

Student Anxiety and Evaluation

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The increased prevalence and severity of academic-related distress is of significant concern on college campuses. Of particular relevance to instructors is the anxiety relating to classroom teaching and evaluation practices. Sources of evaluation anxiety include student uncertainty about the nature of the expected demands as well as their ability to meet these demands. This report presents work from a pilot study investigating correlations between evaluation anxiety and perceived evaluation accuracy for different evaluation techniques across four different disciplines. We also examined the potential mediating role of academic self-efficacy in the relationship between anxiety and expected grade. Our results provide insight into methods to reduce anxiety and increase performance. We try to answer the question: “Should instructors focus their efforts on modifying their evaluation tools or increasing academic self-efficacy?”

La prévalence et la gravité accrues de la détresse liée aux études sont une préoccupation importante sur les campus universitaires. L'anxiété liée aux pratiques d'enseignement et d'évaluation en classe est particulièrement importante pour les instructeurs. Les sources d'anxiété de l'évaluation comprennent l'incertitude des étudiants quant à la nature des demandes attendues ainsi que leur capacité à répondre à ces demandes. Ce rapport présente les résultats d'une étude pilote portant sur les corrélations entre l'anxiété de l'évaluation et la fidélité à l'évaluation perçue pour différentes techniques d'évaluation dans quatre disciplines différentes. Nous avons également examiné le rôle potentiel de médiation de l'auto-efficacité académique dans la relation entre l'anxiété et le grade attendu. Nos résultats donnent un aperçu des méthodes permettant de réduire l'anxiété et d'augmenter les performances. Nous essayons de répondre à la question : « Les instructeurs devraient-ils concentrer leurs efforts sur la modification de leurs outils d'évaluation ou sur l'amélioration de leur efficacité personnelle? »

Pychological distress is a growing problem on campuses, both in terms of prevalence and of severity (Deasy, Coughlan, Pironom, Jourdan, & Mannix-McNamara, 2014). Academic factors are cited as significant stressors/causes of concern more than non-academic factors such as finances and personal relationships (Beiter et al., 2015; Deasy et al., 2014; Kumaraswamy, 2013). While a certain amount of stress is unavoidable and potentially beneficial, a common response to stress is anxiety (Johnson, 2009). Test anxiety is particularly

relevant. It describes a set of responses experienced by students in evaluative situations resulting from concern about the consequences of poor performance/failure. While most commonly studied in the context of traditional exams, this concept can extend to any form of academic evaluation, including essays and oral presentations, and is thus often described as evaluative anxiety. Manifestations of test anxiety can include cognitive responses such as worry and fear of failure, physiologic responses—also known as bodily-affective responses—such as

elevated heartbeat, and behavioral responses such as procrastination and avoidance of studying (Zeidner, 2007).

Apart from its impact on student well-being, evaluative anxiety also impacts academic performance (Baumeister, 1984; Ramirez & Beilock, 2011). Indeed, student marks may reflect their ability to cope with evaluation anxiety as much as their skills and knowledge (Zeidner, 2007). Anxiety reduces goal-focused attention (Mowbray, 2012) and working memory skills (Beilock, Kulp, Holt, & Carr, 2004), and thus impacts all stages of the learning process: preparation, performance, and reflection (Cassady, 2004). Of particular concern is the impact of anxiety on how students learn: anxiety impairs deep-level processing and is positively correlated with surface-level processing (Rozendaal, Minnaert, & Boekaerts, 2001). Highly anxious students do correspondingly worse on evaluations requiring high cognitive involvement, such as short-answer and essay questions, and take home examinations (Benjamin, McKeachie, Lin, & Holinger, 1981). Students with higher anxiety (e.g., worry, emotionality) focus on avoiding failure and not appearing incompetent, whereas low anxiety is associated with a focus on developing skills and mastering the content (Stan & Oprea, 2015).

The degree of anxiety depends, in part, on the characteristics of the evaluation itself. While we often consider exams as highly stressful situations for students, several studies show that students perceive open-ended assessments such as term papers and oral presentations as equally or even more stressful (Deasy et al., 2014; Pitt, Oprea, Tapia, & Gray, 2017). This anxiety reflects, at least in part, discrepancies between perceived assignment quality and the mark they receive (Pitt et al., 2017). Thus, student perceptions of the assessment's accuracy in evaluating skills and knowledge could be implicated in how much anxiety it provokes.

Student personality traits can also account for perceived anxiety around evaluation (Lowe et al.,

2008). Individual differences that are malleable and receptive to change (as opposed to highly stable personality traits) provide particularly advantageous aspects for study, as they may be amenable to change through targeted intervention. For instance, locus of control indicates the degree to which one attributes the outcome of an evaluation to external forces, such as the instructor, or to internal forces, such as one's own actions (Hrbáčková, Hladík, & Vávrová, 2012). An internal locus of control has been linked to greater academic achievement (Rinn, Boazman, Jackson, & Barrio, 2014).

A related target is academic self-efficacy, which indicates students' subjective beliefs about their ability to cope with academic challenges (Bandura, 1997; McIlroy, Bunting, & Adamson, 2000). Possessing the necessary skills and knowledge to complete the task is not sufficient; students must also believe that they can be successful under the challenging circumstances associated with evaluation (Artino, 2012; Bandura, 1997). As such, academic self-efficacy is both situational and task-specific (Artino, 2012). Improving academic self-efficacy may also directly impact academic performance, since many studies reveal strong correlations between these two parameters (see, for instance, Honicke & Broadbent, 2016; Richardson, Abraham, & Bond, 2012). The meta-analysis of Talsma et al. (Talsma, Schütz, Schwarzer, & Norris, 2018) took the additional step of examining causal relationships between performance and self-efficacy and observed a reciprocal relationship. Their data supported the validity of the statements "I believe therefore I achieve" (p. 136) as well as "I achieve therefore I believe" (p. 137) for adult learners. Targeting academic self-efficacy (as well as performance directly) can thus significantly improve student performance.

Research suggests this relationship may be mediated, in part, by a reduction in anxiety, since high-anxiety, low self-efficacy students demonstrate poorer performance compared to students with similar anxiety levels but higher self-efficacy (Raufelder &

Ringeisen, 2016). Strong academic self-efficacy can improve performance by protecting against cognitive and bodily aspects of anxiety resulting from a lack of confidence.

This report presents work from a pilot study investigating correlations between evaluation anxiety, personality measures, and evaluation types in undergraduate students.

Study Purpose

With respect to evaluation, we hypothesized that student anxiety would be less in regard to techniques that they believe accurately reflect their knowledge and abilities. Further, we investigated whether this association was the same across different types of evaluation. Next, we investigated self-efficacy, and hypothesized that anxiety would be reduced in students with greater self-efficacy. We further investigated whether self-efficacy accounted for the association between anxiety and predicted grade. To anchor this project in classroom practice, we kept in mind this question: In order to reduce anxiety and increase student performance, should instructors focus their efforts on modifying their evaluation tools, decreasing anxiety, or increasing self-efficacy?

Methodology

The study population included students at a small, primarily undergraduate university taking classes in four different disciplines:

1. Non-majors in Biology, $n = 110$
2. Sports Studies, $n = 14$
3. Philosophy, $n = 18$
4. Religion, $n = 23$

The survey was administered using an online questionnaire at the beginning of the semester. “No answer” was a response option for every question.

Within the population, 90 students (62% female) filled out the survey.

We examined the association between the anxiety provoked by a particular evaluation technique and its perceived accuracy in assessing students’ skills and knowledge in regard to common evaluation techniques (oral presentations, term papers, and exams) as well as class-specific techniques (posters, lab reports, reflective journals, infographics, and seminars). Please see the Appendix to review all questions asked about anxiety, assessment accuracy, academic self-efficacy, and locus of control. Note that the question asking participants to rate the amount of anxiety caused by various evaluation techniques is similar to that used by England and colleagues (England, Brigati, & Schussler, 2017) to evaluate the anxiety-provoking potential of different pedagogical approaches. The questionnaire also provided measures of each student’s locus of control and academic self-efficacy (McIlroy et al., 2000).

Additional questions asked about gender identification, academic program, program year, and predicted mark in the course. Most students were in their first year (33%), second year (23%) or third year (23%) and most reported majoring in social sciences (51%), humanities (26%), and education (13%). Natural science majors made up 6% of the sample.

All statistical analyses were performed using SPSS (version 24). The differences between populations were analyzed using ANOVA (analyses of variance). Correlations were examined by Pearson bivariate correlations. Mediation analysis was performed using a hierarchical linear regression. This study was approved by the Research Ethics Board of Bishop’s University.

Results and Discussion

Overall, the sample reported relatively high expectations, where 56% expected a grade of 80 or

above. Overall, students rated their self-efficacy as mean: $M = 48.74$, standard deviation: $SD = 8.45$ (range 31-90), with higher values indicating a higher degree of academic self-efficacy. The midpoint of the scale is 40 (McIlroy, et al., 2015). The mean value for locus of control was $M = 49.02$ and $SD = 8.62$ (range

25-68), with higher values indicating an internal (rather than external) locus of control. There were no significant gender differences with respect to locus of control ($t(68) = .159, p > .1$), or academic self-efficacy ($t(68) = 1.822, p > .05$).

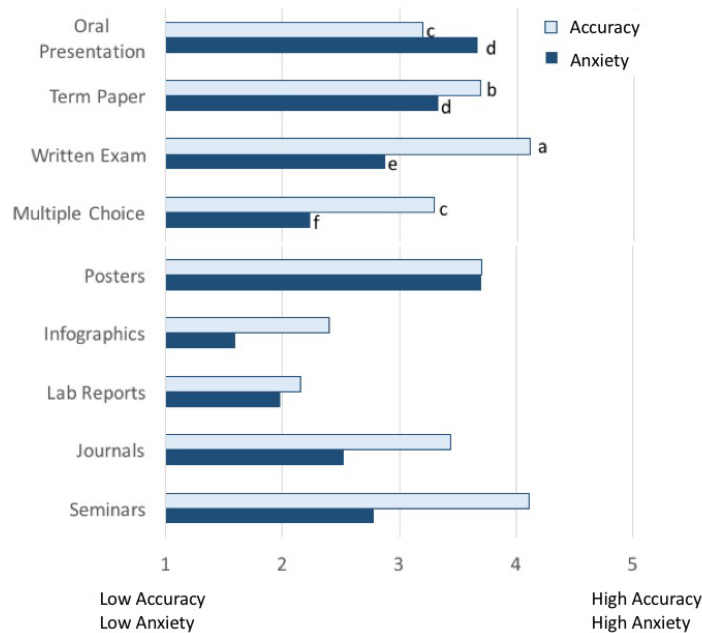


Figure 1. Perceived assessment accuracy and anxiety with respect to different evaluation tools. Different letters indicate significant differences. See Figure 2 for the number of participants in each group.

To test our hypotheses, we compared four relatively common evaluation techniques in terms of the anxiety they provoke and the students' perceptions of their accuracy as measurement tools. Multiple choice exams provoked less anxiety than long-answer exams, which, in turn, provoked less anxiety than term papers and oral presentations, $F(1,79) = 63.05, p < .001$ (Figure 1). The perceived accuracy was highest for long-answer exams, somewhat lower for term papers, and lowest for oral presentations and multiple-choice exams. We also evaluated less common techniques that, for the most part, were relatively unfamiliar to the students: academic posters, infographics, lab reports (in a population of non-science students), reflective journals, and seminar participation. The overall results are shown in Figure 1; while statistical comparisons were not

done because of the small numbers and distinct student populations for each technique, it is apparent that novel evaluation techniques do not necessarily invoke greater anxiety than familiar tools. A preliminary examination of gender revealed that women reported more anxiety ($M = 3.02, SD = .63$) than men ($M = 2.58, SD = .79$), $t(68) = -2.54, p < .05$. This finding is consistent with a number of studies that find a higher prevalence of anxiety in women and minority groups (Bayram & Bilgel, 2008; Hembree, 1988; Wong, Cheung, Chan, Ma, & Wa Tang, 2006). In contrast, there was no significant difference in expected grade between males and females, $t(68) = -1.18, p > 1$. We did not have enough ethnic diversity within the study population to examine differences between minority groups.

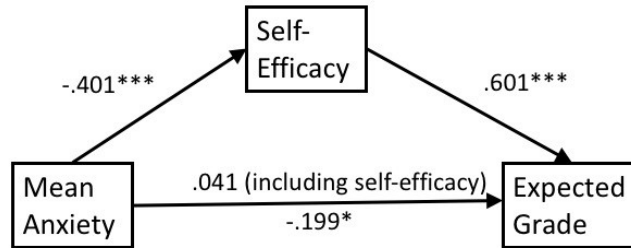


Figure 2. Correlations between individual scores for the anxiety provoked by the technique and its perceived assessment accuracy

As summarized in Figure 2, the correlation between anxiety and perceived accuracy varied between evaluation tools. Multiple choice, written exam, term papers and oral presentations were common to all groups and were therefore examined together. For evaluations unique to a course, they were combined in a “variable” and then split by evaluation type (bottom row of Figure 2). We observed a negative correlation for four techniques (term papers, oral presentations, seminar discussions, reflective journals) which means that these techniques provoke less anxiety in students who believe that they accurately portray their knowledge and skills. In contrast, anxiety was independent of perceived accuracy for both multiple choice and written response exam questions, as indicated by the correlation values of 0.013 and 0.019, respectively. Given the wide prevalence of these measures, it is possible that perceptions of accuracy are independent of feelings of anxiety. In other words, participants might reason that multiple choice and written exams must be sound measures because they are used so widely. A strong positive correlation was observed for lab reports and academic posters, suggesting that students felt the most anxious if they believed that the evaluation was accurate. In this case, the anxiety might stem from a so-called imposter syndrome whereby the evaluation might uncover inadequacies in their learning that they otherwise were able to mask (Kolligian & Sternberg, 1991).

It should be noted that it is still unclear why we are finding different associations across different evaluation techniques. The findings indicate a need

to further investigate the taxonomies of the various evaluations to determine whether they are more subjective or objective, group or individual based, public (oral presentation) or private(test) and to better understand the role of anxiety in evaluation. If larger-scale studies provide similar data, these results can indicate which evaluation techniques could benefit from increased transparency in instructor evaluative procedures.

We averaged the perceived anxiety ratings for the five techniques to obtain a general evaluation anxiety score for each student, and examined correlations between overall evaluation anxiety, expected grade, academic self-efficacy, and locus of control (Figure 3). We observed a significant negative correlation (-0.199) between expected grade and overall evaluation anxiety (Figure 2). Thus, as shown by other studies (e.g., (Hackett, Betz, Casas, & Rocha-Singh, 1992; Roick & Ringeisen, 2017), greater anxiety predicts a lower expected performance. Furthermore, this association can be attributed to differences in academic self-efficacy, since the correlation between anxiety and expected grade decreases to 0.041 when self-efficacy is entered into the model. Students with a greater degree of academic self-efficacy expected higher grades and were less anxious. Locus of control was positively associated with expected mark ($r(87) = .252, p < .05$), but was not significantly correlated with anxiety ($r(88) = -.133, p > .1$), therefore no further mediation was tested with locus of control.

Multiple Choice	Written Exam	Variable	Term Paper	Seminar
.013	.019	.468***	-.240*	-.234*

Seminar (n=9)	Journal (n = 25)	Lab Reports (n = 46)	Posters (n = 10)
-.126	-.600***	.635***	.726***

Figure 3. Correlations between overall evaluation anxiety, expected course grade, and academic self-efficacy. The correlation between mean anxiety and expected grade decreases to 0.041 if academic self-efficacy is included in the model (* $p < 0.05$, *** $p < 0.001$).

Addressing Individual Differences: Academic Self-Efficacy and Anxiety

Academic self-efficacy is both domain-specific and malleable; it may provide a useful and attainable target in our efforts to reduce student anxiety. Bandura (1997) proposed four sources of academic self-efficacy: mastery experiences, vicarious experiences, social persuasion, and physiologic state. These sources can be addressed by incorporating efficacy-enhancing teaching and learning strategies into the classroom (Cheung, 2015).

The most important efficacy-enhancing teaching strategy is creating opportunities for students to master challenging and meaningful tasks (Pajares, 1996); teaching strategies account for more variance in academic self-efficacy than either math background or ACT scores (Fenci & Scheel, 2005). Collaborative learning, in which students work together to solve a problem or complete a task (Laal & Laal, 2012), has been shown to provide efficacy-enhancing mastery experiences in multiple disciplines (Baldwin, Ebert-May, & Burns, 1999; Bong & Skaalvik, 2003; Fenci & Scheel, 2005; Pajares, 1996; Usher & Pajares, 2009). In contrast, lecturing and audio-visual presentations are not effective in this respect (Fenci & Scheel, 2005). For laboratory

courses, inquiry labs, but not quantitative or directed lab activities, appear to promote self-efficacy (Fenci & Scheel, 2005).

The development of academic self-efficacy requires considerable buy-in from the students themselves. Committing to efficacy-enhancing, deep learning strategies requires greater cognitive investment than the surface learning approaches favored by many students (Phan, 2007). Deep learning favours understanding and elaboration over memorization and can be facilitated by the use of metacognitive learning skills such as goal setting and self-monitoring (Nbina & Viko, 2010). Schmidt and Ford (2003) observed that students who increased their use of metacognitive approaches during an online training course showed a greater increase in self-efficacy than those who did not.

Students estimate future successes based on previous experiences, especially for evaluations which are perceived to be accurate representations of their ability levels (Covington, 1985). Thus, providing detailed, individual feedback and recommending strategies for future iterations can facilitate self-efficacy (Margolis & McCabe, 2006). Feedback must be honest and explicit; indiscriminate praise can be counter-productive (Hattie & Timperley, 2007). By understanding the causes of both their successes and their failures, students are more apt to set goals that are challenging yet achievable, and to invest more effort and commitment in their attempts to meet the

goals (Hattie & Timperley, 2007; Locke & Latham, 2002). Feedback also facilitates self-efficacy calibration—the concordance between confidence in performance and accuracy of performance (Stone, 2000). Training students in metacognitive study strategies such as self-testing and self-monitoring can also facilitate better self-efficacy calibration (Hattie & Timperley, 2007; Stone, 2000).

For new types of evaluation, for which students do not have prior experience, watching peers succeed can be very helpful (Usher & Pajares, 2009). While not as effective as performance accomplishments, vicarious learning can also promote the development of academic self-efficacy and appears to augment the impact of the performance accomplishments (Bandura, 1997; Hackett et al., 1992). To be effective, students must perceive the peer model as similar to themselves, but also credible, competent, and enthusiastic (Artino, 2012). Instructors can play a role in training student models to be both credible and competent by ensuring that they are enthusiastic and perform at, or slightly above, the skill level of the other students (Artino, 2012).

Instructors can also address the physiological aspects of academic self-efficacy and of test anxiety itself by using relaxation techniques (Embse, Barterian, & Segool, 2013; Margolis & McCabe, 2006). Doherty and Wenderoth (2017) refined a novel approach pioneered by Ramirez and Beilock (2011), in which students spent 5 minutes writing about their testing worries at the beginning of an exam. Students then crumpled up the paper and threw it into the classroom corridor. This approach was shown to increase student performance and decrease student anxiety. However, it should be noted that, at moderate levels, the emotionality components (affective, physiologic) of test anxiety appear to enhance performance (Cassady & Johnson, 2002) by triggering adaptive self-regulation strategies (Schutz & Davis, 2000).

Addressing Evaluation Transparency: Evaluation Training?

These results also suggest that altering student perceptions regarding the assessment accuracy of open-ended evaluation tools could potentially reduce anxiety as well as increase the accuracy of our evaluations. Students considered oral presentations and term papers to be comparatively low in assessment accuracy and high in inducing anxiety. This disconnect between perceived performance and received grade may reflect instructors' use of both *explicit* and *tacit* knowledge to evaluate student work (Rust, Price, & ODonovan, 2003). The explicit aspect can be transferred from instructor to student by providing students with clearly articulated criteria. Transferring tacit knowledge, the sense of “knowing good work when I see it”, is more difficult, but can be revealed by shared practice and discussion (Rust et al., 2003), p.152. The analysis of exemplars (examples of an assignment representing designated levels of competence) in student groups, followed by an instructor-led discussion, may facilitate this process (Carless & Chan, 2017). Small-scale studies have revealed benefits such as increased performance (based on grades), increased confidence, and enhanced metacognition and academic self-efficacy (Hawe, Lightfoot, & Dixon, 2017). Our research group is currently investigating the hypothesis that explicit training in evaluative procedures will both reduce anxiety and increase performance.

Conclusion and Future Directions

This study examines the interplay of evaluation anxiety, expected student performance, and self-efficacy in undergraduate students. As the study was relatively small in size, our ability to analyze the question with a large degree of complexity was

limited. For example, extensive comparisons between groups was difficult for lack of power. A strength of this pilot is the breadth of evaluation techniques considered, as well as different areas of study. This approach uncovered the complexity of the topic. Different evaluation types evoked very different associations between evaluative anxiety and perceptions of measurement accuracy. Moreover, a larger study might be able to assess the goodness of fit of one evaluation technique over another depending on the learning goals. Our findings conclusively point to the need to continue this investigation on a larger scale.

Our conclusions from the present study are tempered by some limitations of the measures we used. For example, our measure of anxiety was limited to one question only and did not allow for a more in-depth analysis of particular components of anxiety such as physiological features (sweating, heart racing) and cognitive features (distraction, interfering thoughts). Several models in the literature suggest that test anxiety represents a multi-component construct including physiological and cognitive features (e.g. Liebert & Morris, 1967; Sarason, 1984), and that each of these components may be differentially associated with anticipated and actual academic performance (e.g., interfering thoughts; Sarason & Stoops, 1978). Our index of anxiety likely reflects a mix of these components and may mask some nuances of the relationships between anxiety, expected academic outcome, and self-efficacy. It would be of interest in follow-up studies to use a multi-component measure of anxiety to examine whether:

1. Type of student anxiety differs as a function of type of assessment
2. Expected academic outcome varies as a function of type of anxiety
3. The mediating role of self-efficacy in accounting for expected academic performance applies to all or only some of the components of academic anxiety.

Our study also found that self-efficacy explained the associations between anxiety and expected performance. Given the malleability of self-efficacy, this finding points to teaching strategies and evaluations that encourage students to feel that their grades are largely under their control. Here, evaluation transparency might be particularly useful.

For some evaluation techniques, anxiety might be influencing results. However, it is advisable to continue the focus on increasing self-efficacy to promote academic success.

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Appendix A: Questionnaires

A: Rating of evaluation methods for perceived accuracy and degree of anxiety induced

Rate each of the following evaluation practices as to how well they measure your knowledge and skills. If you have not yet done the practice, predict how well it will measure your knowledge and skills. ((1) Very inaccurate, quite inaccurate, neither accurate nor inaccurate, quite accurate, (5) very accurate.)

Rate each of the following evaluation practices based on how much anxiety they cause you to feel. If you have not yet done the practice, predict how much anxiety it will cause you to feel. ((1) No anxiety, slight anxiety, moderate anxiety, significant anxiety, (5) extreme anxiety).

B. Academic self-efficacy scale and academic locus of control scale (McIlroy, Bunting, & Adamson, 2000)

The following are the kinds of statements that people use to describe themselves. Read each one carefully and decide the extent to which each statement applies to you. There are no right or wrong answers. For each statement encircle the number which best describes you (1-strongly agree – 7-strongly disagree). Please respond to all items.

Academic self-efficacy:

I am confident that I can achieve good exam results if I really put my mind to it.

If I don't understand an academic problem, I persevere until I do.

When I hear of others who have failed their exams, this makes me all the more determined to succeed.

I am confident that I will be adequately prepared for the exams by the time they come around.

I tend to put off trying to master difficult academic problems whenever they arise.

No matter how hard I try, I can't seem to come to terms with many of the issues in my academic curriculum.

I am convinced that I will eventually master those items on my academic course which I do not currently understand.

I expect to give a good account of myself in my end-of-semester exams

I fear that I may do poorly in my end-of-semester exams.

I have no serious doubts about my own ability to perform successfully in my exams.

Locus of control scale

If I do not do well in my end-of-semester exams, I have only myself to blame.

My exam results will be directly related to my work throughout the semester.

No matter how well I prepare for my exams, I have no guarantee of being successful.

Getting good 'answerable' questions in my exams is something of a lottery

Thorough revision before my exams is more than likely to issue in a successful outcome.

My exam results are likely to be influenced by the mood of the exam marker at the time.

Luck plays a stronger part in exam results than preparation.

Hard work throughout the semester is certain to be positively reflected in my exam results.

If I prepare myself well for my exams, the examiner will surely detect my efforts and reward me accordingly.

All in all I feel that I am largely in control of my own exam outcomes.

C. Other Questions

What grade do you expect to get in this class? (dropdown menu of percentages)

What is your estimated overall academic average? (dropdown menu of percentages)

With which gender do you identify? (free text)

What is your name? (free text)

What year are you in school? (dropdown menu)