

### Data Analysis

This study used a two-way ANCOVA to investigate whether extended time limits benefited students in general. The between subjects factor was the type of exam question employed (multiple choice only, problem solving only, or combined multiple

choice and problem solving). The within subjects factor was whether extended time limits were provided. The within subjects factor consisted of the mid-term exam(s) with extended time limits and the final exam without extended time. The time that students took to complete their exams was entered as a covariate in the analysis. The ANCOVA examined whether extended time limits were more beneficial depending on the type of exam questions employed. The ANCOVA also explored if there was a difference between students' grades on the mid-term (with extended time) and final (without extended time) exams regardless of the type of exam questions employed. Entering the time students took to complete their exams as a covariate allowed the ANCOVA, which is a combination of an analysis of variance and a regression, to investigate whether students' exam scores can be explained by their exam completion time.

T-tests were also completed for each type of exam question (problem solving only, multiple choice only, or combined multiple choice and problem solving). T-tests compared the grades of students in this study with the exam grades of students from previous years who completed their exams under normal time constraints. These t-tests provided further analysis of whether extended time limits benefited students in general.

Correlation analysis explored whether there was a relationship between the time students finished their exams, and the grade they received. These correlations explored whether students' grades increased with the amount of extra time they used. After the correlations were completed, a Fisher's Z transformation was performed to determine whether these correlations were significantly different among the three types

of exam questions. The Fisher's Z transformation analysis suggested whether the extended time limits were more beneficial depending on the type of exam question employed.

To investigate whether extreme scores affected the correlation analyses discussed above chi-squares were completed. For example, it is possible that those students who finished early did quite well because they knew the material, while those students who finished late did poorly despite staying for the extra time. If this was the case, these extreme groups may hide actual correlations between exam grades and completion time. For each type of exam question students' grades and their exam completion times were separated into low, middle, and high groups using cumulative frequency percentages, such that 33.3% of students fell into each category. However, for the problem solving only exams students' exam completion times were separated into two groups only. If the problem solving only data was separated into three equal groups using cumulative frequency percentages, there would have only been a one minute difference between the middle and late finishing groups. So, for the problem solving only data, students' completion times were separated into two groups (low and high) using a median split (50<sup>th</sup> percentile) to define the two groups. Chi-squares were performed for each type of exam question to investigate whether a relationship existed between the time students completed their exams and the grade they received.



## **CHAPTER FOUR**

### **Results**

A two-way analysis of covariance (ANCOVA) was performed including the two independent variables of type of exam question (multiple choice only, problem solving only, and combined multiple choice and problem solving) and extended time limits (extended time provided on the mid-term exam(s), regular time provided on the final exam). The amount of time students took to complete their exams was used as a covariate in the analysis of variance. Students' exam grades were collected as the dependent variable. Two sets of ANCOVAs were performed because the combined multiple choice and problem solving condition had only one mid-term and a final, whereas the multiple choice only and problem solving only conditions had two mid-terms and a final. In the analysis involving the multiple choice only and problem solving only conditions, a student's data were included in the analysis only if both the mid-term exams and the final exam were completed. If a student missed one of the exams, then his/her data were excluded from the analysis. In the analysis involving all three exam conditions, students in the multiple choice only and problem solving only conditions needed only to complete the first mid-term and the final exam. Even if students in these two conditions missed the second mid-term exam their data were included in the analysis because the second mid-term data was not part of the analysis. For this reason, between the two analyses, there are a slightly different number of subjects and different means and standard deviations for the multiple choice only and problem solving only conditions. Please see Table 1 and Table 3 for a display of this data.

The first analysis that will be discussed concerns the data collected from the multiple choice only and the problem solving only conditions. The two-way ANCOVA performed found a significant interaction between the type of exam questions and extended time ( $F(2, 617)=102.29, p<.001$ ). This interaction exists because on the first mid-term students in the multiple choice only condition performed better than students in the problem solving only condition; however, on the final exam the problem solving only students performed better than the multiple choice only students. There were differences found between the two groups which caused the significant interaction, however these differences did not offer information about the effect of extended time limits. On the basis of the significant interaction found, the simple main effects of type of exam question and extended time limits were tested. On average, there was a significant main effect for the type of exam questions ( $F(1, 308)=4.48, p<.05$ ) and the extended time limits ( $F(2, 617)=195.63, p<.001$ ). Post-hoc tests investigating the nature of these main effects were not completed because when students' exam completion time was entered as a covariate, there was no significant time effect on the results ( $F(1, 617)=0.0048, ns$ ). The focus of this study was whether extra time would benefit students in general. The non-significant time effect indicates that any differences found could not be accounted for by students' exam completion time. Given that a significant time effect was not found, the significant results discussed earlier (interaction and main effects) are of little interest. Please refer to Table 1 to view the mean exam grades for the different types of exam questions and Table 2 for a display of the ANCOVA results.

Table 1.

Mean Exam Grades (in percentages) Used in the ANCOVA for the Multiple Choice Only and Problem Solving Only Exams.

Type of Exam Questions	Mid-Term One			Mid-Term Two			Final		
	<u>M</u>	<u>SD</u>	N	<u>M</u>	<u>SD</u>	N	<u>M</u>	<u>SD</u>	N
Multiple Choice Only	84.00	9.96	253	79.72	10.92	253	55.88	6.95	253
Problem Solving Only	68.71	20.16	58	78.41	14.77	58	74.03	14.51	58

Table 2.

Analysis of Covariance of the Effect of Extended Time Limits on Multiple Choice Only and Problem Solving Only Exams.

Source	df	F
<b>Between Subjects</b>		
Exam Questions (Q)	1	4.48*
Error	308	(261.24)
<b>Within Subjects</b>		
Extended Time(T)	2	195.63**
Q x T	2	102.29**
Time to Completion	1	0.0048
Error	617	(53.82)

Note. Values enclosed in parentheses represent mean square errors.

\* $p < .05$  \*\* $p < .001$

The second ANCOVA analyzed the data from the multiple choice only and problem solving only conditions, excluding the second mid-term exam results, and included the data from the combined multiple choice and problem solving condition (mid-term and final). From the two-way ANCOVA a significant interaction between the type of exam question and extended time was found ( $F(2, 641)=143.14$ ,  $p < .001$ ). There were differences found between the three groups which caused this significant interaction, however these differences did not offer information about the effect of extended time limits. The interaction shows that in two conditions (multiple choice only

and combined multiple choice and problem solving) students performed better on the mid-term than the final; however, in the problem solving only condition students performed better on the final than the mid-term. On the basis of this significant interaction, the simple main effects of type of exam question and extended time were tested. On average, there was a significant main effect for the type of exam question ( $F(2, 641)=5.95, p<.05$ ) and extended time limits ( $F(1, 641)=275.09, p<.001$ ). Post-hoc tests investigating the nature of these main effects were not completed because when the amount of time students took to complete their exams was entered as a covariate, there was no significant time effect on the results ( $F(1, 641)=1.68, ns$ ). Although significant differences were found these differences were not due to the amount of time students took to complete their exams. Given that a significant time effect was not found, the significant results discussed earlier (interaction and main effects) are of little interest. Please see Table 3 to view the mean grades of students in the different exam conditions and Table 4 for a display of the ANCOVA results.

Table 3.

Mean Exam Grades (in percentages) Used in the ANCOVA for the Multiple Choice Only, Problem Solving Only , and Combined Multiple Choice and Problem Solving Exams.

Type of Questions	Mid-Term One			Final		
	<u>M</u>	<u>SD</u>	N	<u>M</u>	<u>SD</u>	N
Multiple Choice Only	84.04	9.86	271	55.88	6.85	271
Problem Solving Only	68.27	19.93	62	73.30	14.57	62
Combined Multiple Choice and Problem Solving	71.41	17.97	312	57.27	16.77	312

Table 4.

Analysis of Covariance of the Effect of Extended Time Limits on Multiple Choice Only, Problem Solving Only, and Multiple Choice and Problem Solving Exams.

Source	df	F
<b>Between Subjects</b>		
Exam Questions (Q)	1	5.95*
Error	641	(344.41)
<b>Within Subjects</b>		
Extended Time (T)	2	275.09**
Q x T	2	143.14**
Time to Completion	1	1.68
Error	641	(67.19)

Note. Values enclosed in parentheses represent mean square errors.

\* $p < .05$  \*\* $p < .001$

Correlation Analyses

Correlation analyses, investigating the relationship between students' exam completion time and exam grades, were completed for each type of exam question. No significant correlations were found. Even when students grades and exam completion times were separated into low, middle, and high groups, no significant relationship was found between students' exam grades and the amount of time they took to finish their exam. Fisher's Z transformations were completed to investigate whether there was a significant difference between the correlations obtained for the different types of exam

questions. The Fisher's Z transformation found that there was a significant difference between the correlations obtained for the multiple choice only ( $r = -.1401$ ) and the combined multiple choice and problem solving ( $r = .1703$ ) conditions ( $Z = 3.790$ ,  $p < .05$ ). This significant difference indicates that the correlation between exam completion time and performance was stronger for the combined multiple choice and problem solving condition than for the multiple choice only condition. In discussing the Fisher's Z one must remember that the correlations obtained by the two groups (multiple choice only and combined multiple choice and problem solving) were not significant, even though the difference between their respective correlations was significant. In discussing the correlation analysis of exam grades and exam completion time it is interesting to note the percentage of students who stayed beyond the normal time limits. The percentage of students who stayed for the extra time limits varied among the different types of exam questions. Please see Table 5 for a display of the percentages of students who stayed beyond the normal time limits.



Table 5.

Percentage of Students Using Extra Time.

Type of Questions	Mid-Term One	Mid-Term Two
Multiple Choice Only	0%	0%
Problem Solving Only	93%	98%
Combined Multiple Choice and Problem Solving	87%	NA

T-Test

The grades of students in the present study were compared with the grades of students from last year's offering of the same course, wherein students completed exams under normal time limits. A comparison between the mid-term grades of students this year (with extra time) with the grades of students from last year (without extra time) was completed to give another measure of how students' may have performed without extra time. T-tests were completed for each type of exam question. In the combined multiple choice and problem solving condition, students in the present study received significantly higher grades than last year's students on both the mid-term ( $t(750)=-9.21, p<.001$ ) and final ( $t(713)=-3.46, p<.001$ ). In the multiple choice only condition, students' grades from the present study were significantly higher than students' grades from last year on the first mid-term ( $t(699)=-10.40, p<.001$ ) and the second midterm ( $t(695)=-8.29, p<.001$ ). However, on the final, students' grades from last year were significantly higher ( $t(679)=26.89, p<.001$ ). In the problem solving only condition, students' grades from the present study were significantly higher than

students' grades from last year on the first mid-term ( $t(147)=-2.63$ ,  $p<.05$ ) and the second mid-term ( $t(144)=-3.14$ ,  $p<.05$ ). On the final there was no significant difference between the two groups ( $t(147)=-0.02$ , ns). These comparisons generally indicate that for each type of exam question students' grades from this year (with extra time) were higher than students grades from last year (without extra time). Please see Table 6 for a display of students' mean grades.

Table 6.

Mean Grades of Students From 1998 and 1999.

Type of Exam Questions	Mid-Term One (Extra Time)		Mid-Term Two (Extra Time)		Final Exam (No Extra Time)	
	1998	1999	1998	1999	1998	1999
	<u>M</u> ( <u>SD</u> )	<u>M</u> ( <u>SD</u> )	<u>M</u> ( <u>SD</u> )	<u>M</u> ( <u>SD</u> )	<u>M</u> ( <u>SD</u> )	<u>M</u> ( <u>SD</u> )
Multiple Choice Only	73.84 (11.92)	83.06** (11.44)	70.76 (13.65)	78.90** (12.02)	75.39** (11.36)	55.47 (7.24)
Problem Solving Only	60.38 (16.61)	68.27* (19.93)	70.69 (14.10)	78.27* (14.68)	73.08 (11.72)	73.13 (14.51)
Combined Multiple Choice and Problem Solving	57.29 (18.95)	69.94** (18.65)	NA	NA	53.11 (17.14)	57.47** (16.41)

\* $p<.05$  \*\* $p<.001$  Associated with the higher mean grade.

## Summary

On the whole, the analyses completed indicate that students in general do not improve their exam performance when given extra time. The ANCOVAs examined whether extended time limits were more beneficial depending on the type of exam questions used (multiple choice only, problem solving only, or combined multiple choice and problem solving). The ANCOVA also explored if there was a difference between students' grades on the mid-term exam(s) (with extra time) and the final exam (without extra time). Entering time as a covariate in the ANCOVA investigated whether the amount of time students took to complete their exams could predict their exam grades. Differences in exam grades were found among the three types of exam questions (multiple choice only, problem solving only, and combined multiple choice and problem solving) and between the two time conditions (extended time on mid-term and regular time on final). However, the differences found between mid-term and final exam grades were not consistently in favor of the mid-term exams completed with extra time. Using time as a covariate indicated that the significant differences found could not be explained by the amount of time students took to complete their exams. Although differences were found, they were due to factors other than the extended time limits. In addition, correlation analyses completed with each type of exam question (multiple choice only, problem solving only, and combined multiple choice and problem solving) showed no relationship between the amount of time students took to complete their exams and the grade they received. Even when students' grades and exam completion times were separated into low, middle, and high groups to take into account the effect

extreme scores may have had on the correlations, no significant relationships were found.

Only one set of analyses indicated that students in general may benefit from extra time on exams. When students' grades were compared with the grades of students from last year's offering of the same course, significant differences were found. These comparisons generally indicated that for each type of exam question students' grades from this year (with extra time) were higher than students' grades from last year (without extra time).

## **CHAPTER FIVE**

### **Discussion**

The present study examined whether students without identified disabilities would improve their exam performance when given extra time. It was hypothesized that students would perform better on problem solving exams when provided with extra time. It was also hypothesized that students' performance on multiple choice exams would not increase with extended time limits. The results of this study do not fully support these hypotheses. On both multiple choice and problem solving exams, differences were found between students' mid-term and final exam grades. However, these differences could not be accounted for by the amount of time students took to complete their exams. Only when students' grades were compared with the grades of students from last year were significant differences found which show the benefit of extra time. On both problem solving and multiple choice exams, students this year, completing their exams with extra time, performed better than students last year, who completed their exams under normal time constraints. It was also hypothesized that there would be no relationship between students' exam completion time and exam performance. The results of this study support this hypothesis. The following is a more detailed examination of these results, followed by a discussion of the limitations and implications of this study, and directions for future research.

To begin, let us discuss the analyses in which students' grades were analyzed with the amount of time they took to complete their exams entered as a covariate. When students' exam completion time was entered as a covariate, there was no

significant time effect on the results. This non-significant result indicates that any differences found among students' exam grades, were not due to the amount of time students took to complete their exams. Although differences were found, these could be attributed to factors other than the extended time limits. For example, it is possible that the mid-term and final exams used in this study had varying levels of difficulty, which may have caused the observed differences among students' grades. For a more specific example, let us consider students' grades in the multiple choice only condition. Students in the multiple choice only condition performed better on the mid-term exam than the final. However, it is possible that the mid-term exam used in this condition was much easier than the final, and thus it was not the extended time limits, but the level of exam difficulty that caused students to perform better. Using time as a covariate indicated that the differences among students' grades could not be accounted for by the extra time provided. This leads to a preliminary conclusion that providing extra time on multiple choice and problem solving exams does not benefit students in general. This conclusion is supported by the correlation analyses completed, which investigated the relationship between exam completion time and performance.

Correlation analyses showed no significant relationship between exam completion time and performance. If extra time benefited students in general, one would expect students' grades to increase as their exam completion time increased. Yet this was not the case. Many students in the combined multiple choice and problem solving condition and the problem solving only condition stayed for the extended time limits. In the combined multiple choice and problem solving condition, 87% of students

stayed beyond the normal time limits. On the first mid-term and second mid-term in the problem solving only condition, 93% and 98% of students respectively stayed beyond the normal time limits. However, even though these students stayed beyond the normal time limits, this was not related to an increase in their exam performance as compared to the final exam marks. The fact that so many students stayed beyond the normal limits, but did not seem to increase their performance when mid-term and final grades were compared, suggests that instructors may have inadvertently increased the difficulty of their final exam. Students in the multiple choice only condition also did not benefit from the extended time limits provided. In fact, none of the students in the multiple choice only condition stayed beyond the normal time limits. This suggests that students in the multiple choice only condition did not feel they needed to use the extra time provided. Providing extra time on multiple choice exams does not seem to increase students' performance, likely because the factual recall of information that is required for multiple choice exams cannot be improved with extra time. Either students know the material and can identify the correct answer from the alternatives, or they do not, and they must then guess at the correct answer.

Only one set of analyses indicated that students in general may benefit from extra time on exams. When students' grades were compared with the grades of students from last year, significant differences were found. These comparisons generally indicated that for each type of exam question, students' grades from this year (with extra time) were higher than students' grades from last year (without extra time). However, there are many factors which may confound this comparison. First of all, in

comparing this year's grades with last year's grades, we are comparing two different groups of students. It is possible that these two groups of students are different (i.e., in terms of motivation, skills, etc.) and thus differences may be found regardless of whether extra time was provided. For example, if this year's students are naturally more skilled than last year's students, we may expect them to receive higher grades, regardless of the extra time provided as part of this study. Second, none of the classes in this study used the same exams as were used in last year's classes. The higher grades obtained by students this year may be due to differences in the exam questions used. It is possible that the exams used this year were easier than last year's exams, which would result in students from this study performing better than last year's students. Thus, it may not have been the extra time that caused the observed improvement in students' grades.

The problems that arise in comparing exam grades from this year with exam grades from last year make it difficult to draw conclusions from such comparisons. Given this difficulty, it seems that the correlation analyses and the analyses of covariance are the most useful analyses. By focusing only on the exam grades of students from this year, these analyses avoid the problems associated with comparing students' exam grades from two different years. One may argue that the analysis of covariance results are limited because they compare students' grades on two different exams (mid-term and final), for which there are no assurances that the two are of comparable difficulty. However, one must also remember that the analysis of covariance included students' exam completion time as a covariate in the analysis,



which allowed it to provide information about whether differences in students' exam grades could be predicted and accounted for by exam completion times. In addition, the analyses of covariance are supported by the correlation analyses finding no significant relationship between students' exam completion times and exam performance. Thus, the results of this study generally indicate that providing students in general with extra time does not improve their exam performance on multiple choice and problem solving exams.

The results of this study suggest that the present practice of providing students with a learning disability, but not students in general, with extra time is not unfair. The present study supports previous literature finding that extended time limits do not benefit students in general (Alster, 1997; Centra, 1986; Hill, 1984; Perlman, Borger, Collins, Elenbogen & Wood, 1996; Runyan, 1991; Wild, Durso & Rubin, 1982; Wright, 1984). Findings are consistent with previous research finding no relationship between exam completion time and performance (Bridges, 1985; Herman, 1997; Kennedy, 1994; Lester, 1991; Owuengbuzie, 1994; Wierzbicki, 1994).

### Limitations

The conclusions made from this research are limited to the extent that the exams used in the courses studied are representative of exams in other courses. It was assumed that the exams studied were not significantly different (i.e., in length or difficulty) than 'typical' exams. It was assumed that the exams used in the courses studied were representative of 'typical' multiple choice and problem solving exams in that the multiple choice exam required fact based recall of information, while the

problem solving exam required synthesis of knowledge. If the exams used as part of this study were not representative of 'typical' multiple choice or problem solving exams, then the results of this study will have limited generalizability. For example, let us assume that professors who naturally tend to make shorter, easier exams agreed to participate in this research. This being the case, it is possible that the students in this study may not have increased their performance with extended time, simply because the exam was too short. Whereas, these students would have increased their performance in other classes wherein the exams are longer. This seems possible for the multiple choice only exam, as students did not use any extra time for this type of exam. However, students in the problem solving only exam and the combined problem solving and multiple choice exam did use extra time. It is possible that the exams in these courses were unrepresentative of exams in other courses, in that the final exam was too difficult. If the final exam was too difficult, comparisons between mid-term grades and final grades would not have shown the benefit of extra time. This being the case, it is possible that the students in this study may have increased their performance with extra time, but this benefit could not be shown in a comparison of mid-term and final exam grades.

The courses included in this study were not randomly chosen, so it is possible that there were systematic differences between the exams used in the courses studied, and the exams used in other courses. In addition, professors were not blind about their participation or the purpose of this study. So, it is possible that the professors in this study may have altered their exams because they knew that students would be

receiving extended time limits. To avoid this possibility, it would have been beneficial, but impractical due to time constraints, to obtain professors' consent to participate after they had already made their examinations. This study did attempt to address this issue by asking instructors to use the same type of questions and test similar content as exams from previous years, when students were not given extended time limits. However, making such a request could not ensure that professors did not unintentionally alter the exam because of the extended time limits. It is difficult to determine whether the exams used in this study are representative of other exams because no guidelines exist about how to ensure an exam length is appropriate. It seems that many professors rely on convention or past experience to determine the length of their exams (Parr, Levi & Jacka, 1996).

### Future Research

This study points to a number of possible directions future research may take. Future studies may wish to change the design of the present study to allow better comparisons to be made, and more information about students to be gathered. Future research may also wish to extend the sample used in this research to include other types of exams. Lastly, future studies may also address a limitation of the present study by examining whether guidelines can be developed to ensure exam lengths are reasonable.

To begin, future research may change the design of the present study, such that students in the same class are randomly assigned to extended time and normal time conditions. Such a design would avoid the difficulties this study found with potential

confounding variables affecting the comparison of students' grades on different exams and the comparison of students' grades from different years. Originally, the present study was designed in such a fashion. On the first mid-term half of the students were to receive extra time, while the other half completed the exam under normal time constraints. Then, on the second mid-term the conditions would be reversed, such that the group of students who did not receive extra time were given extra time, while the other group of students completed the exam with normal time limits. However, ethical concerns about the fairness of such a design prevented it from being implemented. Concerns were raised about the fairness to students if one mid-term exam was significantly harder than the other. If one mid-term was significantly harder, a student who received extra time on that mid-term may be at a significant advantage, in comparison to students who did not receive extra time. However, future research could avoid such ethical concerns by weighting students' grades if such a situation arose. Such an experimental design, with a provision in place to ensure the fair treatment of students, would allow more useful and informative comparisons of students' grades to be made than was possible in the present study.

Future research could also gather more information by further examining those students who stayed for the extended time limits. The results found in this study differed from previous studies finding that normally achieving students benefit from extended time limits (Halla, 1988, as cited in Runyan, 1991; Onwuegbuzie & Daley, 1996; Onwuegbuzie & Seaman, 1995; Powers & Fowles, 1996; Rawlings & Carnie, 1989; Schnipke & Pashley, 1997). Most of this previous research found that extended time

limits are beneficial for subgroups of students within the normally achieving population (i.e., anxious, ESL, introverted) (Onwuegbuzie & Seaman, 1995; Rawlings & Carnie, 1989; Schnipke & Pashley, 1997). Unlike this previous research, the present study did not examine the performance of subgroups of students. Therefore, it is possible that extra time may be beneficial for certain subgroups of students, but that this benefit was hidden in the group means analyzed in the present study. Although none of the students in the multiple choice only condition stayed beyond the normal time limits, the majority of students in the problem solving only and the combined problem solving and multiple choice conditions stayed for the extended time limits. It would be interesting to find out more information about the students who stayed for extra time. Interviews may investigate why these students felt it necessary to stay longer, and what they did during the extra time. Questionnaires could also be employed that would investigate possible variables (i.e., ESL status) that may separate students who benefit from extra time from those who do not.

Future research may also benefit from extending the scope of the sample studied. Future studies could examine students' performance on written language exams. It is possible that written language exams may be affected by time limits to a greater extent than problem solving or multiple choice exams. On written language exams students can increase their grades by editing and revising their work. However, these tasks are quite time-consuming and it is possible that students in general may not be given enough time to complete these task in the time normally provided.

Finally, to address a limitation of the present study, future research may try to develop guidelines to help ensure that the exams used in courses are a reasonable length. It is difficult to make conclusions about the benefit of extra time on exams for students in general because each professor determines the appropriateness of the length of their exams. Thus, it is possible that on some exams, which are too long, students may benefit, while on others they do not. With the present system in place, each courses' exams would have to be tested, unless guidelines concerning the length of exams can be created.

### Implications

It appears, from the results of this study, that students in general do not need extended time limits to complete multiple choice and problem solving exams. Given this, it seems that educators should continue their present practice, allowing students with a learning disability, but not students in general, extra time to complete exams. This study also points to the importance of ensuring that exam lengths are reasonable. A point made in this study was that if an exam length is seriously misjudged, it is likely that all students will benefit from extra time. Present practice assumes that exam lengths are reasonable, however there are no guidelines in place to ensure that this assumption is justified.

Based on the results of this study, it appears that the exams used in university courses are not speed exams for students in general, as these students are given adequate time to display their knowledge. Although students may report that they would prefer extra time, providing extended time limits does not result in an

improvement in these students' performance. The results of this study should help quell the controversy about providing extra time to students with a learning disability to write multiple choice or problem solving exams. Students in general appear to be provided with enough time to display their knowledge. It seems that students in general do not experience difficulties that would result in them requiring extra time to adequately display their knowledge on multiple choice or problem solving exams. Given this, educators can rest assured that providing students with a learning disability extra time on exams does not disadvantage students in general because they are given adequate time to display their knowledge.

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## Appendix A

### Letter of Invitation to Participate in a Study of Extended Time on University Examinations

To Whom It May Concern,

My name is Camille Armitage. I am a graduate student in the Department of Educational Psychology at the University of Calgary, conducting a research project under the supervision of Dr. Marilyn Samuels, as part of the requirements towards a M.Sc. degree. I am writing to provide information regarding my research project concerning extended time on university examinations so that you can make an informed decision regarding your participation.

The purpose of this study is to determine whether students generally will benefit from the extended time limits which students with a learning disability are given when writing examinations. This study will compare the performance of students under normal time constraints and extended time limits. Your participation in this study will depend upon your willingness to participate and whether the class you teach meets the following requirements: students' performance is assessed through three, equally weighted, examinations, and examinations consist mainly of multiple choice or problem solving questions. As a participant in this study you will not be asked to alter the content of your examinations. You will, however, be asked to alter the maximum amount of time which students are given to complete their examinations. The students in the classes participating in this study will be given extended time limits to complete their first two examinations. On the final examination students will receive the normal time limits. To summarize, this study will require professors to adjust the length of the first and second examinations in their course.

Even if you give your permission, you are free to withdraw from the study at any time for any reason, without penalty. Participation in this study will involve no greater risks than those ordinarily experienced in daily life. Data will be gathered in such a way as to ensure anonymity. In written reports professors will not be identified nor will course numbers or section numbers. All students will receive subject numbers and data will be recorded with subject numbers, not individual student's names or student identification numbers. Once collected the data will be kept in the strictest confidence. All files will be destroyed two years after completion of the study.

If you have any questions, please feel free to contact me at 220-5099, my supervisor Dr. Marilyn Samuels at 220- 8322, the Office of the Chair, Faculty of Education Joint Ethics Review Committee at 220-5626, or the Office of the Vice-President (Research) at 220-3381. Two copies of the consent form are provided. Please return one signed copy to me by November and retain the other copy for your records. Thank you for your cooperation.

Sincerely,

**Appendix B****Consent for Participation in a Study of Extended Time On University Examinations**

I, the undersigned, hereby give my consent to participate in a research project entitled **Extended Time on University Examinations**.

I, understand that such consent means that I will provide extended time limits on two of the examinations in my class. I understand that participation in this study may be terminated at any time by my request or the request of the investigator. Participation in this project and/or withdrawal from this project will not adversely affect me in any way.

I understand that this study will not involve any greater risks than those ordinarily occurring in daily life.

I understand that the responses will be obtained anonymously and confidentially. I understand that I will not be identified in any reports that are written nor will any of my students.

I have been given a copy of this consent form for my records. I understand that if I have any questions I can contact the researcher, Camille Armitage, at 220-5099, her supervisor, Dr. Marilyn Samuels, at 220-8322, the Office of the Chair, Faculty of Education Joint Ethics Review Committee at 220-5626, or the Office of the Vice-President (Research) at 220-3381.

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Date

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Signature

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Participants Printed Name

## Appendix C

### Sample Syllabus

This class has been chosen for participation in a study concerning extended time limits on university examinations. This study will examine whether students generally will benefit from the extended time limits which students with a learning disability are given on examinations. Your participation in this study will involve the following. On the first two examinations in this course you will be allowed extended time limits to complete your examination. The amount of time that you took to complete the exam will be recorded on your examination paper. Extended time is defined as time and a half of the time constraints that are normally imposed. For example, if the exam is normally two hours long, extended time will allow students a maximum of three hours to complete the exam. However, you are free to leave the exam whenever you are finished. On the final examination you will complete the exam under normal time restrictions.

To ensure anonymity and confidentiality each student will be given a subject number, which is separate from their student identification number. The subject number is the only way in which data will be recorded making it impossible to trace data to individual students. Essentially, the information contained in this course syllabus allows it to act as an informed consent form. This information is provided so that you may make an informed decision regarding your participation in this study.