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"AND NOW FOR SOMETHING COMPLETELY DIFFERENT" STIMULATING INTERVENTIONS TO IMPROVE ACADEMIC OUTCOMES IN FINANCIAL ACCOUNTING COURSES

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Based on social-psychological and motivation theories, well-crafted interventions have proven remarkably effective to improve educational outcomes in higher education. The intervention we will present in this paper focuses on promoting motivation and performance in financial accounting courses. It aims at reducing class-related boredom which is commonly experienced by students and has an impact on their learning engagement and achievements. Two university courses on financial accounting have been subject to a stimulating intervention, a short lecture in a field unrelated to accounting. The study found a hugely beneficial impact on the dropout rates as well as the average grades particularly for younger (18 to 20 years) full-time students and a somewhat smaller positive impact on the average grades for older (25 to 30 years) part-time students.

Keywords: Higher education, intervention, Academic boredom, Academic emotions, Student engagement, Academic outcome.

Introduction

Many theoretically based interventions have been developed to improve educational outcomes in higher education. Based on social-psychological and motivation theories, well-crafted interventions have proven remarkably effective. The intervention we will present in this paper focuses on promoting motivation and performance in financial accounting courses. The intervention aims at reducing class-related boredom which is commonly experienced by students and has an impact on their learning engagement and achievements.

First, we will discuss the theoretical background of our research. We will give a short overview of targeted interventions in higher education, then we will briefly discuss the effects of students' emotions on learning. After that, we will describe the concept of class-related boredom before we will present and discuss the newly designed intervention and the empirical results.

Literature Review

Many **targeted interventions** have been developed to improve educational outcomes in higher education. These interventions have great potential as they are brief and cost-effective (Harackiewicz & Priniski 2018, 409; Wilson 2011). They can have powerful and long-lasting effects when they address specific motivational processes. This kind of targeted interventions has been called motivation interventions or sociopsychological interventions reflecting their theoretical background. A critical feature of such targeted interventions is that they are theory-based to identify powerful levers of change in the educational process. (Harackiewicz & Priniski 2018, 409; Wilson 2006; Yeager & Walton 2011; Walton 2014).

Based on social-psychological and motivation theories, targeted interventions have proven remarkably effective because they target specific educational problems and the processes that underlie them. One kind of interventions focuses on promoting motivation and performance in particular courses, where measurement could be course-specific, such as engagement, interest, and course grades (Harackiewicz & Priniski 2018, 409).

Targeted interventions have been implemented in different ways. One feasible way is to use these interventions in classes, integrated into the class structure with an assessment of academic outcomes (Harackiewicz & Priniski 2018, 427; Aronson et al. 2002).

New advances in neuroimaging and neurobiology have shifted the paradigm of education research toward the effects of **students' emotions** (Kirwan 2018, 14; Hinton, Miyamoto, & Della-Chiesa, 2008). Neuropsychobiology studies reveal the complex effects of students' emotional states on the biological basis of acquiring, storing and retrieving information throughout the learning process (Kirwan 2018, 15, Friedlander et al., 2011), Immordino-Yang and Damasio (2007, 3) highlight the relevance of affective and social neuroscience for education as they state 'We feel therefore we learn'.

The implication for teachers is to optimize the learning environment through addressing the emotional component as well as the cognitive skills within each learning activity to optimize deep learning that lasts over time and can be retrieved and applied to different contexts Kirwan 2018, 15).

Pekrun and colleagues (2002) identified nine learning emotions (enjoyment, hope, pride, anxiety, relief, anger, boredom, shame, and hopelessness) and developed the conceptual framework of the Control-Value Theory of Achievement Emotions (Kirwan 2018, 16; Pekrun, 2006). They categorized these emotions into four groups: positive-activating emotions (e.g., enjoyment, hope and pride), positive-deactivating emotions (e.g., relief and contentment), negative-activating emotions (e.g., anger, anxiety, and shame), and negative-deactivating emotions (e.g., boredom and hopelessness) (Acee et al. 2010, 17; Pekrun et al 2002).

This theory in academic learning builds on decades of negative emotion research and is based on the neurological biological bases of emotional learning, as well as being congruent with Bandura's (1997) social learning theory and Zimmerman's (1989) self-regulated learning theory. According to Pekrun's Control-Value Theory of Emotions (Pekrun, 2006), the student's appraisal of their control over and value of a learning situation leads to an emotional reaction which determines the motivation behavior toward learning engagement (Kirwan 2018, 16).

Using this conceptual framework, the effects of students' emotions have been linked to the whole learning process. Positive emotions are positively correlated to motivation, engagement and learning outcomes (Kirwan 2018, 17). Additionally, motivation is associated with academic success (Busato et al. 2000).

Negative emotions of test anxiety, boredom, and frustration were correlated with poor academic performance (Kirwan 2018, 17; Cho & Heron 2015). Boredom has been correlated with lower motivation, lower studying and learning strategies, and lower academic outcomes (Kirwan 2018, 17; Tze, Daniels & Klassen 2015).

Academic boredom is one of the most common emotions experienced by students in the framework of academic emotions, and it can be classified into class-related boredom and learning-related boredom (Cui et al. 2017; Pekrun et al. 2002, 2010). Class-related boredom is boredom experienced by students in the course of class activities. For students, class-related boredom functions at a higher level than learning-related boredom does (Cui et al. 2017; Pekrun et al. 2010; Tze et al. 2015). Many studies found that class-related boredom had several negative effects on academic performance. For example, class-related boredom experienced frequently or for a long time may result in a relatively stable bored belief, which may affect learning, career choices, and lifelong learning in relevant domains (Cui et al. 2017; Watt and

Vodanovich, 1999; Goetz et al. 2003). A recent meta-analysis investigated the relationship between boredom and academic outcomes. It showed that boredom has negative effects on learning motivation, the use of learning strategies, and achievement. These results are congruent to the control value theory and implicate that education professionals should identify strategies to alleviate students' boredom in academic settings (Tze et al. 2015).

The above-discussed findings suggest that education professionals should identify strategies to reduce students' boredom in academic settings.

Authors have made different suggestions to eliminate or reduce boredom. They suggested reducing the number of slides and amount of information in each slide, providing accompanying handouts and making the slides colorful. Other ways to cope with boredom are introducing funny sections or activities, one on one interaction with students, displaying videos, pictures and establishing friendly competitions among students by asking some interesting questions (Ubah 2018, 91).

The Intervention

We sought to develop a completely new **intervention** specifically for lectures in normative subjects, like financial accounting. According to the above findings, the newly designed intervention aims at using emotions to improve the academic outcome of the classes. The focus lies on the two emotions enjoyment and boredom. The intervention should increase class-related enjoyment and decrease class-related boredom and therefore have a positive impact on academic outcomes.

The research objects were two university courses on financial accounting in a bachelor degree program (International Business Relations) at the University of Applied Sciences Burgenland in the 2018/19 winter term. This 4,500-student university is located in a rural area in Austria close to the Hungarian border. One of the classes were full-time students, typically graduates of secondary education at ages between 18 and 20 years. The other class consisted of part-time students, typically employed and with a few years of work experience after graduation from secondary education, most of them between 25 and 30 years old with a few of them up to 40 years of age.

All courses in this program are organized in weekly seminars of 180 minutes each. Because of the tense space situation, it is necessary to adhere to a strict schedule with a timeframe of 210 minutes for the block. Instructors often decide to have a break of 30 minutes splitting the seminar into two parts of 90 minutes each, or they have two shorter brakes dividing the seminar into three parts of approximately 60 minutes each.

Our intervention followed the second pattern but replaced the second break by a short lecture of about 7 minutes in a field completely unrelated to accounting. In the first half of the courses, we chose topics from the field of natural sciences. In the second half, we decided to present scientific errors that had been accepted for decades until the errors were uncovered. At the beginning of each lecture, the students were reminded that there would be no test or other forms of assessment of this part. The short lectures were supported with a few slides. The students did not get access to the slides to ensure that they would pay maximum attention to the lecture if they had an interest in the topic.

The inspiration for the lectures came from the science pages of daily papers and magazines, additionally collected information from current encyclopedias, especially Wikipedia, and Google Scholar, where the most important papers for the topics were studied. The accounting instructor has a scientific background. The following examples may give an understanding of the nature and the depth of the short lectures.

Example of a lecture on natural science 1: Why do mammals have a placenta? The placenta is the most important key innovation of mammals, and it was one of the biggest mysteries how evolution invented it. The placenta prevents the mother's immune defense from rejecting the embryo. 20 years ago, the paternally expressed gene 10 (Peg 10) was found responsible. All mammals have this gene. In humans, it is in the middle of the 7th chromosome, in mice it is found in their 6th chromosome. When researchers want to find out what a certain gene does, they disable it (in a procedure called gene knockout) in lab animals like mice and see what happens. In the case of the Peg 10 gene, the mice were healthy and normally active, but the females could not become pregnant because their immune system rejected the embryo. But how did evolution manage to implement this gene? Ono et al. (2001) found that it was a retrovirus. Retroviruses inject their RNA into the genome of the host cell, and they often cause tumors, immunodeficiencies like HIV) and neurological disorders. So it can be concluded that some 300 million years ago a group of animals was infected by a retrovirus that modified the immune system in the area of the reproductive system. Most of the animals probably died, but those who survived became the ancestors of all mammals including us humans. The price we have to pay for this evolutionary modification is high – all mammals are prone to cancer. But the advantage – staying mobile instead of guarding the nest with the eggs – outweighs the cost.

Example of a lecture on natural science 2: What is the Neanderthals' heritage in us? Homo neanderthalensis is an extinct subspecies of archaic humans, who lived in Eurasia in the Pleistocene (from circa 400,000 until approximately 25,000 years ago). Neanderthals are the closest relatives to us, the Homo sapiens. Homo sapiens is estimated to exist for 200,000 years and outside of Africa for approximately 40,000 years. Both subspecies lived side by side for about 2,600 to 5,400 years in Europe and Western Asia. The genome of Neanderthals differs from ours only about 0.5% (Lambert & Millar 2006, Green et al., 2010).

However, the Neanderthals had 100,000s of years more time to adapt to life in Eurasia. Neanderthals and Homo sapiens mated and had common offspring. Genetic research shows that Neanderthal genes are present in all modern humans, except Africans (who never had any contact with Neanderthals). Research can pinpoint that: Our autosomes (the 22 chromosomes that are not sex chromosomes) contain between 1.15% (Europeans) and 1.38% (East Asians) Neanderthal genes, the X chromosome about 0.2% to 0.3% (Sankararaman et al. 2014). Mating between Homo sapiens and Neanderthals had some disadvantages. Mendez et al. (2016) found a mutation in the Neanderthal's Y chromosome that made miscarriages more likely. On the other hand, mixing with people who lived in a place for 100,000s of years longer is an advantage because they had already developed immune defenses against local Eurasian diseases. The Neanderthals also had more time to adjust their skin color to the local climate. While in Africa a dark skin color is beneficial for preventing skin cancer, the reduced sunshine in Eurasia makes a lower pigmentation desirable that helps to form vitamin D. Indeed, Vernot et al. (2014) found the Neanderthal influence on the gene BNC2 in chromosome 9, which is responsible for skin pigmentation.

Example of a persistent scientific error 1: Menotoxin. In most mammals, if no fertilization takes place, the uterus reabsorbs the endometrium. Overt menstruation is found only in some higher primates (including humans), some bat species, and in elephant shrews, but not in the typical hunting and domestic animals of humans. Its nature was not fully understood until the end of the 19th century, so it has been perceived as mysterious and became significant in terms of cultural history. This mysterious character of menstruation has probably also contributed to extraordinary scientific failures. In the early 20th century, Vienna was one of the hotspots of medical science, and the "Wiener klinische Wochenschrift" was one of the most well-known and prestigious scientific journals of that time. Béla Schick (1920) reported his findings of menstrual toxin there. He has made two observations: Freshly cut flowers wither within a few hours if touched or cut by a woman between the first and third day of her cycle, and yeast dough did not rise well when held or kneaded by a woman during that time. Subsequently, there were numerous follow-up studies in Austria, the United Kingdom, and the USA. Béla Schick has reported damages for roses, anemones, and chrysanthemums. David Macht and Dorothy Lubin (1923) found it for peas, Anna Lánczos (1930) fed rats with menstrual blood and found that they suffered from orientation problems afterward. On the other hand, William Freeman et al. (1934) found no effects on lupines. It needed 50 years to falsificate the hypothesis of menotoxin (Davis 1974, Ernster 1974). What was the problem? All the studies relied on insufficient data, mostly on a few anecdotes. There were no repeat studies, and the whole setting was empirically questionable. Béla Schick's original data (though statistically insignificant) even indicated that there was no difference in dough rising and flower withering during menstruation, but the data were misinterpreted by the researcher. Anyway, the nonsense was believed 50 years and was considered a scientific standard in the relevant fields of medicine and pharmacology.

Example of a persistent scientific error 2: Synchronisation of menstrual cycle. In a study of 135 women in dormitories at Wellesley College (Mass.), Martha McClintock (1971) found that menstrual cycles are synchronizing. After six months, the average difference in the menstruation cycles has decreased by two days. Follow-up studies of female students (Graham & McGrew 1980, Quadagno et al. 1981) and lesbian couples (Weller & Weller 1992) confirmed the results. Menstrual synchronization received media attention and was accepted by popular culture, e.g. discussed in women's magazines and mentioned in sitcoms. After the turn of the millennium, those studies revealed as a methodological error (Harris & Vitzthum 2013). What was the problem? Menstruation cycles vary in length (28-31 days), so the statistical findings were simply a mathematical phenomenon of resonance (Yang & Schank 2006), and also in duration (3-5 days), so there is a high probability of overlap by chance (Ziomkiewicz 2006).

There are two major learnings from Béla Schick's and Martha McClintock's scientific flaws:

First, female researchers make the same mistakes as male researchers. Second, when the results sound good, they are likely to be believed and not doubted. This attitude, observable in many people, also occurs among experienced scientists of high intelligence and impeccable ethical standards.

Results

At the end of the term, the students' grades received in the written exams of the two courses were compared with the grades of the corresponding two courses of the previous year. The grading of the financial accounting courses follows a very strict scheme, the tests are graded anonymously, and it is unlikely that the instructor's expectations have any influence on the grades.

The Austrian grading scheme consists of five grades (1 to 5). Grade 5 is a fail and means less than 50 % of the maximum points have been achieved. The grades 1 to 4 are passing grades, with 1 being the best (more than 87.5 %).

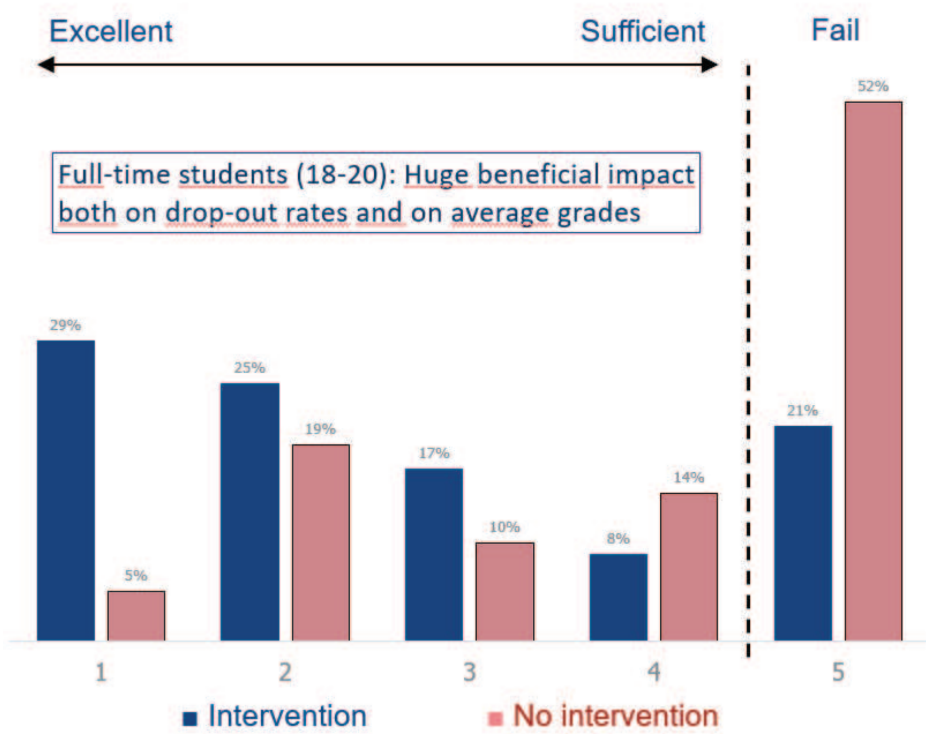

Figure 1. Comparison of academic outcome – Full-time students

Fig. 1 shows the comparison for the full-time students. 21 % of the students in the full-time group with intervention failed, compared to 52 % in the control group. 29 % in the intervention group had the best grade (1), compared to only 5 % in the control group. The total number of students in the intervention group was 24, in the control group 21. There is a hugely beneficial impact both on drop-out rates and on average grades, when the students are young (18 to 20 years) full-time students.

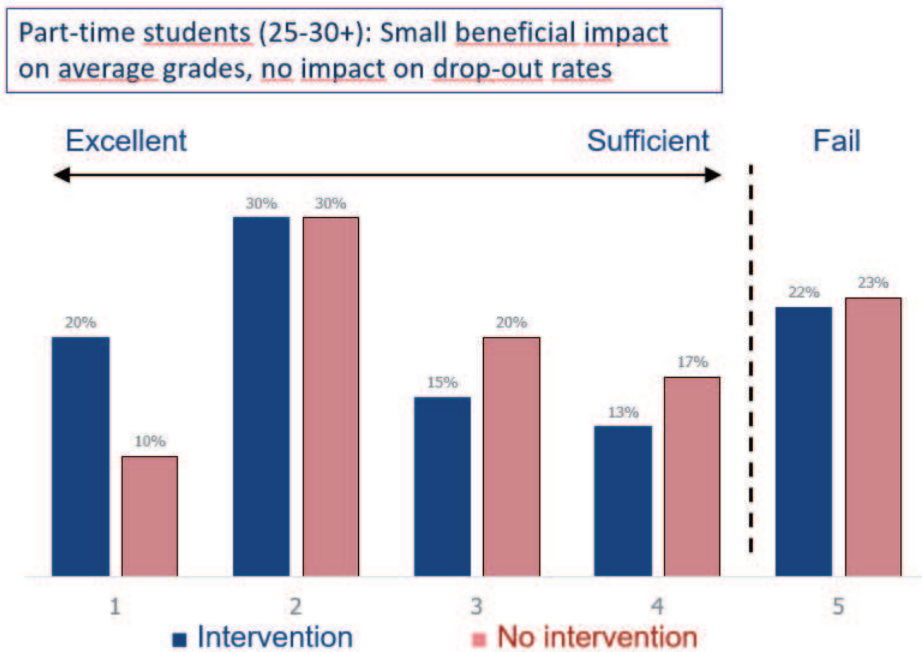

Figure 2. Comparison of academic outcome – Part-time students

Fig. 2 shows the comparison for the class of part-time students. 23 % of the students in the part-time group with intervention failed, compared to 22 % in the control group. 20 % in the intervention group had the best grade (1), compared to only 10 % in the control group. The total number of students in the intervention group was 40, in the control group 30. There is a somewhat smaller beneficial impact on average grades, but no impact on the drop-out rates, when the students are elder (25 to 40 years) employed part-time students.

Discussion

The study involved only a small number of participants: 24 full-time students and 40 part-time students in the two intervention groups, and 21 and 30 in the two control groups without intervention. Of course, this small number limits the significance of the study, and repeat studies are necessary to provide a better database, preferably at different universities in different countries.

A major concern was to rule out that the experiment was subject to a Hawthorne effect (Landsberger 1958) or demand effect (Orne 1969). One of the strategies to overcome these concerns is to deceive participants about one or more aspects of the research to conceal the research hypothesis. In our intervention, the students were encouraged in the belief that the short lectures were only meant to lighten the lesson (or to make the lecturer more popular with the students). At the end of the term, the participants were inquired about their experiences with the intervention, for example, whether they felt able to present the topics to other people, or whether they did further reading on any of the topics (e.g. in Wikipedia or in

Google Scholar). The students were also inquired how much they liked the short lectures, and they reported great satisfaction with the intervention, which is evidence for an increase in motivation. Thus, the experiment's real purpose of determining the intervention's impact on students' academic performance was veiled to the very end. It is therefore very unlikely that students changed their exam preparation behavior to meet or hinder the expectations of the lecturer.

About the differences between full-time students and part-time students, only hypotheses can be made. This difference was not anticipated by the researchers and is a quite surprising result. Therefore, the data do not give hints to explain this outcome. We hypothesize that the reason is the difference in basic motivation. Full-time students are older and employed. We know from the admission interviews that working part-time students have very precise ideas about their future career path and what role the chosen study program should play to achieve their goals. Some of the younger full-time students still have very vague anticipations, and some of them choose to study only because they have no better idea for the period after leaving school. This could mean that the motivation of part-time students is higher and thus the impact of motivational measures is greater on full-time students. Any follow-up studies should put additional attention to this difference from the beginning.

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