# The impact of grades on student motivation

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## Abstract

Although research has explored how in-class pedagogical practices and narrative feedback affect student engagement and motivation, questions remain on the impact of grading systems (i.e. multi-interval grades vs pass/fail and narrative evaluation) on academic motivation. Here, we compared the motivation of students who received multi-interval grades to students who were evaluated with a pass/fail and end of course narrative evaluation. In addition, we compared academic motivation at institutions with different grading systems. Grades did not enhance academic motivation. Instead, grades enhanced anxiety and avoidance of challenging courses. In contrast, narrative evaluations supported basic psychological needs and enhanced motivation by providing actionable feedback, promoting trust between instructors and students and cooperation amongst students. Even when accounting for potential confounding factors, students in universities that used narrative evaluations experienced higher intrinsic and autonomous motivation compared to students who received multi-interval grades. Given the potential for grades to thwart basic psychological needs and academic motivation, institutions should re-evaluate when and in which programs grades may be appropriate or necessary.

## Grading and motivation

Multi-interval grades (e.g. A, B, C, D) at the end of a course have a dual function of providing feedback to the student and measuring performance for external audiences (Bailey and Garner, 2010; McCarthy, 2017). However, recent research on grades in universities suggests that grades could have negative effects on student well-being and learning. Specifically, grades can enhance

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stress and anxiety (Bloodgood et al., 2009) and cheating (Pulfrey and Butera, 2013) and reduce cooperative learning (Rohe et al., 2006), critical thinking (Tannock, 2015), autonomous academic motivation (Pulfrey et al., 2011) and feelings of trust between teachers and students (Tannock, 2015). Partly in response to such critiques, a growing number of departments (Rohe et al., 2006; White and Fantone, 2010) and universities in North America (e.g. Bennington, Stanford, Quest University Canada) have switched from traditional grading systems to alternatives such as pass/fail and summative narrative evaluations at the end of a course.

Student motivation to learn can be broadly categorized into two types based on the degree to which the goal is autonomously endorsed: intrinsic and extrinsic. Intrinsic motivation will be fostered in environments that support three basic psychological needs: *autonomy* (perceived volition by oneself), *competence* (perceived efficacy) and *relatedness* (feeling mutuality of care with individuals and community) (Deci and Ryan, 2000). Intrinsic and autonomous forms of extrinsic motivation, collectively termed 'autonomous motivation', provide a suite of positive outcomes for creativity (Deci and Ryan, 2000), psychological well-being (Bailey and Phillips, 2016) and engagement and academic performance (Taylor et al., 2014). In contrast, less autonomous forms of extrinsic motivation, collectively termed 'controlled motivation', result in decreased achievement and well-being and reduced persistence in academic tasks (Ryan and Deci, 2017).

A wide range of personal and learning environment characteristics may affect academic motivation as well as the impact of grades on autonomous motivation. For example, academic motivation is influenced by age, gender and academic discipline (Campos-Sanchez et al., 2014; Ratelle et al., 2007). Students with lower (Black and Deci, 2000) or higher (Mouratidis et al., 2011) GPAs (Grade Point Averages) may be more vulnerable to the negative impacts of grades. In addition, personal socio-cultural factors such as past experiences with grades, parental upbringing and career aspirations (Lynch and Hennessey, 2015) may affect the cognitive interpretation of grades (Ryan and Deci, 2017). Although few studies have assessed differences in academic motivation by comparing students at different postsecondary institutions, one such study (Levesque et al., 2004) suggested that differences in pedagogical environments lead to dissimilar perceptions of autonomy and competence.

Experiments demonstrated that awarding grades can reduce autonomous motivation by thwarting autonomy (Butler and Nisan, 1986; Pulfrey et al., 2013; Ryan and Weinstein, 2009). Others, however, suggest that grades can also enhance autonomous motivation if students view grades as competence-enhancing informational feedback (Cameron et al., 2001). Given the higher level of autonomy given to undergraduate students (Ratelle et al., 2007), in terms of selecting majors, timetables or decisions to attend university, grades in university may support autonomous motivation by providing competence-enhancing information that helps students make personally meaningful decisions (e.g. how to study or what subjects to take) towards self-endorsed goals or careers (Harackiewicz et al., 2000; Midgley et al., 2001). Furthermore, because most universities require a minimum GPA or entry qualifications, students may be more likely to be higher performing individuals who may be more resilient to the negative effects of grades on autonomous academic motivation (Black and Deci, 2000).

Given the many factors that influence academic motivation, pedagogical environments such as grading systems as well as the impact of receiving grades may also influence academic motivation. However, few studies have explored academic motivation in institutions with alternative grading systems (Rohe et al., 2006; White and Fantone, 2010). In addition, although multi-interval grades are ubiquitous across most institutions, there is a paucity of research on the impact of grades on motivation in universities (notable exception: Pulfrey et al., 2011). Furthermore, in contrast to the extensive research on the experience of receiving narrative/written feedback that can accompany grades (Ferguson, 2011; Jones and Gorra, 2013; Pokorny and Pickford, 2010), limited studies

specifically explored how students experience receiving grades themselves. This is an important gap to address especially because students tend to feel dissatisfied with narrative/written feedback and may fail to read or understand the comments that accompany grades (Bailey and Garner, 2010; Jones and Gorra, 2013; Pokorny and Pickford, 2010). There is also a need to identify the types of academic motivation that drive students to attend university and engage in positive learning behaviours, in order to explore how institutions with alternative grading systems may attract or engender different types of academic motivation.

The key questions asked are as follows:

1. How do grades and narrative evaluations affect basic psychological needs and academic motivation in undergraduate students?
2. More generally, what types of academic motivation drive undergraduate students?
3. Do universities with alternative grading systems attract or engender students with different academic motivation?

## Methods

We conducted a two-part, mixed-methods study. First, we interviewed students about their experience of receiving grades and narrative evaluations. Students at this university (Table 1 'Hybrid-University') take a combination of courses that provide multi-interval grades at the end of a course and courses graded as pass/fail that typically also provide an end of course narrative evaluation. Second, we conducted a comparative analysis at three North American universities by measuring academic motivation at a university with traditional multi-interval grades for all undergraduate courses and two universities with alternative grading systems. These two universities with alternative grading systems have some ('Hybrid-University') or all ('Narrative University') of the classes assessed as pass or fail (Table 1).

**Table 1.** Description of the grading systems at the three institutions surveyed.

| University pseudonym | Grading system | Description of grading system |
|---|---|---|
| Grades-University | Traditional | Multi-interval grades given at the end of a course for *all* undergraduate courses. |
| Hybrid-University | Alternative | Multi-interval grades given at the end of a course for *most* undergraduate courses. Students choose to have 9%–38% of courses evaluated as pass/fail instead of receiving a final multi-interval grade. For some, pass/fail classes final narrative evaluations are also provided. |
| Narrative-University | Alternative | Students receive no multi-interval grades. Final narrative evaluations are provided for *all* courses. |

Interviews were conducted with students attending Hybrid-University.

### Context

The two universities with alternative grading systems are small (<5000 students) primarily undergraduate liberal arts and science universities, whereas the university that uses multi-interval grades is a large (>30,000 students) research university with a wide range of professional and graduate programs.

## Narrative evaluation

End of course narrative evaluations at both universities with alternative grading systems include feedback for assessment tasks and comments on whether the student met the goals of the course (Bailey and Garner, 2010; Ferguson, 2011). In addition to such comments, they also include more holistic and personalized comments on changes in observed academic skills, attitudes or 'soft-skills' such as team-work over the duration of the course. Within the first term of courses at Hybrid-University, all students take courses that are assessed using multi-interval grades as well as pass/fail with a narrative evaluation. Thus, all students who were interviewed had taken courses assessed as pass/fail with narrative evaluation as well as courses assessed with multi-interval grades.

## Interviews

We conducted a series of 10- to 30-minute semi-structured interviews with 13 participants from Hybrid-University in June 2016. One of the authors conducted all interviews; this interviewer was a student and a peer to the participants. Participants were first to fourth year undergraduate students and were recruited by email from four courses (Spanish 200 (n = 4), French 200 (n = 3), Chemistry 100 (n = 2) and Eco-psychology 300 (n = 4)). We interviewed everyone who was interested in participating in the study. For participants in Spanish, French, and Chemistry, the interviews were conducted within 1 day of participants receiving a graded assignment from their instructor. In each of these courses, students receive a grade for each assignment as well as a grade at the end of the course. The Eco-psychology course was graded as pass/fail and each student received a final narrative evaluation at the end of the course. Participants in Eco-psychology were interviewed within 1 week of receiving their final course narrative evaluation. Participants could enter in a draw for a CAD$25 gift certificate.

We asked open-ended questions that prompted participants to reflect on their experience of receiving grades. Specifically, we asked what information (if any) they gained from the grade that they recently received. In addition, we asked questions about whether grades affected decisions on what classes to take as well as how their relationship to grades had changed since high school. Participants who had recently received a narrative evaluation were also asked to reflect on the experience of receiving these and whether their motivation, engagement or experience in this class would have been different if the course had been graded.

Two researchers independently coded the interviews. We first coded the interviews based on how grades and narrative evaluations fostered or thwarted basic psychological needs of autonomy, competence and relatedness. We then re-coded looking for emergent themes from the experience of grades and narrative evaluations based on repeating keywords or phrases that were not captured by the first set of pre-determined codes of autonomy, competence and relatedness. After this initial coding process, the researchers came together to discuss differences in interpretation or impressions until consensus was reached (Van den Hoonard, 2015). We used negative case analysis to ensure the integrity of these themes (Patton, 2002).

## Survey

We designed an online survey using Interceptum. Between May and July 2016, undergraduate students at Grades-University (n = 100), Hybrid-University (n = 113) and Narrative University (n = 181) participated in the study. In total, there were 392 valid surveys. After completing the survey, participants could enter in a draw for a CAD$25 gift certificate.

## Demographics

Survey participants recorded demographic information that has been shown to either influence academic motivation or moderate the effect of grades on academic motivation including age, year of study, field of study and high-school GPA. Students ranged in age from 19 to 64 (23.9 (mean) $\pm$ 0.35 (SE)), were in their first to sixth year of study (3.18 $\pm$ 0.06) and had a high school GPA of between 0.5 and 4.0 (3.54 $\pm$ 0.04). A wide range of disciplines were represented in the sample including social and life sciences (n = 191), pre-medicine (n = 25), math and physical sciences (n = 117), as well as arts and humanities (n = 55). Because of the breadth of fields and the fact that many of the students were in interdisciplinary programs, we divided field of study into two categories: students who were in science and math courses versus students who were not (i.e. humanities and arts programs) given that research has suggested lower autonomous motivation and engagement in science and math classes than in humanities courses (Campos-Sanchez et al., 2014; Momsen et al., 2010).

## Academic motivation

We used two measures of academic motivation. The first, the Academic Motivation Scale (AMS) (Vallerand et al., 1992; Table 2) has 28 items that measure three types of intrinsic motivation (to know, towards accomplishment, to experience stimulation) and three types of extrinsic motivation (from most autonomous to controlled – identified, introjected and external regulation) on a 7-point scale from 'does not correspond' to 'corresponds exactly'. In addition, there is a four-item subscale that measures amotivation. For the final analysis, scores for intrinsic and extrinsic motivation were weighted and combined ($2 \times$ Intrinsic + Identified − Introjected − $2 \times$ Extrinsic) to create a single composite index (Levesque et al., 2004).

**Table 2.** Academic Motivation Scale (Vallerand et al., 1989, 7 of 28 items shown) and Learning Self-Regulation Questionnaire (all items shown).

| Motivation type | Item | Narrative-University | Hybrid-University | Grades-University |
| --- | --- | --- | --- | --- |
| *Academic Motivation Scale* | 'I go to university …' | | | |
| Intrinsic – to know | … because I experience pleasure and satisfaction while learning new things. | 6.0 [0.1] A | 6.1 [0.1] A | 5.6 [0.1] B |
| Intrinsic – towards accomplishment | … for the satisfaction I feel when I am in the process of accomplishing difficult academic activities. | 5.1 [0.1] A | 4.9 [0.1] A | 4.8 [0.1] B |
| Intrinsic – to experience stimulation | … for the intense feelings I experience when I am communicating my own ideas to others. | 4.6 [0.1] A | 4.6 [0.1] A | 3.8 [0.1] B |
| Extrinsic – identified | … because eventually it will enable me to enter the job market in a field that I like. | 5.3 [0.1] A | 5.1 [0.1] A | 5.7 [0.1] B |
| Extrinsic – introjected | … because of the fact that when I succeed in college I feel important. | 4.8 [0.1] A | 4.2 [0.1] A | 4.8 [0.2] B |
| Extrinsic – external | … because with only a high-school degree I would not find a high-paying job later on. | 4.6 [0.1] A | 4.3 [0.1] A | 5.7 [0.1] B |
| Amotivation | … honestly, I don't know; I really feel that I am wasting my time in school. | 0.2 [0.1] A | 1.8 [0.1] A | 2.0 [0.1] A |

*(Continued)*

**Table 2. (Continued)**

| Motivation type | Item | Narrative-University | Hybrid-University | Grades-University |
|---|---|---|---|---|
| *Self-Regulation Questionnaire* | | | | |
| Autonomous-Subscale | I participate actively in my class because learning is important to my intellectual growth. | 6.4 [0.1] A | 6.2 [0.1] A | 5.5 [0.2] B |
| | I participate actively in my class because I feel like it's a good way to improve my skills and my understanding of the material. | 6.2 [0.1] A | 6.1 [0.1] A | 5.2 [0.2] B |
| | I am likely to follow my instructor's suggestions because I believe my instructor's suggestions will help improve my skill and understanding. | 5.9 [0.1] A | 5.7 [0.1] A/B | 5.4 [0.1] B |
| | I will work to expand my knowledge throughout my degree because it's exciting and interesting to learn new things. | 6.6 [0.1] A | 6.6 [0.1] A | 6.0 [0.1] B |
| | I will work to expand my knowledge throughout my degree because it's a challenge to really understand course material. | 5.2 [0.1] A | 5.1 [0.2] A | 5.1 [0.1] A |
| | Mean of Autonomous subscale | 6.3 [0.1] A | 6.0 [0.1] A | 5.5 [0.1] B |
| Controlled subscale | I participate actively in my class because others would think badly of me if I didn't. | 2.8 [0.1] A | 3.5 [0.2] B | 2.3 [0.1] C |
| | I participate actively in my class because I feel proud when I do well* (Item omitted) | 5.5 [0.1] A | 5.6 [0.2] A | 4.9 [0.2] B |
| | I am likely to follow my instructor's suggestions because I would get a bad grade if I didn't do what they suggest. | 3.6 [0.2] A | 4.8 [0.2] A | 5.2 [0.1] B |
| | I am likely to follow my instructor's suggestions because it's easier to do what I'm told than to think about it. | 2.5 [0.1] A | 3.2 [0.2] B | 3.5 [0.2] B |
| | I am likely to follow my instructor's suggestions because I would feel guilty if I didn't comply with my instructor's suggestions. | 3.4 [0.1] A | 3.6 [0.2] A | 3.5 [0.2] A |
| | I will work to expand my knowledge throughout my degree because I want others to think that I am intelligent. | 4.0 [0.1] A | 4.4 [0.2] A | 4.2 [0.2] A |
| | I will work to expand my knowledge throughout my degree because a good GPA will look positive on my record. | 3.9 [0.2] A | 4.9 [0.2] B | 5.6 [0.1] C |
| | Mean of controlled subscale | 4.3 [0.1] A | 4.0 [1.1] B | 4.0 [0.1] B |

Mean and [SE] and statistically significant groups (As and Bs) based on post hoc Tukey's test ($p < 0.05$) are denoted.

The second, the Learning Self-Regulation Questionnaire (SRQ-L) (Black and Deci, 2000; Williams and Deci, 1996 Table 2) assesses autonomous or controlled regulation for engaging in specific learning techniques on a 7-point scale from 'not at all true' to 'very true'. The items were adapted from chemistry and medical school studies (Black and Deci, 2000; Williams and Deci, 1996) to be more generalized for undergraduate students' reasons for learning. For example, the language was changed from 'I will participate actively in medical interviewing because …' to 'I will participate actively in learning because …' One item was removed as it was poorly correlated with other items and reduced reliabilities. Reliabilities with this one item removed were similar to those found elsewhere (AMS: $\alpha_{Intrinsic} = 0.91$; $\alpha_{Extrinsic} = 0.85$ and SRQ-L: $\alpha_{Autonomous} = 0.78$; $\alpha_{Control} = 0.74$; (Komarraju et al., 2009; Vallerand et al., 1992). We combined the autonomous and controlled subscales into a single composite index of self-regulation for engaging in specific learning techniques.

## Analyses

We examined the correlations between variables and conducted standard tests to ensure that data met the assumptions of analysis of variance (ANOVA).

To assess differences between the universities in autonomous motivation to attend university (AMS) and engage in specific learning techniques (SRQ-L), we used an ANOVA and accounted for the effect of potential confounding factors such as age, field of study and year of study and high-school GPA. This analysis was conducted on the two composite indices of autonomous academic motivation. For this analysis, we included all two-way interactions with university and used Type III sum of squares in R (R Core Team, 2013). We followed standard backward elimination procedures (Crawley, 2007) and sequentially removed interaction terms and independent variables that did not have statistically significant effects ($p > 0.05$) on the dependent variables. We used the package 'Car' to run ANOVAs as well as the package 'multcompView' to run post hoc Tukey's test to compare means between the three universities.

# Results

## Grades and academic motivation

Grades influenced feelings of autonomy, competence and relatedness in several ways. In terms of competence and autonomy, some students felt that grades provided information on their skills or abilities that helped them avoid classes, teachers or assignments that would lower GPAs or pursue careers in which they may be more likely to fail:

> If I got a C in class, I'd be like, 'oh I'm never doing that again, that's not for me.' (P4)

> … grades affect the confidence levels in certain topics or direction of my life … getting certain grades might deter people from actually wanting to learn that information after graduation. (P8)

However, other participants seemed to feel less autonomous in their decisions and expressed ambivalence or regret with the choices that they made to prioritize their GPA over taking classes or doing assignments that they felt would be important for their personal growth or learning:

> Even though that would be a better learning outcome for me, the grade was questionable. So, I ended up taking the *easy, safer* route. I think grades generally do that for me. (P7)

The value of grades as competence-enhancing informational feedback did not appear to be salient to students. In fact, most students struggled to respond to questions about the information provided from grades and few students provided examples of how grades could help them adjust study habits. Instead, what seemed to be most salient was the impacts of grades on well-being, stress and anxiety. The higher-GPA participants felt that they experienced particularly high external pressures from grades because they were applying to competitive graduate programs. For example, a student said, '[Grades] are definitely a huge point of stress. I think they occupy a lot more mental space than they ideally should' (P2).

However, even students with lower grades with no intention of pursuing further education still said that grades were a source of stress and anxiety. For these students, grades affected feelings of 'self-worth' (P1), made salient past negative experiences with grades (e.g. high-school) and adversely affected feelings of competence. Here, a student with no intention of pursuing graduate studies speaks about the negative impacts of low grades:

> When my competence is rated in letters D through A, it's really easy to get stuck in a mindset where I feel that I'm unintelligent or I feel that I'm not capable based on the grade. Regardless of how much I've actually learnt … Grades really never brought me happiness, they mostly brought me sadness. (P13)

For this student, not only did low grades adversely affect feelings of competence but also by adversely impacting relationships with instructors, peers and parents. This student also said, 'When I get poor grades, I have a poor relationship with my parents' (P13).

Because students feel they have a lot at stake and frequently felt confused by the grade they received, comments regarding apparent inconsistencies and fairness in grading suggested that grades could also harm the interpersonal relationship between students and instructors:

> And it was actually pretty frustrating because it felt like even in classes where I was really into the content and worked really hard I came out with a B+. And in classes that I didn't care about and didn't work very hard I still got a B+. (P5)

Beyond basic psychological needs, the data helped to better understand the contextual factors that lead students to worry more or less about grades. For example, when participants compared their academic motivation in high school and university, they suggested that they felt less concerned about grades in high school because they consistently received high grades and thus grades seemed to pose less of a threat to self-esteem or personal goals. Others felt that they cared less about grades in university because they now felt autonomously motivated to learn. For example, a student said, '[At university] I'm really academically motivated, I don't think it's necessarily tied to grades too much … I'm more interested in the value of learning …' (P11). Other contextual factors that seemed to affect academic motivation in university included consistently receiving low grades (and thus not feeling able to affect the grade) and not having concrete plans for graduate school. When describing contextual factors that lead to differences in concerns about grades, they did not identify any pedagogical practices (e.g. the use of rubrics or other autonomy-supportive practices) that influenced their motivations and experiences of grades.

Another recurring theme seemed to relate to the recent neoliberal marketization of universities. Several participants spoke about grades with phrases such as 'pay-off' or 'cost-benefit analysis' as though they were talking about a detached consumer–seller relationship with instructors providing grades in exchange for student tuition rather than a trusting relationship between instructors and students.

## Narrative evaluation and academic motivation

In contrast to the generally adverse impacts of grades on basic psychological needs and academic motivation, narrative evaluations supported competence and feelings of relatedness. Each participant who received narrative evaluations expressed how they provided information on specific areas of competence, areas that need improvement as well as advice on *how* to improve and were thus more useful than grades. The specificity of the comments seemed to promote feelings of trust with the instructor even when comments were critical. For example, a student who received a narrative evaluation said,

> … 'you weren't very good at this', I don't take it personally because it's not personal. And it was bang on. It's like, yup I know. But it's good to have that affirmed and be like okay I really do gotta buckle down and focus on that… I think I know that already, but I think it's important to have that brought up by somebody you respect, and you know isn't just insane. (P9)

Another student spoke about the specificity of the comments and trust that was engendered in a narrative evaluation in comparison to grades:

> There's a lot of trust and acceptance with her response. She was able to see me for who I was and was able to build her remarks upon who I was as a person and where I can evolve to … I think it's always more powerful to have a response that's geared towards the person who's being evaluated …. So they can take the initiative to actually work on those improvements compared to a letter grade or short answer which is just 'this is what you did wrong, fix it' …. The more interpersonal a teacher can become with their student, the better of a relationship they have, the more they're going to want to work with each other, work with the system. Therefore, I think that narrative evaluations are a step above graded evaluations. (P8)

When asked to reflect on how grading methods (i.e. pass/fail and narrative evaluation compared to multi-interval grades) influenced their engagement in the course, one student suggested that narrative evaluation led her to care more about the collective learning experience rather than her own individualistic grade:

> [Class] wouldn't be as group-based, people wouldn't really be thinking about each other, more about themselves and what their performance was going to be like to get a letter grade. (P10)

Furthermore, one participant who received a narrative evaluation also suggested that if the course had been graded, she would have focused more on superficial details rather than deeper personal reflections on the academic content:

> If it was graded, I probably would have focused a more on the mechanics of the education, like writing in my journal that was a lot more grammatically correct … But since it was pass/fail I was able to write more of what I want to and wrote in more of a reflective way on what I'm learning personally. (P8)

## Grading system and academic motivation

The potentially positive effects of alternative grading systems were also suggested by the patterns in academic motivation at the three universities. Students from the two universities with alternative grading systems tended to have higher autonomous motivation for attending university, while the participants at Grades-University scored the lowest (Figure 1, Table 2). In terms of autonomous motivation to engage in specific learning techniques, the universities using alternative grading systems

also scored higher in comparison to Grades-University. However, for the controlled regulation subscale (Table 2), Grades-University did not always rank the highest for these items. Notably, Hybrid-University scored the highest for the three controlled subscale item that seemed to relate to interpersonal pressure (Table 2). The importance of interpersonal pressure at this university was also indicated by one interview participant who suggested that regardless of whether or not a class was graded, she felt pressure to impress the teacher and ensure that she contributed positively to the class discussions. These types of interpersonal pressures were more important to her than grades. Indeed, based on the two items of the Self-Regulation Questionnaire explicitly about grades, participants at Hybrid-university were less concerned with grades than students at Grades-University.
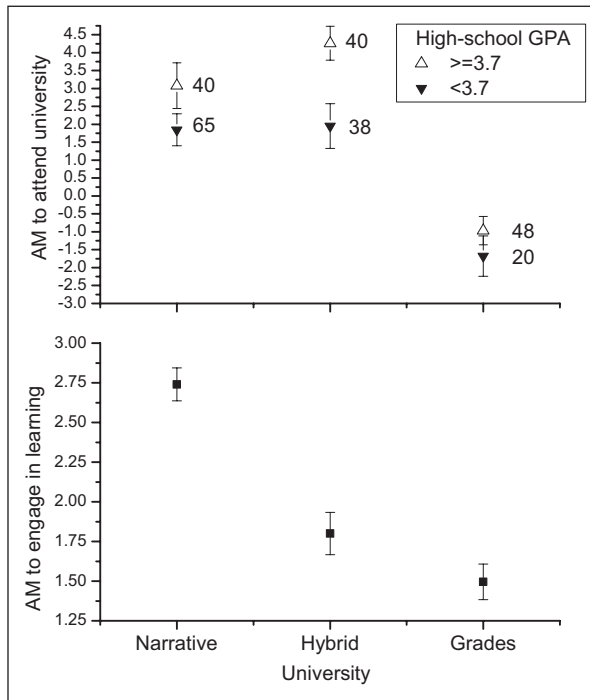


**Figure 1.** Variation in autonomous motivation (AM) to attend university (composite index based on the AMS, adjusted $R^2 = 0.23$, top) and engage in specific learning techniques (composite index based on the SRQ-L, adjusted $R^2 = 0.15$, bottom) at three universities. Symbols represent means and standard errors are shown. Numbers next to symbols indicate sample sizes.

Overall, there were significant differences in the composite index of academic motivation to attend university (AMS: $F_{(2, 246)} = 12.6$, $p < 0.0001$, $\eta_p^2 = 0.23$ ) and the composite index of autonomous motivation to engage in specific learning techniques (SRQ-L: $F_{(2, 389)} = 36.8$, $p < 0.0001$, $\eta_p^2 = 0.16$ ). Post hoc tests suggested statistically significant differences between the two universities with alternative grading systems and Grades-University (Figure 1) for autonomous motivation to attend university. However, in terms of autonomous motivation to engage in specific learning techniques, Narrative-University was statistically different from the other two universities. None of the interaction terms had significant effects. However, students with higher high-school GPAs had higher autonomous academic motivation to attend university ($F_{(1, 246)} = 10.3$, $p = 0.002$, $\eta_p^2 = 0.04$, adjusted $R^2 = 0.23$).

## Discussion

The aim of this study was to explore how grading systems (i.e. final multi-interval grades and pass/fail grades with narrative evaluations) affect the academic motivation of students. Specifically, we examined how grades and narrative evaluations thwarted or supported autonomy, competence and relatedness. In contrast to previous studies (c.f. Cameron et al., 2001), we found limited evidence to suggest that students experienced grades as competence-enhancing informational feedback. Rather, grades promoted anxiety, a sense of hopelessness, social comparison, as well as a fear of failure. Even among high-performing students, concerns such as entrance into graduate schools and the need to 'competently' protect feelings of self-worth led students to avoid challenging courses, teachers or careers (Crocker et al., 2003; Pekrun et al., 2006; Smyth et al., 2015). Thus, our findings support research by Tannock (2015) that '… grading undermines the sense of collective solidarity and mutual responsibility between students that democratic education seeks to foster and promotes instead an embrace of competitive and detached individualism' (p. 6).

In contrast to the student dissatisfaction and recall inability with respect to narrative/written feedback that accompany grades (Bailey and Garner, 2010; Butler and Nisan, 1986; Ferguson, 2011; Jones and Gorra, 2013), students in this study had positive experiences with final narrative evaluations that were not associated with multi-interval grades. Although these interviews were only conducted with a small group of students, the results may suggest that providing narrative/written feedback *without* an associated grade could lead to more positive student experiences of receiving narrative/written feedback (Pulfrey et al., 2011). When narrative/written feedback is provided alongside grades, grades may overshadow the potentially competence-enhancing informational feedback that narrative/written feedback alone could provide (Murtagh and Baker, 2009; Pulfrey et al., 2011). A student's need to protect or celebrate the normative judgement of self-worth associated with a grade overpowers the importance of feedback. Furthermore, although well-intentioned instructors provide narrative/written comments to attempt to reduce the adverse effects of grades on autonomous motivation, one study showed no difference in the reduction in autonomous motivation between students presented with grades or grades accompanied with narrative/written feedback (Pulfrey et al., 2011).

Our analysis of three universities helped gain insight into whether institutions with alternative grading systems may attract students or promote different types of academic motivation. Participants at Narrative and Hybrid-University exemplified the 'high-quality' academic motivation, with high autonomous motivation and low controlled motivation that is predictive of optimal learning (Ratelle et al., 2007; Vansteenkiste et al., 2009). In contrast, students at Grades-University had motivational profiles with higher extrinsic motivations that are more like high achieving school pupils (Ratelle et al., 2007). Although we cannot state that the grading system at these universities *caused* students to develop more autonomous or controlled academic motivation, the results are consistent with the interview findings and previous studies that show pass/fail and narrative evaluations may be more likely to promote autonomous academic motivation than multi-interval grades (Bloodgood et al., 2009; White and Fantone, 2010).

These results extend the work conducted on grades and motivation and demonstrate that even though undergraduate students may have greater autonomy in their education, as with school pupils (Covington, 2000; Pulfrey et al., 2013), grades can still adversely affect autonomous academic motivation. Although some of the pressures the students felt from grades were rooted in more autonomous and self-endorsed goals such as acceptance into graduate schools, students also faced several external pressures. For these students, the culture of grade pressure not only came from faculty but also from peers, parents, graduate studies advisors and neoliberal consumer culture (Lynch and Hennessey, 2015; Molesworth et al., 2009; Pulfrey and Butera, 2013; Taylor et al., 2014).

Students also provided examples of how grades negatively affected their relationships with their peers and instructors. At university, students may feel torn between the individualistic grade goal pursuits and the need to fit into a social identity (Bliuc et al., 2011) that could, especially with small seminar classes in which learning depends on the engagement of peers, include working towards collective educational goals. Furthermore, because students often fail to understand grading schemes or narrative/written feedback that accompany grades (Chalmers et al., 2018; Pokorny and Pickford, 2010), the real or perceived arbitrariness of normative grading structures can enhance insecurity, foster resentment towards courses and instructors and create a sense of powerlessness among the students that erodes interpersonal relationships between students and instructors (Lynch and Hennessey, 2015; Tannock, 2015). Because instructors distribute a limited number of high grades to students, they maintain power and authority over students. This may simultaneously thwart both relatedness and autonomy (Butler and Nisan, 1986; Pulfrey et al., 2013).

Similar to past studies (Smyth et al., 2015; Tannock, 2015), our results also suggested that grades can adversely affect learning by distracting students from deeper personal reflection on academic content towards more superficial details. Research has also suggested that although extrinsic rewards such as grades may improve performance for short-term lower level cognitive processes (e.g. rote memorization) (Wood, 2009) and for tasks that are not inherently interesting, they do not promote interest in an academic field, deep processing or long-term retention (Harackiewicz et al., 2000; Midgley et al., 2001).

There are several limitations to this study. In terms of the survey, although we accounted for some of confounding factors, there are other differences in pedagogy, class size or programs between the three universities that may have led to the observed differences. Given the wide range of variables affecting academic motivation, further studies are necessary to identify characteristics of pedagogical environments (including grading systems) that influence academic motivation. Although logistically challenging to design in a natural setting, quasi-experimental studies at multiple institutions with multi-interval grades and alternative grading systems are necessary. Research in medical schools that have switched to pass-fail grading have conducted relevant studies (Bloodgood et al., 2009; Rohe et al., 2006; White and Fantone, 2010), but it is important to extend this research in different types of academic programs. Another potential limitation of the interview is that the author conducting the interviews was a student on campus and was known to some of the interview participants. Because of this relationship, and the social stigma surrounding issues of mental health in general (Wynaden et al., 2014), there may have been pressure to respond in a socially desirable manner (Richman et al., 1999) and thus not discuss feeling controlled by grades or openly express the psychological distress that is caused by grades. Therefore, it is possible that the participants may have understated the external pressures imposed by grades.

Furthermore, participants who knew and trusted the interviewer may have been more likely to elect to participate in this interview. Given the small sample sizes of the interviews and the survey, it is important to note that the participants may not be representative of the entire university population. More research is needed with greater sample sizes across a wider range of institutions and departments to assess the generalizability of this study and better understand the nature of the pressures that students face as well as the relationships between assessment methods and academic motivation (Urdan and Schoenfelder, 2006). The slightly different patterns that we observed between the autonomous motivation to attend university and engage in specific learning techniques requires further investigation. Whereas students at Grades-University perceived greater grade pressure, students at Hybrid-University perceived greater interpersonal pressure from peers and teachers. Although peer relationships can affect achievement goals and motivation within schools (Gairns et al., 2015; Urdan and Schoenfelder, 2006), they have not been examined in the context of academic motivation in university.

Despite these limitations, this mixed-methods study helped to advance our understanding of grades and motivation. The interviews with students at Hybrid-University who are uniquely situated to compare the experience of receiving both multi-interval grades and narrative evaluations helped to demonstrate that regardless of performance, students may struggle with the adverse psychological impact of grades. This result was particularly surprising given that the students at Hybrid-University were relatively autonomously motivated and, compared to Grade-University participants, were less concerned about grades.

Few universities are likely to abolish grades. However, universities should question the conventional use of multi-interval grades and consider their advantages and disadvantages in different departments, years of study, courses and learner types. For example, there may be specific courses or programs (e.g. introductory courses or graduate schools) in which cultivating deep learning and motivation may be more important than standardized communication of performance to external audiences. For such courses, greater use of narrative evaluations (as opposed to multi-interval grades) may be warranted. In addition, withholding grades from students or providing narrative/written feedback several days prior to the grades may help students focus on mastery-related learning goals rather than extrinsic rewards.

A university does not exist in a vacuum. Under neoliberal influences, the need to meet performance objectives, standardize curricula and increase the number of students has led to an emphasis on grades at most universities (Lynch and Hennessey, 2015; Tannock, 2015). Although research has demonstrated that grades can help motivate students and enhance performance in certain types of exercises (Harackiewicz et al., 2000; Midgley et al., 2001), our study suggested that there may be significant negative impacts of the omnipresent culture of grades for all students. The threat of grades seemed to adversely affect relationships between students and faculty and caused students to avoid classes or assignments that could provide important learning opportunities.

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