WHAT MOTIVATES STUDENTS?: AN ANALYSIS OF INTRINSIC AND EXTRINSIC MOTIVATION IN ONLINE PEDAGOGY

By

Amin Belady

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University of California, Riverside

APPROVED

Dr. Matthew Casselman

Department of Chemistry

Dr. Richard Cardullo, Howard H. Hays Jr. Chair

University Honors

ABSTRACT

COVID-19 has brought many changes to the world we were accustomed to; the field of education has seen significant changes in the past two years as instruction had transitioned from in-person to remote modes. There have been many studies done in the area of pedagogy (the study of teaching) and online instruction, however the pandemic had forced online education to a scale not previously studied. In this study, student extrinsic (external), intrinsic (internal), and overall motivation levels were collected and analyzed through surveys, which provided insight into the relationship between the shift to online education and change in motivation levels. It was hypothesized that a shift to online setting may decrease levels of intrinsic motivation due to the removal of environmental factors that help maintain intrinsic motivation found in a traditional in-person setting. Overall results portray a significant drop in intrinsic motivation levels of those taking a course in an online setting, with this drop in motivation also being connected to the performance of students within the course. In light of these results, better online learning spaces can be designed to support students' motivation to learn, specifically at an intrinsic level, to ultimately increase the success of students in an online learning space.

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Introduction

Beginning in March 2020, the field of pedagogy (the study of teaching) experienced a massive disruption due to the unforeseen Covid-19 pandemic which quickly shifted most teaching to an online learning setting. This shift can most notably be seen with approximately 99% of teachers switching to remote instruction by June of 2020 (Hamilton et al., 2020). Alongside this, approximately 93% of households with a child in school (grades K-12) had some form of remote learning occurring, thus leading to the online platform growing in significance and its evolution into the dominant form of learning (McElrath, 2020). With many students switching to a previously unexperienced educational setting, many questions arose regarding their studies, perhaps the most significant one being: how would this shift to online education impact their learning experience?

When it comes to the way in which a student learns and processes information, a significant factor is their level of motivation. Pedagogically, motivation is defined as the method in which the instigation of a goal-oriented activity is performed and sustained (Schunk, Pintrich, & Meece, 2002). One of the impacts of motivation is that it is often seen as a pre-requisite to higher level of student engagement during the learning process. Higher levels of education attainment by a student correlates to a higher level of engagement during the learning process (Saeed & Zyngier, 2012). Motivation does not exist in a single dimension however, since there are different kinds of motivation that a person can experience. The main two types that have a significant impact on a student's overall level of motivation are intrinsic and extrinsic motivation.

Intrinsic motivation is defined as the performance of an activity or behavior because of one's inherent satisfaction or goals, and not for a separable outcome (Ryan & Deci, 2000); this is otherwise known as one's internal motivation. People who experience more intrinsic motivation

will often pursue a goal in order to gain internal satisfaction or pleasure, or to take on as a personal challenge. For this reason, it may seem as though intrinsic motivation is only influenced by one's internal strive for pleasure, yet it can also be influenced by certain external factors (outer influences), one of them being the concept of "relatedness." As described in the Harvard Graduate School of Education article, "Intrinsically Motivated," relatedness is the desire experienced by a person to connect to others and to feel a sense of care that they are not able to achieve in solitude, and for this reason, it is one of the main external influences that keeps intrinsic motivation high in a student. As the pandemic grew larger and more people were forced into isolation, the levels of relatedness experienced by students decreased. In October of 2020, a national survey on mental health given by Making Caring Common resulted in 36% of respondents reporting extreme loneliness (Walsh, 2021). This study came after the CDC performed a similar national survey in June of 2020 which resulted in 31% reporting symptoms of anxiety and depression due to isolation (Czeisler et al., 2020). Thus, as the pandemic forced more students into a study space that is more isolated than a traditional in-person environment, a student's intrinsic level could be potentially stunted. Overall, intrinsic motivation is essential for one to maintain a steady level of motivation, yet it can be easily deterred by certain external factors, which may result in a shift in focus to extrinsic factors.

Extrinsic motivation (external motivation) is defined as the act of performing an activity in order to gain a separable outcome, or a reward. This is often seen as the more dominant motivation type within a person, and the reason for this is that as one grows up, society implements many ideals into a person that diminishes one's intrinsic motivation (Ryan & Deci, 2000). In other words, a common trend is that younger people will have higher intrinsic motivation levels when it comes to deciding what to pursue, while older people have a higher extrinsic motivation level since they

will follow the paths that contain an external reward in the end. An example of this trend can be seen with the idea that most children have providers that take care of their basic needs (*e.g.*, housing, food, education), thus giving them time to focus on activities that intrinsically interests them. As one grows up however, they must learn to become their own providers by taking on certain tasks in order to achieve necessary extrinsic rewards (*e.g.,* money), thus placing the focus on pursuing tasks that interest them extrinsically but may not be intrinsically fascinating. There are two variations of this external form of motivation that plays a role in one's life. The first is the positive extrinsic motivation, which is the act of performing the activity in order to receive a positive outcome. Examples of this include a student studying for a final in order to receive a good grade on the test, and thus, in the course, or working within a company in order to get paid. The other variation is negative extrinsic motivation, which is performing an act in order to prevent a negative outcome. This can be seen when a student completes an assignment, but only doing so in order to prevent a parental punishment or a bad grade in a course, or completing a job one wouldn't want to do in order to prevent getting fired. Thus, extrinsic motivation is a highly influential motivation type and can often be seen being in conflict with the level of intrinsic motivation one experiences (Jovanovic & Matejevic, 2014).

It is apparent that intrinsic and extrinsic are both factors when it comes to determining how one feels about performing a certain task or willingness to complete it. The way in which these two types of motivation work together is highlighted in the self-determination theory (SDT), which is the understanding of what factors increase or decrease one's levels of intrinsic motivation, extrinsic motivation, and psychological well-being, all of which play a role in one's educational success (Ryan & Deci, 2020). The main way in which these factors are studied is based on how they allow one to get a greater level of intrinsic motivation and a well-internalized level of extrinsic

motivation (high self-esteem), which would offset the undermining of internal motivation when external rewards are present. To further understand this idea, there are three points in which these factors are studied, and these are their impact on autonomy, competence, and relatedness within a person. Autonomy refers to initiative of one's personal actions, competence is formed by the feeling of mastery for a subject, and relatedness (as previously mentioned) is a sense of being in a collective. The transition from in-person education to an online format would have an influence on all these areas, but the main one that would be impacted (and will be the focus of the study) is the sense of relatedness a person has, since the environmental factors that play a role in this have shifted drastically.

Within this study, students that are taking the same course will be surveyed for their levels of intrinsic, extrinsic, and overall motivation levels. One subset of students will be enrolled in a course with a traditional in-person setting, and the other subset enrolled in a course with an online setting. The purpose of this study is to gain a better understanding as to how the environment in which a student learns can have an impact on the levels of internal and external motivation they have. Understanding how the format and mode of instruction will allow instructors to have a better understanding of student motivational factors, which may lead to the formation of better learning plans and teaching structures that will more greatly benefit a student's motivation and lead to superior student learning outcomes. Due to the trends seen within the motivation types and the environment in which a student studies in, the hypothesis is that an online setting will have an impact on the levels of motivation that a student has, whether it be intrinsic, extrinsic, or overall. Expected results are expected to show that intrinsic motivation will be more negatively impacted than extrinsic motivation by the shift to online learning due to the stripping of certain environmental factors that are only experienced in a traditional in-person setting.

Methodology

To measure motivation levels of each student, a survey was created which consisted of questions that either focused on a participant's intrinsic (internal) motivation, or their extrinsic (external) motivation. These survey questions were based on the Motivated Strategies for Learning Questionnaire, or the MSLQ, which was created by Paul R. Pintrich "for assessing college students' motivational orientations and their use of different learning strategies for a college course" (Pintrich et al. 1991). The MSLQ can recently be seen in its use to measure medical students' reflection on their methods of learning (Soemantri, Mccol, & Dodds, 2018) and for measuring how motivation impacts the academic performance of dental students (Almalki, 2019). For years, this questionnaire has been beneficial in observing how students within a course utilize their intrinsic and extrinsic motivation through the varying question types asked. An example of a question that measures intrinsic motivation is: When given the opportunity, I often choose the assignment that I will learn the most from, even if I won't get as good of a grade. This statement focuses on internal motivation seeing as it asks if the participant prioritizes their growth of knowledge more than an external grade. Thus, the opposite of this would be an example of a question measuring one's external motivation: When it comes to class, the most satisfying thing is getting a good grade. In this study, the questions designed from the MSLQ utilized a scale ranging from 1-5, with 1 being "not true to me" and 5 being "very true to me," which students would answer based on how much they agree with each statement. The results were subsequently analyzed to determine if there were any shifts in intrinsic, extrinsic, or overall motivation in either the online or in-person classes; or if there were significant differences in motivational factors between the two subsets of students. In order to ensure a diverse population was also being studied

with these surveys, participant demographic information was collected, including gender, age, ethnicity/race, and major/concentration.

To ensure comparable data, surveys were administered in two sections of Dr. Matthew Casselman's CHEM 008A Organic chemistry course; one of which was taught online, while the other was taught in a traditional in-person format. This allowed for data collection to be done at the beginning and end of the quarter with the same group of students who are being taught the same curriculum in differing learning settings. The data collection consisted of two surveys distributed via Google Forms online in order to ensure easy access across the class and participants.

The study commenced during week one of the Fall 2022 quarter with study recruitment. The study was announced by the researcher in-person or online during a synchronous online session. Subsequently, an announcement via the course webpage provided additional information as well as a link to the informed consent form. Student participation was completely voluntary and had no impact upon their final grade in the course. The informed consent form was made available for one week, after which the first survey was made available and remained open for the next two weeks (until the end of week 3). This first survey included questions to gather pertinent demographic information, and to assess the initial level of intrinsic, extrinsic, and overall motivation displayed by the students in each section. The second survey, which consisted of the same (or slightly altered) questions, was distributed in week 9 and was open until the end of finals week. This allows sufficient time for the participants to finish the survey and to evaluate how the quarter had an impact on the varying motivation levels for each section. If a student answered the first survey but not the second, their initial survey responses were removed from the study.

Results

At the end of data collection, and once all incomplete participant entries have been removed from the dataset, the participant pool for the study ended with 18 students from the in-person section and 21 from the online section. Table 1 displays the diverse races/ethnicities, majors/concentrations, and genders that were a part of the study. Overall, the population surveyed contained a diverse group of volunteers from many different backgrounds and studies, comparable to the student population in the class.

Each participant's responses were analyzed by taking the average of their intrinsic and extrinsic level question response (1-5 scale), then the mean of all participant averages was found to gain an overall view of the online and in-person sections; these numbers can be seen in Table 2. The traditional in-person section saw a small drop of 0.04 in intrinsic motivation, while the online section saw a larger drop of 0.31. In terms of extrinsic motivation, the in-person section saw an increase of 0.13 while the online section saw a small increase of 0.03. Overall, the trends witnessed for both courses were that intrinsic motivation dropped within the quarter and extrinsic motivation increased. Overall motivation was also reviewed by taking the average of all responses – both intrinsic and extrinsic motivation collectively. The trend differed for each section however, with overall motivation increasing by 0.04 for the in-person section but dropping by 0.14 in terms of the online section. Figure 1 contains the data in a bar graph to visually display it, showing that the drop in intrinsic and overall motivation is very prominent for the online section when compared to the in-person.

Table 1: *Participant Demographic Data*

Data Set	**Data Subset**	**Number of Students**
Race/Ethnicity	Hispanic/Latinx	12
	Asian/Asian American	14
	White/European	8
	Black/African American	2
	Bi-/Multi-Racial	2
	Prefer not to say	1
Major/Concentration	Biology	16
	Biochemistry	4
	Chemistry	2
	Other*	17
Gender	Male	11
	Female	27
	Other	0
	Prefer Not to Say	1

*Consisted of: CMDB (cell, molecular, developmental biology), Economics, Microbiology, Neuroscience, Chemical Engineering, and Psychology

Table 2: *Intrinsic, Extrinsic, and Overall Motivation Levels*

Survey + Motivation Type	**In-Person Average**	**Online Average**
Survey 1 - Intrinsic	3.99	3.98
Survey 2 - Intrinsic	3.95	3.67
Survey 1 - Extrinsic	3.61	3.58
Survey 2 - Extrinsic	3.74	3.61
Survey 1 - Overall	3.80	3.78
Survey 2 - Overall	3.84	3.64

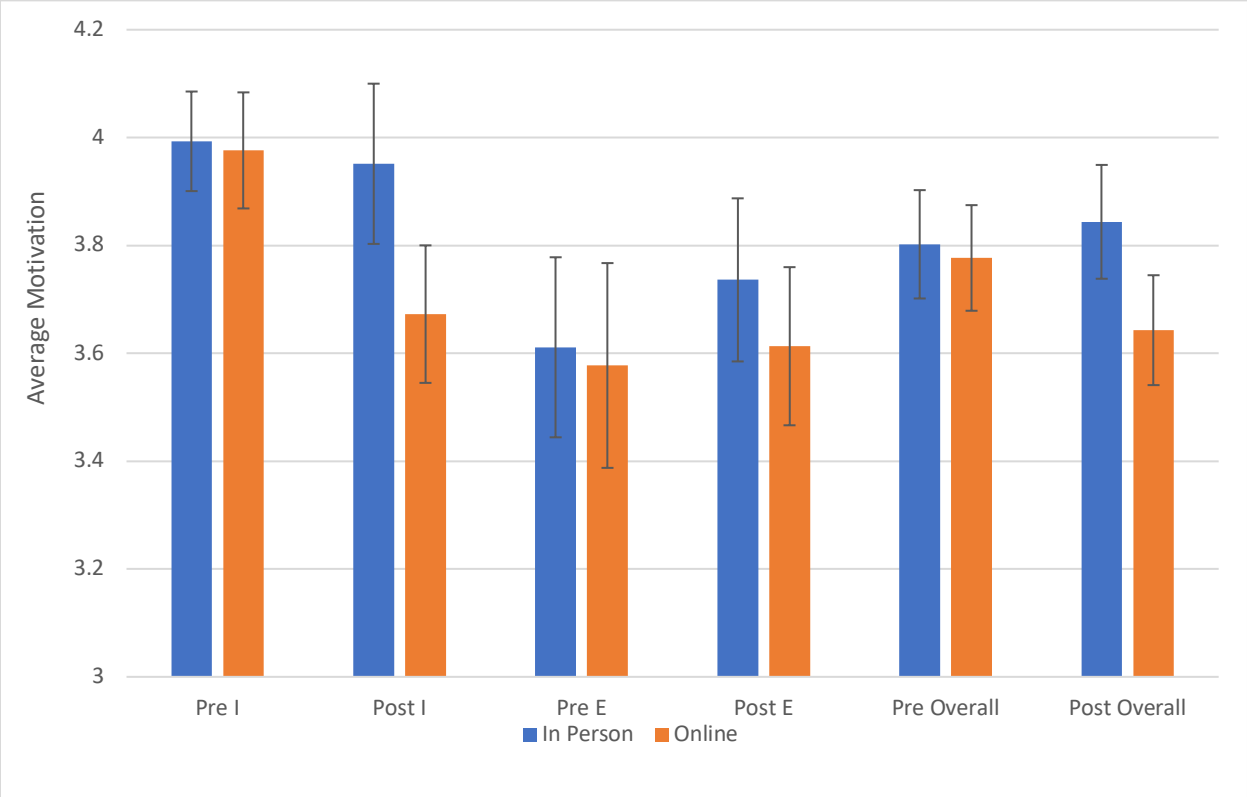

Figure 1*: Intrinsic (I), Extrinsic (E), and Overall Motivation Levels as measured in pre-course (Pre) and post-course (Post) surveys*

In order to evaluate the significance of the data collected, two types of t-tests were performed based on what was being tested, the two being the two-sample test and the paired test. Although both t-tests determine whether two sets of data are significant, the difference is that the two-sample test is used for statistically independent sets of data while the paired test evaluates two sets of data from the same group, just at different times (Xu. et al 2017). For this reason, when analyzing motivation changes within a section, the paired test was used to test significance. Data that was analyzed between the online and in-person section used the two-sample test due to their independence in section population. Table 3 breaks down the main t-tests done on the data set seen within Table 2. Analysis of the critical values (p) showed that the changes in all motivation types were not significant across the two classes or within the in-person section, but within the Online section there was a significant drop in the intrinsic motivation of students ($p = 0.01$).

Final course grades were also collected for data analysis as a part of this study. Participants were grouped by their final grades within each teaching condition, high-performing students earning A or B grades; and lower-performing students who earned C, D, F grades or withdrew from the course. Table 4 displays the number of participants within each teaching condition that were placed into each grade group, and the average GPA for both the in-person and online sections. Between the two sections, the difference in average GPA were not significantly different. Although the difference in GPA was not significant, some of the changes in motivation levels seen within the grade groups of the online section were. When performing paired tests on grade groups of the online section, although the changes in motivation of the A/B group was not significant, there was a significant decrease in intrinsic and overall motivation seen within the C/D/F/W portion of the class (Table 5). The significance in these changes can be connected back to the significant drop in intrinsic motivation within the online class.

***Table 3**: T-Tests for Intrinsic, Extrinsic, and Overall Motivation Levels*

T-Test + Data Set	**Critical Value (*p*)**
Paired – In-Person Intrinsic Motivation	0.70
Paired – In-Person Extrinsic Motivation	0.35
Paired – In-Person Overall Motivation	0.70
Paired – Online Intrinsic Motivation	0.01*
Paired – Online Extrinsic Motivation	0.79
Paired – Online Overall Motivation	0.20
Two-Sample – In-Person vs Online Intrinsic Motivation (Survey 1)	0.91
Two-Sample – In-Person vs Online Intrinsic Motivation (Survey 2)	0.16
Two-Sample – In-Person vs Online Extrinsic Motivation (Survey 1)	0.90
Two-Sample – In-Person vs Online Extrinsic Motivation (Survey 2)	0.56
Two-Sample – In-Person vs Online Overall Motivation (Survey 1)	0.86
Two-Sample – In-Person vs Online Overall Motivation (Survey 2)	0.18

*Data is significant, $p < 0.05$

***Table 4**: Grade Distribution and GPA Data*

	In-Person	**Online**
A/B Grades	9 Students	15 Students
C/D/F/W Grades	9 Students	6 Students
GPA Average	2.56 ± 0.28	2.76 ± 0.19
GPA Two-Sample T-Test Critical Value	0.54	

***Table 5**: Motivation Levels of Grade Groups within the Online Section*

Survey + Motivation Type	**A/B Average**	**A/B Critical Value (*p*)**	**C/D/F/W Average**	**C/D/F/W Critical Value (*p*)**
Survey 1 - Intrinsic	3.94	0.17	4.06	0.01*
Survey 2 - Intrinsic	3.74		3.50	
Survey 1 - Extrinsic	3.41	0.32	4.00	0.09
Survey 2 - Extrinsic	3.56		3.71	
Survey 1 - Overall	3.68	0.89	4.03	0.02*
Survey 2 - Overall	3.66		3.60	

* Data is significant, $p < 0.05$

Discussion

When comparing intrinsic and extrinsic motivation between an online and an in-person class, a few trends begin to emerge. Firstly, intrinsic motivation appears to decrease in both online and in-person classes while extrinsic motivation increases (Figure 1). One major difference in the teaching conditions is that intrinsic motivation within the online course significantly decreased – on a five-point scale – from an average of 3.98 to 3.67 ($p = 0.01$) while the in-person course only saw a reduction of 3.99 to 3.95 ($p = 0.70$), which is not a significant drop by any degree (Tables 2 and 3). This may have been due to online learning forcing many students into a form of social isolation, which is a known factor in the reduction of intrinsic motivation which stems from an increase in student anxiety, as described in the article "Intrinsically Motivated". This reasoning is also why there was not a significant decrease of intrinsic motivation levels within the in-person class; the traditional classroom setting allows relationships to be formed between other students and the curriculum, increasing the intrinsic motivation to learn the material to maintain this form of "relatedness."

Another major difference between the classes is the increase of extrinsic motivation within each teaching condition. The in-person section had a larger increase of 0.13 for extrinsic motivation while the online course only had an increase of 0.05. Although these increases are not significant, they are worth noting because a trend seen within motivational studies is that higher extrinsic motivation will offset the effects of lower intrinsic motivation (Ryan and Deci, 2000). This pattern is not seen however, as the online section had a significant decrease in intrinsic motivation, the in-person class had the larger increase in extrinsic motivation instead. The reason for this pattern was that the intrinsic motivation was heavily deterred by a greater sense of solitude for the students in the online section, while the students of the in-person section were greatly

motivated extrinsically by the presence of their peers. This also goes back to the drop in intrinsic motivation being caused by a lack of "relatedness" within an online setting, and not due to the overpowering effects of extrinsic motivation on a student. Thus, the anomaly of the in-person class was due to the presence of students, or the sense of "relatedness," not only maintaining the intrinsic motivation of the section, but also heightening their extrinsic motivation.

Focusing on the high and low performing students in the online section, the changes in motivation levels observed may have had a significant impact on the performance level of the class. This impact was especially noted for lower-performing students earning C, D, F or W grades, seeing that they had a significant decrease of 0.56 for intrinsic motivation level, which is greater than the 0.20 decrease seen in students who earned an A or B in the course (Table 5). The cause in their drop in grade cannot only be attributed to their drop in intrinsic motivation however, seeing as they also had a significant drop in overall motivation (0.43), and a nearly significant drop in extrinsic motivation (0.29). This finding is crucial in terms of online learning because it correlates to the trend that students' motivation levels are parallel to their "academic effort through study effort" (Kusurkar et al., 2012) – as students motivation drops, so does their academic effort. With greater drops in motivation (especially intrinsically) observed within the online section than within the in-person section, it is evident that the same teaching style cannot be used for both environments. Thus, with the online section having a significant decrease of intrinsic motivation, and having lower performing students display significant decreases in almost all motivation types, it appears that teaching must be implemented in mind with maintaining students' motivation levels. Bolstering intrinsic motivation would not only increase study efforts but would likely also increase the performance of students in an online setting.

This study is not without its limitations. The first limitation and potential improvement would be increasing the population size for both the online and in-person classes. With a more robust dataset, it may have been possible to observe significance between groups despite small differences in motivational levels. Alongside this, the size of the population studied has an influence on the validity of the data collected; the motivation levels collected are potentially higher/lower than what would normally be experienced. This is due to the small population size causing values on the more extreme ends of the scale to influence the data set to a greater degree.

Conclusion

At the end of the quarter, students that were taking a course within an online learning environment compared with a traditional in-person setting had different levels of motivation and changes in those motivational levels, as hypothesized within the introduction. Overall, there were trends of an increase in extrinsic (external) motivation levels of students from both sections, but there was a significant decrease of intrinsic (internal) motivation levels for the online section, while the in-person section maintained a steady level. This drop of intrinsic motivation within the online section also gave insight into how a drop in motivation levels leads to a drop in performance, with the lower performing students in the section having a drop in extrinsic motivation and significant drops in intrinsic and overall motivation. Thus, this study gave a better view as to intrinsic motivation being the type of motivation that is the most impacted when switching to an online platform, and also gave insight as to how motivation levels have a paralleled influence on the performance levels of students.

Although the change in intrinsic motivation levels for the online course was significant, some factors that could have further traced reasoning for this could be studied in the future. One

of these factors is the effect of the climate in which the student is studying in, otherwise saying, are there things within their place of learning that could have also lowered their intrinsic motivation levels. Examples of these factors could include parents, siblings, and lifestyle, all of which could have potentially increased or decreased certain student responses on the surveys. Another factor that could have also been further studied was the mental impact that the Covid-19 pandemic had, since a pandemic at this scale has not been present during a technological time we live in now.

With this study's findings, online instructors have a better understanding of how to format their courses in order to better the performance of their students, and this is by enhancing their motivation levels, specifically intrinsically. One of the main issues that stems from online learning is the feeling of disconnect between the instructor and students, and between a student and their peers. This disconnect can be lessened by providing students with group-based assignments in order to increase the feeling of "relatedness" between the students, therefore lessening the feeling of solitude that comes with an online learning environment (Escandell & Chu, 2021). Alongside this, assignments can be given with multiple attempts and no penalties for trying again to shift the student focus from "getting the grade" (extrinsic) to instead learning the information to build an understanding of the material (intrinsic). Another change that can prevent loss of motivation is breaking down the grade of a course to not prioritize examination for the final grade, but also provide opportunities to complete projects and assignments that allow students to not only perform better, but also engage with the material more. The reasoning for this change is that students who enroll in a course where an exam has a great weight on their final grade are often deterred in their motivation for the course (Klein, 2020), but this structural change will allow students to learn from their mistakes and work through assignments that increase their understanding and enjoyment in learning. Therefore, the increase in engagement with the material and the lessening of the influence

of examination will lead to greater motivation levels observed. Thus, the changes discussed can assist in increasing and creating a stable level of intrinsic motivation within online learning, while also building a student's overall motivation and increasing the performance levels of students.

In conclusion, future studies of student motivation in varied learning environments may provide deeper insight into how an online environment negatively impacts intrinsic motivation and the full impact of how motivation can influence a student's performance in a course. The field of pedagogy can always be further studied in order to find the most effective ways in which students process information and learn the curriculum of a subject, and the pandemic has allowed many studies to be carried out for online education at a scale that was not possible before. Thus, this study serves as one step closer to determining how to effectively increase a student's motivation levels to further increase their engagement and understanding of the subject, especially for those within online courses.

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