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Applying a followership approach to the learning experience

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Master in Management - ISCTE Business school

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RESUMO

No mundo digital actual, a capacidade de atenção dos alunos é cada vez mais limitada e os níveis de tédio estão a aumentar, tanto nas aulas universitárias como nos cursos de formação das empresas. Isto coloca pressão sobre as concepções tradicionais de aprendizagem para reduzir o tédio e manter a aprendizagem. Embora tradicionalmente se considere que é da responsabilidade do educador minimizar o tédio, uma perspectiva de *followership* sugere que os alunos também desempenham um papel intrínseco de co-produção na experiência de aprendizagem.

Este estudo tem como objetivo analisar o efeito da interacção entre o desenho das aulas e as crenças de co-produção dos alunos no seu envolvimento na aula, nos níveis de aborrecimento e nas notas esperadas. Para o efeito, foi realizado um inquérito a estudantes do ensino superior, do qual resultaram 202 respostas válidas. Os resultados sugerem que as crenças de co-produção desempenham um papel significativo na modulação do efeito indirecto do desenho sociotécnico das aulas no tédio sentido pelos alunos através do seu envolvimento na aula. Este efeito prende-se mais com a passagem do tempo do que com a falta de atenção.

Crenças de co-produção mais fortes podem ajudar os estudantes a atenuar os efeitos negativos do tédio no desempenho académico e os professores, bem como os gestores, podem beneficiar em considerar a literatura sobre *followership* enquanto uma nova perspectiva, e simultaneamente considerarem o desenho sociotécnico em contexto de aprendizagem.

Palavras-Chave: Followership, tédio, crenças coprodução, envolvimento, desenho socio-técnico de aulas (STCD), notas esperadas

JEL classification codes: M53 Training, D23 Organizational Behaviour

ABSTRACT

In today's digital world, students' attention spans are increasingly limited, and boredom levels are on the rise, both in university classes and company training courses. This puts pressure on traditional learning designs to alleviate boredom and uphold learning. While it is traditionally been viewed as the educator's responsibility to minimize boredom, a followership perspective suggests that students also play an intrinsic co-production role in the learning experience.

The purpose of this research is to analyse the impact of the interaction between class design and students' co-production beliefs on their class engagement, boredom levels, and expected grades. To do so, a survey was conducted towards higher education students, resulting in 202 valid responses. The findings suggest that co-production beliefs play a significant role in shaping the indirect effect of Socio-technical class design on students experienced boredom via class engagement. This pertained to the passage of time rather than the lack of attention.

Stronger co-production beliefs may help students mitigate the negative effects of boredom time on academic performance, and scholars as well as managers may benefit from considering literature on followership as a new perspective to consider while also referring to socio-technical design in learning settings.

Keywords: followership, boredom, co-production beliefs, engagement, Socio-Technical Class Design (STCD), expected grades

JEL classification codes: M53 Training, D23 Organizational Behaviour

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INTRODUCTION

The amount of literature, articles, and TED talks available and published on the topic of leaders and leadership is staggering, while in contrast finding information devoted to followers or followership is particularly limited. A quick look at a google scholar and web of science search for the term leadership shows a proportion of approximately 200 papers on leadership to each one on followership.

Today's society values leadership, to make key decisions and guide people to success. We are uncomfortable with the term "follower" as it portrays blind loyalty at a first perception. The terms follower and followership carry a negative connotation with views of followers as powerless and subservient (Uhl-bien et al., 2018). However, early research into followership tend to demonstrate a binding between leaders and followers. The Power of Followership (Kelley, 1992) explains and analyses the world of followers and their interactions with leaders. According to this author, leadership only contributes 20% to the success or failure of an organization. Followers therefore account for 80% of an organization's effectiveness, so it is critical we learn more in depth regarding this phenomenon of followership.

This is especially important in a knowledge-based economy where innovation is paramount, and learning is a key process that all organizations must foster to remain competitive. Educators are expected to design and deploy pedagogical strategies that are conducive to a positive experience that engages students. Student engagement fosters learning outcomes and matches effective learning strategies for adults or young adults namely those advocated by the andragogic model (Knowles, 1978) that closely matches the job characteristics model (Hackman & Oldham, 1975). However, the advent of digital technology in our everyday lives means we are forever multitasking and juggling between different pages on our computers, the next push notification on our smartphone just minutes away, and the next interesting thing on social media just a swipe away. This puts pressure on traditional learning designs that have become less exciting, and therefore, boring. Boredom equates with low engagement and therefore, boredom is a psychological state that matters.

From a leadership viewpoint, it is up to the educator to guarantee that boredom is kept to a very minimum. However, from a followership perspective, the intrinsic co-production roles ascribed to followers, would imply the learning experience (and thus, experienced boredom) is a product of everyone and not truly within the reach of the educator. Currently, it is yet uncertain if this followership perspective applies to explaining boredom in learning experiences or if the classical leadership approach is more suitable.

Hence, this research will be to examine a followership approach to the learning experience.

To better examine this concept, the following research questions will guide this study:

- How and when does class design explain learning experience?

- To what extent does students' engagement in class mediate the positive effect of class design on learning experience?
- Is this mediation conditioned by students' co-production beliefs so that when these beliefs are strongly held the effect is stronger?

In order to tackle these questions, the following objectives have been laid out:

- To assess how well socio-technical principles can be transferred from a work setting into a class setting.
- To test whether a followership approach to the learning experience (as measured by the co-production beliefs interaction) should replace the classical leader-centric approach in education.

Traditionally, the eye is always on the educator of a defined class and is solely responsible for the learning outcomes and results of his or hers teaching. Taking a followership perspective, this study would put more responsibility on the follower of the course and their output during the lecture. Giving managers and teachers a different insight on the reasons behind the efficiency of a training course, being able to see it as a co-produced matter. Ideally, the learning experience would be one that engages the students, and where students proactively foster such engagement. The topic of engagement, within the context of work, is also rising up on the managerial priorities as it creates an environment with beneficial outcomes both to the organization and its employees (Veestraeten, 2021).

Therefore, this study will give a better understanding of the followership perspective and whether it can be applied at university level with participation in classrooms waning and attention spans of students harder and harder to keep a hold of. Similarly, this could also be interesting to apply to employee training programs.

The first part of this dissertation broaches the literature review, where all relevant theoretical points related to the subject of research will be discussed on the basis of peer review articles and books of numerous scientific authors. This part also includes the formulation of hypotheses and a proposed model for the research. Subsequently, the method will describe the context in which the data was collected, the sample as well as the methods used to collect the necessary information to draw conclusions from this study. The third part will present the results obtained from this research. Finally, the last part will be dedicated to conclusions and recommendations. The theoretical contributions and managerial implications will be discussed in greater detail. Additionally, an analysis of what has limited the study will be made, as well as suggestions for improvement will be given.

I.LITERATURE REVIEW

Followership being a relatively new area of research, there have been few scholars who have explored the entirety of this construct. Little attention has been paid to followership in the leadership research. Exploring this construct in the specific case of the learning process dictates us to investigate numerous subjects. The different topics of the investigation problem will be introduced starting with the dependant variable (boredom) and flowing backwards through the conceptual model ending with the key concept of “co-production beliefs” as a novel contribution from the followership theory.

1.1 Boredom

How to define boredom, this psychological state of low interest? A famous expression in the American-English language referring to something as being boring or dull is “as exciting as watching paint dry”. If we imagine this, we instantly recognize the state of mind as being opposed to a state of enjoyment, focus and productivity. These adjectives have been used to define the opposite of boredom, i.e. psychological flow (Norsworthy et al., 2021). In such a state, individuals lose track of time, and conversely, in a state of boredom time flows extremely slow. The subjective perception of time flow is one of the multidimensions of boredom (Fahlman et al., 2013) which is also matched by attentional dispersion. The next sections will explore both.

1.1.1 Time flow

According to Zakay (2014), psychological time should be considered as information. It is true that humans can experience the passage of time, but the precise nature of the process by which this is accomplished is yet unknown. People have temporal experiences, which are subjective emotions related to the passage of time. Psychological time is a creation of the mind in contrast to being a reflection of proper scaled duration (Danckert et al., 2005). Temporal aspects like duration, pace, and the chronological order of external and internal events help in the process of psychological time telling. In circumstances like leisure, play, or intense work where one is engaged in the activity, one loses track of time. On the other hand, when one finds himself in a dull or boring environment, this is characterised by a desire to leave the setting and this sense of time passage is increased.

The perception of time is an important determinant of the subjective experience of boredom. Hence, boredom time refers to the duration of time that one feels bored and feels as time is dragging on. It can be used to compare how long different activities or situations keep a person engaged or entertained. The task at hand can have an effect on this perception of time flow. According to the Meaning and Attention Components model of boredom (Westgate & Wilson, 2018) boredom results either from attentional or meaning reasons. As regards attention, whenever there is a mismatch between attentional resources and the demands of the task, i.e. when the demand is too low or too

high comparing to available resources, the individual will experience a sense of attentional boredom. Likewise, when the task is incongruent with the individuals valued goals a cognitive state of meaninglessness emerges, i.e. the individual experiences meaninglessness boredom. Both can occur to generate the strongest sense of boredom. This closely relates to Danckert et al. (2005) conclusion that individual's perceived effort and willingness to persist do play a role in whether they feel time as passed quickly or not during a given task.

1.1.2 Lower cognitive performance

Boredom is a common experience, which usually appears as a result to a specific situation, this situation usually being an experience where one finds themselves with their attentional resources are free and not allocated to a given task which demands information processing.

Additionally, being bored can stem from a monotonous environment which lacks stimulation and variance, or from having to perform the same task over and over without a sense of challenge or having to listen to a lecture which in the attendee's perception gives no new information and is read in a monotonous voice (Vogel-Walcutt et al., 2012).

Hence, boredom is an important issue in psychology, education and work-life but has not received significant attention from researchers even though it has a crucial link with well-being, job satisfaction and other aspects of human behaviour (Zakay, 2014). Boredom attention, according to Fahlman et al. (2013) refers to the quality or intensity of the feeling of boredom. It reflects how fully one's attention is captured by the activity or situation at hand. Boredom attention can vary even if the duration of the boredom is the same. For example, if someone says they were extremely bored during a lecture, they are referring to the fact that they found it difficult to pay attention, even though the lecture may have been relatively short.

This unique sentiment called boredom manifests itself when the overall level of information being processed is lower than the optimal level. Studies (e.g. Zakay, 2014) show that boredom is linked with a lowering of cognitive and perceptual performance. Hence, reducing the amount of effort one invests in performing tasks, hindering either their job performance or educational achievements.

Taking a closer look into the relationship between boredom and academic outcomes, a meta-analysis conducted by Tze et al. (2016) exploring the relationship between students' academic boredom and their motivation, study strategies, behaviours and performance found that boredom experienced in class had a greater negative impact on a student's academic outcomes than boredom experienced while studying. The authors also found that the higher level of boredom university students reported, the lower their effort put into studying and academic achievement were.

Anyone would accept that the grades might not be the most important outcome in a learning experience, but they are definitely not irrelevant. Both from a feedback perspective that signals

students how effective is their learning strategies and effort but also to differentiate and identify profiles suitable to the level of knowledge or learning ability each one may offer to.

As vastly reported in literature, expectations are relevant to explain and anticipate one's own performance (Isaac, 2001). Expectancy theory argues that individuals make choices based on the expected outcomes of their actions. Lawler and Suttle (1973) suggest that an individual's motivation to engage in a particular behavior or activity is influenced by three factors: expectancy, instrumentality, and valence. If an individual believes that their effort will lead to improved performance, that improved performance will lead to certain outcomes that are valuable to them, and that those outcomes are desirable, they will be more motivated to engage in that behavior or activity. For students, just like self-efficacy has been reported as a facilitator, expected grades can be an indicator of real grades.

Boredom is related to many cognitive and attention processes and the experience of being bored should lower expectations about one's academic performance in the specific course. Therefore, we hypothesize that:

H1: Boredom is negatively associated with expected grade.

H1a: Boredom attention is negatively associated with expected grade.

H1b: Boredom time is negatively associated with expected grade.

In a learning setting, boredom is often equated with the educator's poor skills or ill-designed classes that fail to motivate or engage learners into the learning process so to provide a positive learning experience. Therefore, class design may be a helpful concept.

1.2 Learning experience

The learning experience students go through depends greatly on the class design originating from the educator. When it comes to adult education referred to as andragogy, made up of the Greek roots "andros" (man) and "agogos" (guiding) making literally mean "guiding of man", the pioneer author on this subject is Malcolm Knowles.

1.2.1 Andragogy

The more familiar word pedagogy refers to learning strategies in child education, in contrast andragogy refers to the methods and approaches used in adult education. In his andragogy theory Knowles (1978) identifies five core adult learning principles. Firstly, adults need to know the reason for learning something. Adult learners want to know the value of what they are learning and know the why's behind the need to learn them. Secondly, prior experience of adults, meaning they have

an existing foundation of previous experiences and tends to be a good repository for learning. Thirdly, adult learners have self-concept. They need to be responsible for their decisions on education, involvement in the planning and evaluation of their instruction. Subsequently, the learning orientation of adults tends to be more task-orientated, life-focused and problem-centric. This orientation of adult learning tends to be more for immediate applications rather than future uses. Finally, adults are more motivated by internal personal factors rather than external motivators or pressures.

From these principles, Knowles et al. (2020) proposed a program planning model for designing, implementing, and evaluating educational experiences with adults. For example, with regard to the first assumption that as adults mature, they become more independent and self-directing, Knowles suggested that the classroom climate should be one of “adulthood” both physically and psychologically. In an “adult” classroom, adults should feel accepted as active learners, respected in their critical positioning, and supported.

A mentor of Knowles, Cyril Houle wrote many books on adult education. For Houle (1996, pp. 29–30), “education is fundamentally the same wherever and whenever it occurs. It deals with such basic concerns as the nature of the learner, the goals sought, the social and physical milieu in which instruction occurs, and the techniques of learning or teaching used. These and other components may be combined in infinite ways.” What is significant, Houle writes, is that andragogy has alerted educators to the fact that they “should involve learners in as many aspects of their education as possible and in the creation of a climate in which they can most fruitfully learn” (p. 30)

Therefore, adult learning relies on the premiss that adults are more mature and far more autonomous, they have a greater need to understand the significance behind learning something and need to be involved in the evaluation process. Within organizational settings, the principles of andragogy are closely matched by the job characteristics model (Hackman & Oldham, 1975) as mentioned in the introduction.

1.2.2 Job characteristics model

This model is made up of five elements that are believed to influence the employees’ motivation and satisfaction at work (Hackman & Oldham, 1975), namely:

- Skill variety: Jobs should be created such that different types of skills are needed to do them. As a result, work will be less monotonous and more enjoyable.
- Task Identity: Organizations should include tasks with definite beginning and ending points so that workers are aware of when the task is finished. Because they will be able to see the results of their work, employees may feel more satisfied with their jobs.
- Task significance: A task needs to be important, matter, and have meaning for the organization or society.

- **Autonomy:** Refers to the degree of control employees have over the process and window of time they use to perform a task.
- **Feedback:** Worker's ought to have access to enough feedback of their work. Since that will help them identify where they need to improve.

This model suggests that to increase motivation and job satisfaction and employee performance the job needs to be enriched by building greater scope for personal achievement, recognition and greater opportunity for individual achievement. Therefore, job enrichment can be viewed as an organizational intervention “designed to restructure jobs with the intent of making them more challenging, motivating and satisfying to the individual” (Loher et al., 1985, p. 280). This is particularly relevant today as employees tend to bring more abilities, higher expectations, and a greater desire for self-responsibility to the workplace (Loher et al., 1985).

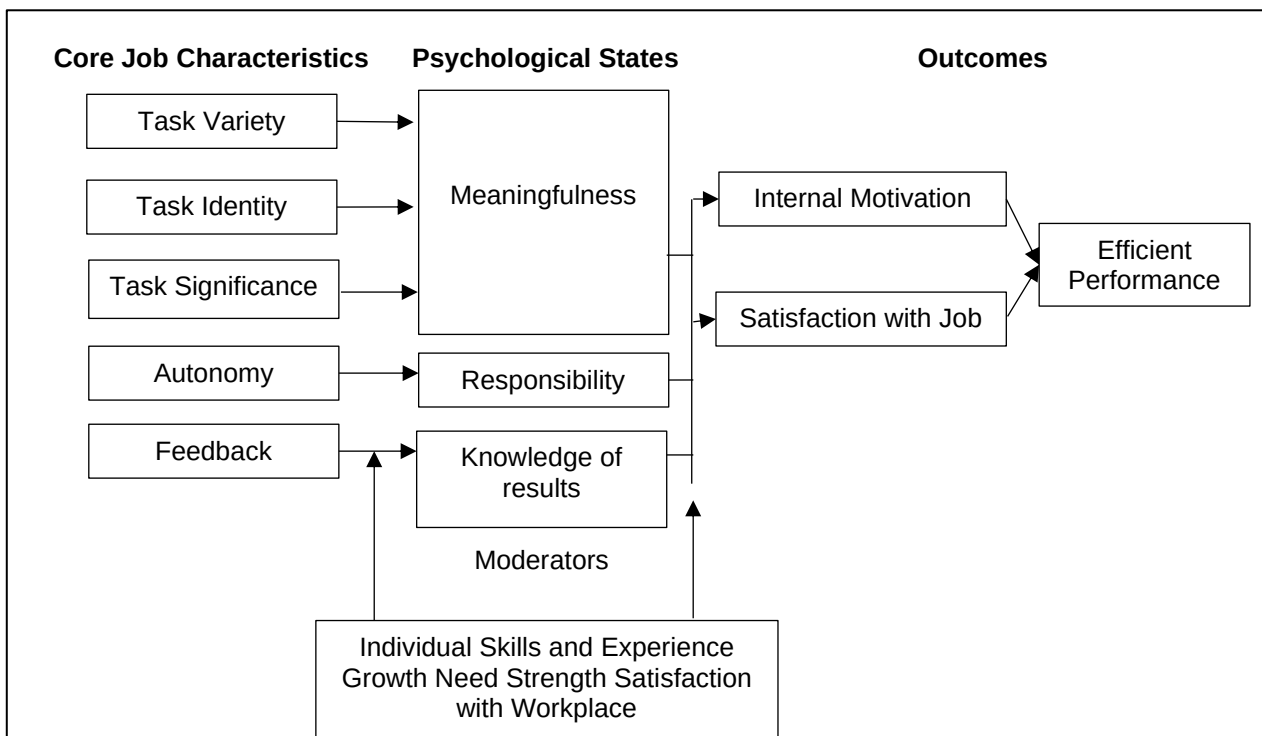


Figure 1.1 – Relationship between core job dimensions, critical psychological states and on-the-job outcomes (from Hackman & Oldham, 1975)

Hence, the learning experience refers to the contextual conditions within which learners perceive the teaching atmosphere, including the surroundings, instructor and course design which has been greatly studied under the umbrella of andragogy (Forrest & Peterson, 2006). By looking into the Job Characteristics Model, it is reasonable to establish a parallel with the learning experience within the larger frame of andragogy. Both work and learning are expected to be a meaningful experience where individuals should feel responsible for themselves and be aware of their achievements. For such, classes should abide with the five core characteristics and 1) develop several skills (avoiding

monotony or unchallenging tasks), providing task identity (by providing lesson per class), 3) fostering impactful learning, 4) giving room for autonomous activity, and 5) feedbacking to self-improve. Due to the underlying socio-technical nature of the job characteristics model (Steers & Mowday, 1977) we can name this design as “socio-technical class design”.

By providing this, classroom becomes a learning context that favours flow experience as the following might occur (at least partially): 1) matching the individual skills with the difficulty of the task; 2) provide clear learning goals; 3) provide timely and clear feedback; 4) the learner is deeply focused; 5) action and awareness become indistinguishable; 6) the learner loses self-consciousness; 7) the learner has a high sense of control; 8) the learner loses track of time; and 9) the learner takes the task as being intrinsically rewarding (Marty-Dugas & Smilek, 2019). This is closely related to boredom as someone experiencing a state of flow will not have the time to feel bored or worried (Csikszentmihalyi, 2000).

Based on this rationale we put forth the following hypotheses:

H2: Socio-Technical Class Design is negatively associated with boredom.

H2a: Socio-Technical Class Design is negatively associated with boredom attention.

H2b: Socio-Technical Class Design is negatively associated with boredom time.

As in the job characteristics model, psychological states mediate the relation between job design and job outcomes. In bridging class design with experienced boredom, student’s engagement may be a helpful concept.

1.3 Engagement

Across organizational literature the social nature of individuals is commonly highlighted as a condition one must attend to when thinking about management policies or designing HR practices (Dessler, 2000). Bonds are the common denominator of such social nature (Chriss, 2007) and, in literature, such bonds are at the origin of well-known constructs under the umbrella of “work attachment” (Bowlby, 1979) such as “organizational commitment” (Mathieu & Zajac, 1990), “employee loyalty” (Hirschman, 1970), “job involvement” (Lodahl & Kejnar, 1965), or “work engagement” (Schaufeli et al., 2002). From these, work engagement is not only the most recent to emerge as one that is both conceptually and empirically differentiated from the others (Hallberg & Schaufeli, 2006) but the only that partially encompasses the other three (Shuck et al., 2013).

Kahn (1990) introduced this concept as the “harnessing of organization members’ selves to their work roles; in engagement people employ and express themselves physically, cognitively and emotionally during role performances” (p. 694). Hence, an engaged employee or student has a sense of energetic and effective connection with their work, and they look upon their work as challenging, as opposed to stressful and demanding (Bakker et al., 2014).

Schaufeli et al. (2006) research into this topic characterizes work engagement as a positive work-related state of fulfilment that is expressed by vigour, dedication and absorption. Vigour is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work and persistence even in the face of difficulties. Dedication refers to being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge. Finally, absorption is characterized by being fully concentrated and happily engrossed in one's work, where time passes quickly, and one has difficulties with detaching themselves from work (Schaufeli et al., 2013). It is worth noting that engagement has one dimension that is closely related to psychological flow: absorption. This shows how likely they are connected.

Thus, work engagement is characterized by a high level of energy and strong identification with one's work. Furthermore, it is often established in research that burnout is the opposite pole of engagement (Schaufeli et al., 2006; Bakker et al., 2014), where one finds themselves in a slow process of progressive loss of energy and enthusiasm. Accordingly, vigour and dedication are considered direct opposites of exhaustion and cynicism, respectively, the two core symptoms of burnout (González-Romá et al., 2006). Similarly, Demerouti, Mostert & Bakker (2010) characterizes burnout by a low level of energy and poor identification with one's work.

Within a learning context (e.g. a school), "work engagement" may transfer to "learning engagement" which would express a sense of energetic and effective connection with the task at hand while seeing themselves able to deal with the demands of the learning tasks.

1.3.1 Consequences of engagement

As researchers believe burnout to be the opposite of engagement, studies have linked work engagement to better health. A possible reason for this positive link is that engaged workers are more inclined to engage in leisure-time, activities that foster relaxation and psychological detachment from work such as exercise and various hobbies (Ten Brummelhuis & Bakker, 2012).

Moreover, Sonnentag (2003) suggests that engaged workers are more likely to be receptive to discovering new ways of thinking which would result in a higher active learning behaviour and generally a more proactive behaviour. Bakker et al, (2012) further states that engaged employees are more willing to learn new things when they are also well organized, careful, and hardworking introducing a personality aspect to the concept. Further, employees who are dedicated and enthusiastic about their jobs are more likely to engage in proactive behaviours to keep those positive work situations and further improve them, therefore having a general positive effect on colleagues (Sonnentag, 2003).

Additionally, the number of studies showing a positive relationship between employee engagement and job performance is increasing (Demerouti, Cropanzano, Bakker & Leiter 2010).

One of the most convincing arguments that engaged workers perform better than non-engaged workers is that engaged employees often experience positive emotions, including happiness, joy, and enthusiasm. Positive emotions seem to be able to improve a person's ability to make decisions, implying that they build a variety of personal resources (Fredrickson, 2001). Personal resources can have a physical nature (e.g. health), a social nature (e.g. social networks), an intellectual nature (e.g. knowledge), or a psychological nature (e.g. self-efficacy). These personal resources can be used to cope with the job demands and to perform well.

As mentioned previously "work engagement" may transfer to "learning engagement" which would explain the degree to which a student is involved, motivated, and invested in their academic pursuits. Student engagement in class is linked to a psychological flow experience (Shernoff et al., 2003) which expresses the exact opposite of boredom-time experience. Flow relates to a state where individuals are fully immersed and absorbed in the task at hand, leading to increased productivity and performance (Norsworthy et al., 2021). High levels of work engagement can lead to greater job satisfaction, while high levels of student engagement can lead to greater academic achievement and success (Reyes et al., 2012).

Overall, the three concepts mentioned (boredom, class design, student engagement) are helpful to explain a process that starts on class design and flows through student engagement to explain experienced boredom.

Thus, we propose the following hypotheses:

H3: Classroom engagement mediates the negative association between STCD and boredom.

H3a: Classroom engagement mediates the negative association between STCD and boredom attention.

H3b: Classroom engagement mediates the negative association between STCD and boredom time.

By putting together, the full path that connects STCD to boredom via class engagement as well as boredom to expected grade, we hypothesize a full sequential mediation as follows:

H4: STCD has an indirect sequential positive effect on expected grade via classroom engagement and boredom.

H4a: STCD has an indirect sequential positive effect on expected grade via classroom engagement and boredom attention.

H4b: STCD has an indirect sequential positive effect on expected grade via classroom engagement and boredom time.

This process has been approached with a focus on class design, which is usually attributed to the teacher who can also be taken as the main agent in leading the class activities. However, from a followership perspective, students are not taken as passive in the influence processes that also lead to how classes are given. In line with followership theory, the learning experience should be coproduced.

1.4 Followership

While there has been much research into leadership, few have delved into followership especially when it comes to the learning experience. In order to investigate this topic, we have to first understand followership.

1.4.1 The construct

Followership has multiple meanings (Carsten et al., 2010). Researchers' findings imply that whereas some people socially define themselves in terms of passivity, respect, and obedience, others highlight the value of confronting and questioning their leaders in a positive way. Due to some ambiguities in the literature regarding the definition of the phenomenon, Table 1.1 presents the different definitions to provide clarification.

All these definitions depart from diverse viewpoints and one does not necessarily preclude the other. Because this study is focused on how students conceive their role in class, the perspective offered by Carsten et al. (2018) is more suitable. Therefore, we opted to highlight this definition with an emphasis on role and co-production beliefs.

Table 1.1 – Definitions of Follower and Followership

Author	Definition
--------	------------

Kelley (1992)	<i>"A follower is a person who makes a decision whether or not to collaborate with a leader in order to achieve an organizational purpose (p.93)."</i>
Collinson (2006)	<i>"While it is often assumed that leaders and followers retain a shared sense of identity, post-structuralist analyses reveal that followers' identities may be more differentiated and contested within the workplace. Followers might enact resistant and dramaturgical selves producing outcomes that leaders may not anticipate, be aware of, or indeed even understand (p.186)"</i>
Kellerman (2008)	<i>"The response of those in subordinate positions (followers) to those in superior ones (leaders). Followership implies a relationship (rank) between subordinates and superiors, and a response (behaviour) of the former to the latter (p.93)"</i>
Riggio et al. (2008)	<i>"If all followers actively used their courageous conscience, we would likely have fewer toxic leaders who steer the organisation down the path of organisational corruption or societal damage. (p.15)"</i>
Carsten et al. (2010)	<i>"Individuals hold followership schema along a continuum from more passive (e.g., blindly obedient) to more proactive (e.g., change agent) views. The strength with which these schema influence social constructions in particular workplaces, however, appears to be related to contextual variables of leadership styles (authoritarian or supportive/empowering) and climate (bureaucratic/hierarchical or empowering) (p.558)"</i>
Crossman & Crossman (2011)	<i>"Followership is a relational role in which followers have the ability to influence leaders and contribute to the improvement and attainment of group and organizational objectives. It is primarily a hierarchically upwards influence (p.484)"</i>
Uhl-Bien et al. (2014)	<i>"An investigation of the nature and impact of followers and following in the leadership process (p.89)"</i>
Carsten et al. (2018)	<i>"Individuals with a strong co-production orientation believe that the follower role is responsible for gathering and relaying important information to leaders, identifying and solving problems, and constructively challenging the leader when appropriate (p.735)"</i>

The difference between leadership behaviours and followership behaviours is that the former focuses on the independent activities of those in "subordinate" positions, while the latter addresses people behaving in relation to a leader (Sy et al., 2010). In other words, followership behaviours are

about how people connect with others who have greater status, with respect to leaders, rather than with their own co-workers. The way that followers choose to communicate with leaders, how they choose to take responsibility in relation to leaders, how they choose to solve problems in relation to leaders, and other behaviours are examples of followership. Research also shows that context may have an impact on both followership constructs and follower behaviour (Carsten et al., 2010).

1.4.2 Followership frameworks

Uhl-Bien et al. (2014) take into account the important literature available on the topic of followership and from this they introduce a theory of followership into leadership research. The constructionist approach and the role-based approach are two different perspectives on followership that emphasize different aspects of the relationship between leaders and followers, from which to conduct future research into followership.

The first, a constructionist approach, is also known as “the leadership process”. It represents a system in which followers and leaders engage to co-construct followership and leadership as well as their consequences. In this way, it emphasizes leadership as a dynamic process that takes place in the relationships of those who are leading and those who are following (Collinson, 2006). The constructionist approach to followership views followership as a dynamic and co-constructed process that emerges through the interaction between people that can shift from a leader-like to a follower-like position and vice versa. According to this approach, followers are not passive recipients of leaders but active participants who co-create the meaning and purpose of the organization. This approach emphasizes the importance of social identity and the ways in which followers construct their identity in relation to the leader and the organization (Uhl-Bien et al., 2014).

Another approach is role-based, also called “reversing the lens”. This framework demonstrates how followers' traits and behaviours may influence both more distant consequences, such as leadership procedures and organizational effectiveness, as well as immediate outcomes of follower and leader behaviours (Crossman & Crossman, 2011).

The role-based approach to followership emphasizes the roles and responsibilities of followers within the organization. According to this approach, followers have specific tasks and responsibilities that are defined by their position within the organization. This approach focuses on the skills and competencies that are required for effective followership and emphasizes the importance of followers' ability to execute their role effectively.

1.4.3 Co-production beliefs

From a role-based perspective, co-production beliefs are defined as “the extent to which individuals believe the follower role involves partnering with leaders to advance the mission and achieve optimal levels of productivity” (Carsten & Uhl-Bien, 2015, p. 211). Independently of the perspective taken,

co-production beliefs play a central role in followership theory and proposes that leadership is jointly generated by leaders and followers when they form strong leadership relationships that enables them to co-produce leadership outcomes. The follower's duty is to collaborate with the leader (or to challenge the leader) to advance the objectives, vision, and behaviours essential for both the work unit and organizational success. A co-production perspective transforms followers from passive recipients of leaders' influence to active contributors in the leadership process. In this way, it offers a more balanced view to leadership (Carsten et al., 2018).

All in all, the learning experience is the interaction of organizational actors with ascribed roles (i.e. teachers and students) as well as the interaction with a program, course, or any other experience in which learning occurs. From this central concept in followership theory (co-production beliefs), we propose our last hypotheses:

H5: Co-production beliefs interact with Socio-Technical Class Design negative association with boredom in such a way that when co-production beliefs are stronger the effect is larger.

H5a: Co-production beliefs interact with Socio-Technical Class Design negative association with boredom attention in such a way that when co-production beliefs are stronger the effect is larger.

H5b: Co-production beliefs interact with Socio-Technical Class Design negative association with boredom time in such a way that when co-production beliefs are stronger the effect is larger.

H6: Co-production beliefs interact with the indirect effect STCD has on boredom via classroom engagement in such a way that when co-production beliefs are stronger, the indirect effect is larger.

H6a: Co-production beliefs interact with the indirect effect STCD has on boredom attention via classroom engagement in such a way that when co-production beliefs are stronger, the indirect effect is larger.

H6b: Co-production beliefs interact with the indirect effect STCD has on boredom time via classroom engagement in such a way that when co-production beliefs are stronger, the indirect effect is larger.

Due to the existence of a direct path theoretically required to guarantee any possible mediation effect is tested against its absence, a necessary hypothesis has to be formulated where:

H7: Co-production beliefs interact with the direct positive effect STCD has on expected grade in such a way that when co-production beliefs are stronger, the effect is larger.

As regards the role co-production beliefs may play in the sequential mediations hypothesized:

H8: The indirect sequential positive effect STCD has on expected grade via classroom engagement and boredom interacts with co-production beliefs in such a way that when co-production beliefs are stronger, the indirect effect is larger.

H8a: The indirect sequential positive effect STCD has on expected grade via classroom engagement and boredom attention interacts with co-production beliefs in such a way that when co-production beliefs are stronger, the indirect effect is larger.

H8b: The indirect sequential positive effect STCD has on expected grade via classroom engagement and boredom time interacts with co-production beliefs in such a way that when co-production beliefs are stronger, the indirect effect is larger.

1.5 Conceptual model

Based upon the previously discussed literature review, there exists potential relationships between class design and experienced boredom whilst taking an alternative followership approach. Firstly, we have applied a role-based approach also referred to as reversing the lens to this study (Uhl-bien et al., 2014). This approach centres on investigating the ways followers implicate their roles and the outcomes associated with their behaviour, instead of studying the leader as the only person who causes outcomes.

The theoretical model is depicted in Figure 1.2 and summarises the hypotheses made throughout the literature review. It illustrates how the psychological state of boredom is affected by not just the leader with their class design but a by-product of everyone.

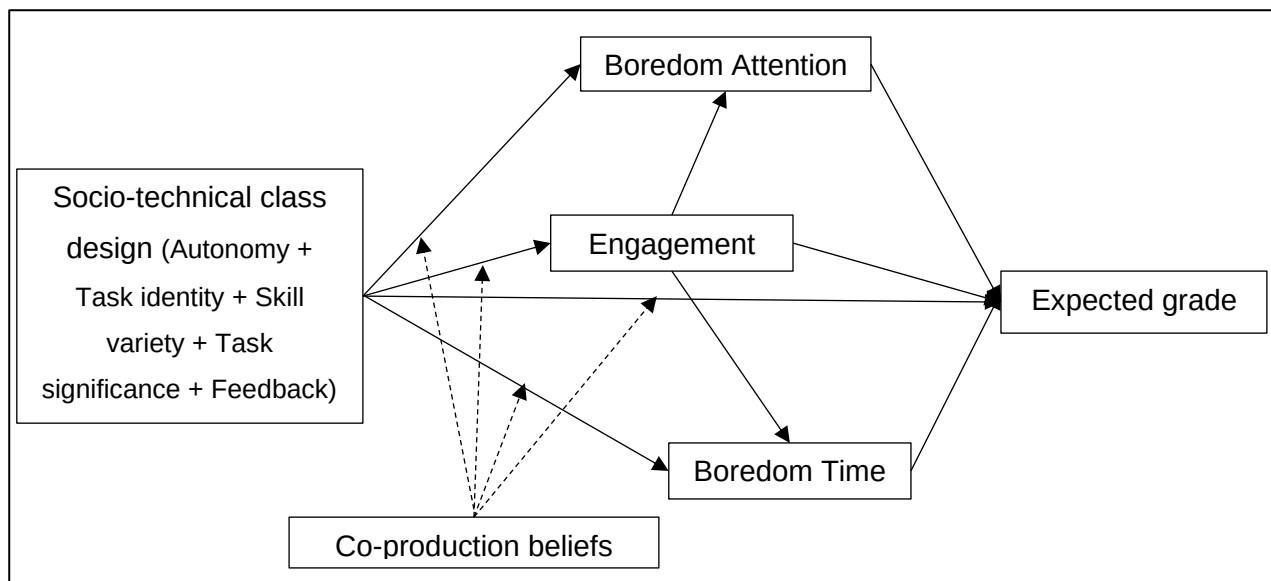


Figure 1.2 – The proposed model of relationships

II. METHOD

2.1 Data analysis strategy

Because literature has developed theory and measures of the constructs that have been validated internationally, we have taken a hypothetic-deductive approach which means we adopted quantitative methods to investigate the phenomenon of followership in learning outcomes. To collect data the method used was surveys in order to better understand the behaviours of students.

The study designed is cross-sectional, meaning that data for all measures was provided simultaneously. Primary data was collected from students. Because this design has been criticised for inflating correlation among variables (common method bias, Podsakoff et al., 2003) we conduct horizontal and vertical collinearity tests as well as a single common factor test. The questionnaire was formulated to gather ample information about follower (e.g. student) behaviour and engagement of the students during an ongoing course.

The conceptual model depicts moderated mediations, i.e. indirect effects between class design and boredom through student engagement, conditioned by co-production beliefs.

As a pre-condition to work with latent constructs, it is necessary to test the psychometric quality of the measures, i.e. their validity (that the items are measuring the expected latent constructs) and reliability (that the scales are measuring such construct in a consistent way). This is usually done with factor analysis, namely, confirmatory factor analysis guided by theory which can help judging on the construct validity complemented with other measures of validity, namely convergent validity (judged with AVE .500 or more, Fornell & Larcker, 1981) and discriminant validity (HTMT, Henseler et al., 2015). Reliability is judged based on Cronbach Alpha or Composite Reliability (Joreskog, 1971) that should be .70 or more. We test the overall measurement model with confirmatory factor analyses using the recommended thresholds to judge on model fit (Hair et al., 2019).

Due to the relatively modest sample size, we additionally opted to test the structural model i.e. the mediation and interaction effects simultaneously by using Partial Least Squares Structural Equations Modelling (PLS-SEM). This data analysis technique has been increasingly adopted as it enables robust analysis with a relatively small sample size (Hair et al., 2021). Although a bit redundant, SEM firstly tests the measurement model, to ascertain its psychometric validity and reliability as well as to rule out multicollinearity. PLS-SEM deploys different model validity indicators, which also have the advantage of crossing with previous validity checks.

Once ensured the model is sound, the structural model is then tested with the support of bootstrapping with 5000 extractions for a confidence interval of 95% to test direct, indirect, and interaction effects per se as well as the moderated mediations indices (Preacher et al., 2007).

2.2 Sample

A total of 355 higher educational students participated in this study, from all different fields of study, not limiting the sample to any specific university or country. All respondents had to be in the process of attending a course in person and awaiting their grade, assuring that they experienced the full extent of the learning process and that they were not biased in any way by the grade. The responses were checked for incomplete entries and answers to the control variables that may exclude them from further analysis, resulting in 202 answers being accepted for the study. The valid response rate is 57% which is lower than average reports (68%, Holtom et al., 2022).

A larger percentage of the participants were females (55.7%) and the rest being males (44.3%). The age of the students varied from 17 to 38 with the average being 23,4 (SD=3.5). In terms of education the majority of respondents were enrolled at Master's level (54%), followed by Bachelor's students (41%).

2.3 Procedure

The data collection process was initiated by approaching students directly in university environment and asking them to scan a QR code which directed them to the online survey in Qualtrics. Students were asked to complete the survey in the most honest way possible with the guarantee that the information provided is anonymous and confidential. Further data collection was put in place with an anonymous link shared through social networking platforms such as WhatsApp and Instagram, asking higher education students to fill out the survey and also to share the link with other students to respond. The survey was made available in English, Portuguese and French to attract a wider audience and not be impeded by language barriers.

The respondents were asked to answer the questions and statements about their perceptions regarding a specific course of their choosing, their attitude during this course and their perception of the students' role within a university, as well as sociodemographic information and control variables.

2.4 Measures

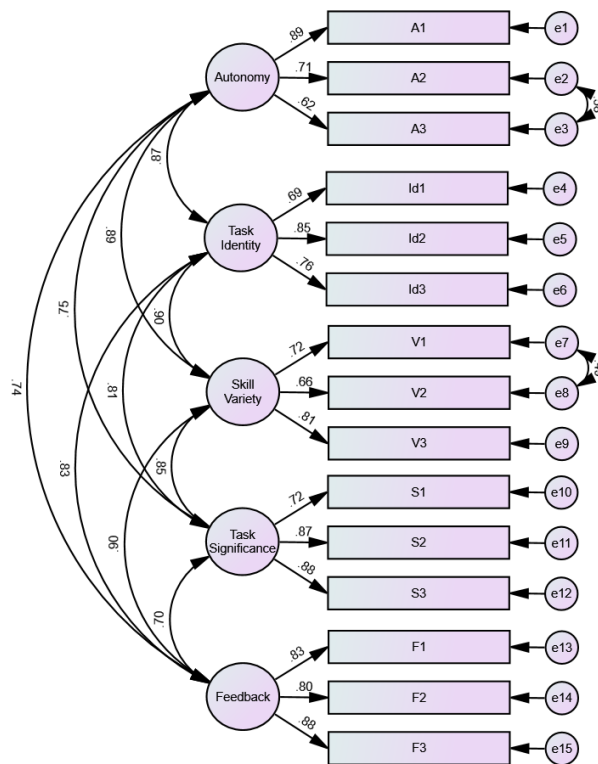
The questionnaire was based upon previous literature review. The first question was asking the respondent to think about and name a specific course they attended in person with one single professor at their university. The questionnaire ensued with five distinct matrix tables to measure each component of the conceptual model. The items from each scale were adjusted whenever necessary to fit into the educational context and the student-in-class experience. The questionnaire is presented in Annex A.

The respondent would fill out each item of the questionnaire using an ordinal scale from 1 to 6, measuring the student's level of agreement with the statement displayed. The lowest value

represents “Strongly disagree”, “Mostly disagree”, “Slightly disagree”, “Slightly agree”, “Mostly agree” and the 6th “Strongly agree” respectively in this order.

Sociotechnical Class Design was measured following the Job-Characteristics model based on the revised 15-item Job Diagnostic Survey (Idaszak & Drasgow, 1987). The original items organized in five dimensions (3 items each) were adapted for classroom context as follows: Autonomy (“A1 These classes allow me to learn the way I’d like to”, “A2 In these classes I am given a chance to use my personal initiative or judgment”, “A3 In these classes I am given considerable opportunity for independence and freedom of thinking”), Task identity (“Id1 These classes usually tell a story/lesson that has a beginning and an end”, “Id2 The in-class activities allow me to gain a sense of achievement for having completed them”, “Id3 After each class I am capable of summarizing the main ideas and topics we explored”), Skill variety (“V1 The in-class activities require me to develop or use a variety of skills”, “V2 The in-class activities require me to use a number of complex or high-level skills”, “V3 Classes include many different types of in-class activities”), Feedback (“F1 In-class activities offer feedback on how well I am doing”, “F2 Whenever I finish an in-class activity I can tell whether I performed well”, “F3 These classes allow me to gain positive and constructive feedback”), and Task significance (“S1 I learn things in these classes that will significantly affect the lives and well-being of other people”, “S2 How much I learn from these classes will impact my professional performance”, “S3 Considering the big picture, these classes are very significant and important”).

The CFA of the original scale showed suboptimal fit indices, which Lagrange Multipliers identified as being due to two cases of covariances between errors of the same latent construct. After adding such covariances (Figure 2.1) the data shows a good fit to the model ($\chi^2(78)=142.037$, $\chi^2/df=1.821$, CFI=0.968, TLI=0.957, RMSEA=0.064 90% CI[0.047; 0.080] PClose=0.086; SRMR=0.040).

Figure 2.1 – CFA Sociotechnical Class Design (1st order factors)

All factors showed acceptable reliability ($CR_{\text{Autonomy}}=0.854$, $CR_{\text{TaskIdent}}=0.812$, $CR_{\text{SkillVariety}}=0.816$, $CR_{\text{Significance}}=0.850$, $CR_{\text{Feedback}}=0.863$.) Convergent validity was tested with Fornell & Larcker (1981) procedure which showed AVE for all latent constructs were above the 0.500 threshold ($AVE_{\text{Autonomy}}=0.553$, $AVE_{\text{TaskIdent}}=0.591$, $AVE_{\text{SkillVariety}}=0.528$, $AVE_{\text{Significance}}=0.656$, $AVE_{\text{Feedback}}=0.678$). Although the latent constructs have strong intercorrelations, HTMT analysis (using a liberal value of .900) showed no issues related to discriminant validity (Table 2.1).

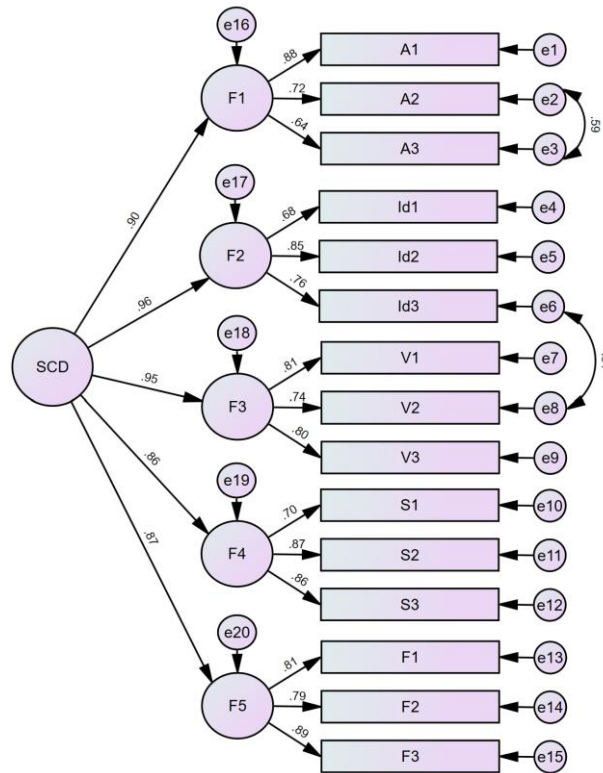
Table 2.1 – HTMT analysis of Sociotechnical Class Design

	F1	F2	F3	F4
F1 Autonomy	-			
F2 Task Identity	0.813	-		
F3 Skill Variety	0.765	0.846	-	
F4 Task significance	0.710	0.836	0.859	-
F5 Feedback	0.684	0.841	0.838	0.711

As the covariances between latent constructs are considerably high, we ran a CFA for a single factor structure and for a 2nd order factor structure. Findings show the single factor structure has poor fit indices ($X^2(88)=315.553$, $X^2/df=3.586$, $CFI=0.888$, $TLI=0.866$, $RMSEA=0.113$ 90%CI[0.100; 0.127] PClose=0.000; SRMR=0.055) but the 2nd order factor solution has good fit ($X^2(83)=155.923$,

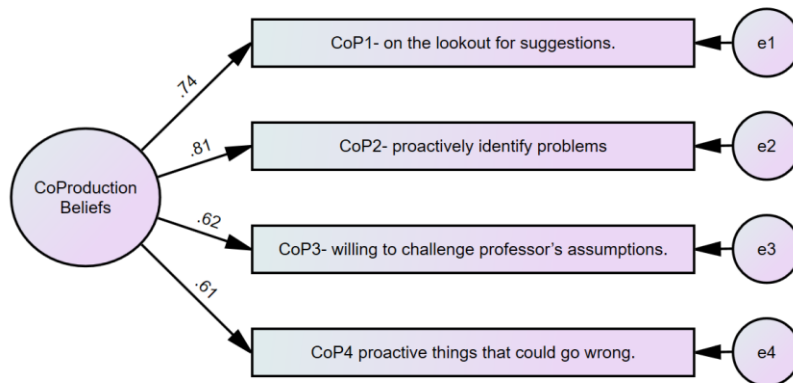
$\chi^2/df=1.879$, CFI=0.965, TLI=0.956, RMSEA=0.065 90%CI[0.049; 0.081] PClose=0.060; SRMR=0.039). The model has also high convergent validity (AVE=.823) and reliability (CR=.959).

Figure 2.2 – CFA Sociotechnical Class Design (2nd order factor)

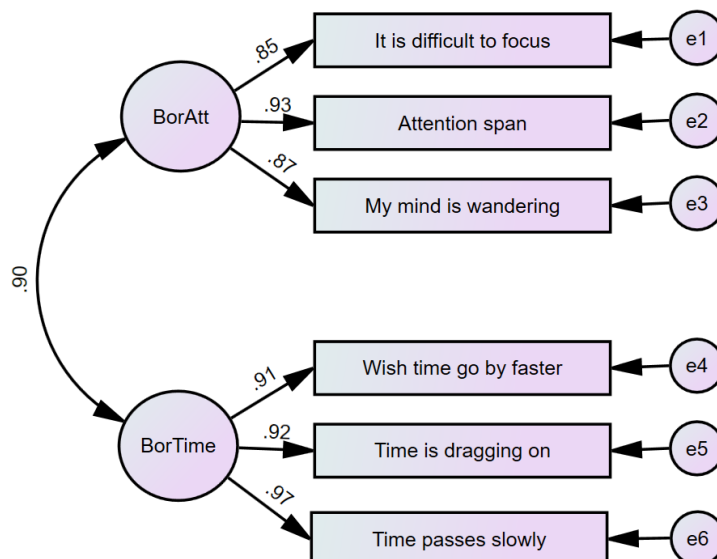


Considering the magnitude of the loadings connecting the general 2nd order factor for STCD and its respective 1st order factors, it seems reasonable to treat this variable at the 2nd order level.

Co-production beliefs were measured with Carsten and Uhl-Bien's (2012) 5-item scale adapted to the student-professor in-class interaction ("CoP1- Students should be on the lookout for suggestions they can offer in class to professors", "CoP2- Students should proactively identify problems that could affect the university", "CoP3- As part of their role, students must be willing to challenge professor's assumptions", "CoP4- Students should be proactive in thinking about things that could go wrong", "CoP5- Students should communicate their opinions, even when they know professors may disagree"). The CFA showed suboptimal fit indices and Lagrange Multipliers suggested one of the items was harming the overall model fit. By removing the last item the model (Figure 2.3) showed acceptable fit ($\chi^2(2)=2.430$, $\chi^2/df=1.215$, CFI=0.998, TLI=0.994, RMSEA=0.033 90% CI[0.000; 0.148] PClose=0.460; SRMR=0.0194). Although convergent validity is suboptimal (AVE=0.487), the factor shows acceptable reliability (CR=0.790) which, according to Fornell & Larcker (1981, p.46) encourages the psychometric soundness of the measure.

Figure 2.3 – CFA for Co-production Beliefs

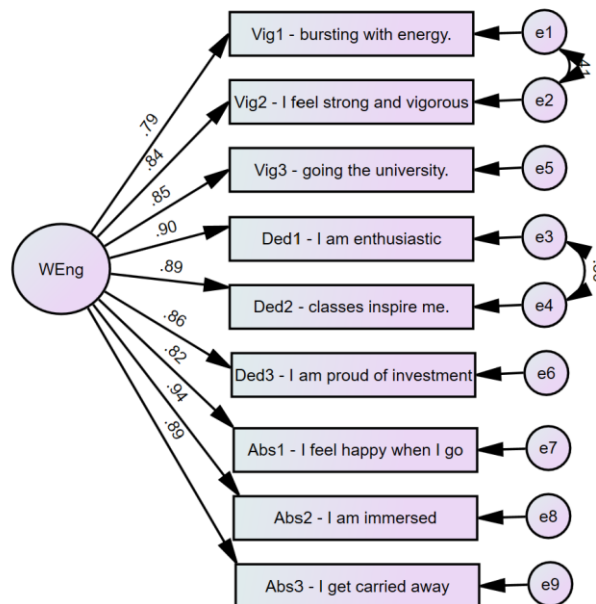
Boredom was measured with three items from two subscales within the Multi-Dimensional Boredom Scale from Fahlman et al. (2013), namely Inattention (“It is difficult to focus my attention during these classes”, “In these classes my attention span is shorter than usual”, “My mind is wandering in these classes”) and time perception (“I wish time would go by faster during these classes”, “Time is dragging on in these classes”, “It seems like time passes slowly in these classes”). The CFA of the bifactorial model (Figure 2.4) showed acceptable fit indices ($X^2(8)=11.233$, $X^2/df=1.404$, CFI=0.998, TLI=0.995, RMSEA=0.045 90%CI[0.000; 0.101] PClose=0.497; SRMR=0.0131). The solution has both convergent validity and reliability ($AVE_{BorAtt}=0.785$; $CR_{BorAtt}=.916$; $AVE_{BorTime}=0.870$; $CR_{BorTime}=.953$) and, although the covariance is unusually high, the HTMT statistics does not reach the threshold to indicate lack of discriminant validity (HTMT=0.897).

Figure 2.4 – CFA Boredom experience

Class Engagement was measured using the UWES-9 scale from Schaufeli et al. (2006) adapted to the class experience. Vigour (3 items, “Vig1 - When I’m in these classes, I feel bursting with energy”, “Vig2 - I feel strong and vigorous when I’m having these classes”, “Vig3 - When I get

up in the morning, in days that I have these classes, I feel like going the university”), dedication (“Ded1 - I am enthusiastic about these classes”, “Ded2 - These classes inspire me”, “Ded3 - I am proud of my investment in these classes”), and absorption (“Abs1 - I feel happy when I go the extra-mile in these classes”, “Abs2 - I am immersed in these classes”, “Abs3 - I get carried away when I am in these classes”). CFA of the original solution showed unacceptable fit indices and the Lagrange multipliers suggested two covariances should be added between error terms. The solution showed suboptimal fit ($\chi^2(24)=71.372$, $\chi^2/df=2.974$, CFI=0.976, TLI=0.965, RMSEA=0.099 90%CI[0.073; 0.126] PClose=0.002; SRMR=0.0266) but the correlations between latent variables were very strong and this compromised discriminant validity (minimum HTMT>0.964). A principal components analysis gave clear indication of a single valid (KMO=0.956, Bartlett's $\chi^2(36)=1999.662$, $p<.001$; $0.719<MSA<0.872$) component accounting for 78.5% total variance and this single-factor model was tested in a CFA. The fit indices for a single factor solution (Figure 2.5) are acceptable ($\chi^2(25)=44.026$, $\chi^2/df=1.761$, CFI=0.990, TLI=0.986, RMSEA=0.062 90%CI[0.029; 0.091] PClose=0.243; SRMR=0.0191), and the solution has both high convergent validity (AVE=0.753) as well as good reliability (CR=0.965).

Figure 2.5 – CFA Class engagement



Finally, ensued the sociodemographic data collection and additional questions for control purposes. Namely age (open numeric), gender (1=Male, 2=Female, 3=Other), programmes' level (1=Bachelors, 2=Masters, 3=PhD), average class size (1=1-10 students, 2=11-20, 3=21-30, 4=31-40, 5=41-40, 6=51 or more), class duration (1=1.5h, 2=2h, 3=3h, 4h=4), and expected grade from the course (0-20).

III. RESULTS

The results chapter starts by presenting the measurement model as well as other required indicators of the model validity and reliability that, albeit not being strictly results, as necessary to gauge the interpretability of subsequent findings. Therefore, we will start by showing model fit indices for as well as multicollinearity measures which are important to assess the true explanatory power of the model. Then, we will show descriptive and bivariate statistics that may not be used to test hypotheses but surely are useful to understand the magnitude of variables as well as patterns of association between them. Lastly, we show findings pertaining to the structural model proposed and therefore, the hypotheses, as produced by PLS-SEM.

3.1 Measurement model

The measurement model that integrates all latent variables in the conceptual model showed good fit ($\chi^2(508)=684.471$, $\chi^2/df=1.347$, CFI=0.971, TLI=0.968, RMSEA=0.042 90%CI[0.033; 0.049] PClose=0.963; SRMR=0.0427). By fusing STCD with Class Engagement, the fit worsened ($\chi^2(512)=783.643$, $\chi^2/df=1.531$, CFI=0.955, TLI=0.951, RMSEA=0.051 90%CI[0.044; 0.058] PClose=0.369; SRMR=0.0500) to the point of the baseline model being a preferred model ($\Delta\chi^2(4)=99.172$, $p<0.001$; $\Delta CFI=-0.016$). Another fused model (class engagement with boredom dimensions) showed also worse fit compared to the baseline ($\chi^2(513)=834.372$, $\chi^2/df=1.626$, CFI=0.947, TLI=0.942, RMSEA=0.056 90%CI[0.049; 0.063] PClose=0.083; SRMR=0.0586) as indicated by the χ^2 difference ($\Delta\chi^2(5)=149.901$, $p<.0001$) and CFI difference ($\Delta CFI=-0.024$). Because the data analysis technique suitable to test the conceptual model is PLS-SEM, we additionally report model fit with indicators used in such analysis. SRMR falls below 0.08 (0.052) and NFI is only marginally below 0.90 (0.87).

Following Hair et al. (2021) recommendations, we started by assessing item loadings. Table 3.1 shows the outer loadings, and respective AVE, and reliability (both CR and Cronbach' alpha).

Table 3.1 – Validity and reliability for constructs

Item	Dimension	Outer loadings	LB 95%	UB 95%	AVE	CR	Cronbach's alpha
1st Order STCD							
Q1_1	Autonomy	0.855	0.821	0.883	0.761	0.855	0.844
Q1_2	Autonomy	0.902	0.867	0.923			
Q1_3	Autonomy	0.860	0.811	0.893			
Q1_4	Task Identity	0.808	0.742	0.856	0.721	0.815	0.806
Q1_5	Task Identity	0.896	0.873	0.913			
Q1_6	Task Identity	0.842	0.794	0.879			
Q1_10	Skill Variety	0.836	0.799	0.865	0.747	0.833	0.831
Q1_8	Skill Variety	0.884	0.855	0.907			
Q1_9	Skill Variety	0.872	0.822	0.906			
Q1_11	Task Significance	0.826	0.772	0.863	0.775	0.856	0.854
Q1_12	Task Significance	0.902	0.876	0.922			
Q1_13	Task Significance	0.910	0.888	0.927			
Q1_14	Feedback	0.895	0.859	0.920	0.803	0.881	0.877
Q1_15	Feedback	0.884	0.847	0.911			
Q1_16	Feedback	0.908	0.885	0.927			
2nd order STCD					0.554	0.944	0.942
Q1_1	STCD	0.808	0.757	0.847			
Q1_2	STCD	0.691	0.589	0.757			
Q1_3	STCD	0.619	0.507	0.702			
Q1_4	STCD	0.687	0.608	0.752			
Q1_5	STCD	0.815	0.776	0.846			
Q1_6	STCD	0.736	0.670	0.791			
Q1_8	STCD	0.753	0.688	0.802			
Q1_9	STCD	0.695	0.604	0.766			
Q1_10	STCD	0.813	0.772	0.844			
Q1_11	STCD	0.718	0.652	0.769			
Q1_12	STCD	0.764	0.693	0.812			
Q1_13	STCD	0.768	0.699	0.814			
Q1_14	STCD	0.751	0.678	0.802			
Q1_15	STCD	0.710	0.632	0.771			
Q1_16	STCD	0.809	0.765	0.846			
Class Engagement*					0.771	0.951	0.950
Q4_1	Engagement	0.848	0.802	0.882			
Q4_2	Engagement	0.889	0.855	0.914			
Q4_4	Engagement	0.906	0.881	0.924			
Q4_5	Engagement	0.878	0.844	0.902			
Q4_6	Engagement	0.859	0.809	0.892			
Q4_7	Engagement	0.876	0.833	0.906			
Q4_9	Engagement	0.888	0.858	0.912			
Boredom*					0.856	0.920	0.916
Q3_2	BoredomAttention	0.920	0.887	0.941			
Q3_3	BoredomAttention	0.942	0.925	0.955			
Q3_4	BoredomAttention	0.913	0.886	0.935			
Q3_6	BoredomTime	0.957	0.943	0.967	0.913	0.905	0.904
Q3_7	BoredomTime	0.954	0.937	0.966			
CoProduction Beliefs					0.606	0.802	0.787
Q2_1	CoProduct	0.734	0.082	0.840			
Q2_2	CoProduct	0.833	0.703	0.931			
Q2_3	CoProduct	0.759	0.585	0.908			
Q2_4	CoProduct	0.783	0.649	0.929			

Note: Expected grade is a single item measure and therefore has no relevant validity or reliability indicators. Due to multicollinearity issues some items were removed (as explained in the next section)

3.2 Multicollinearity

We then assessed collinearity. We found one case of a VIF over 5 (item 3 from Boredom time) which was removed. All the other items have VIF value below this threshold (Table 3.2), thus suggesting no multicollinearity issues affect the model. Dropping this item had neither a nefarious effect on the constructs' convergent validity (AVE=0.913) and reliability CR=0.905) but it does strengthen the inter-factor correlation to suggest possible factor fusion could occur with Boredom Attention (HTMT=0.903) as shown in Table 3.3. Although this is technically suggested, considering the theoretical background and the interest it has for the overall model, as well as the absence of any other case that offends HTMT requirements, we opted to preserve the bifactorial structure. We will, as a caveat, mind possible variance inflation upon the expected grade in future analysis. A similar procedure was conducted with class engagement leading to the removal of two offending items.

Table 3.2 – Collinearity statistics

Indicator	VIF	Indicator	VIF	Indicator	VIF
Q1_1	2.751	Q1_2	2.76	Q2_3	1.443
Q1_1	1.674	Q1_2	3.077	Q2_4	1.43
Q1_10	2.722	Q1_3	2.414	Q3_2	3.071
Q1_10	1.583	Q1_3	2.565	Q3_3	3.79
Q1_11	1.678	Q1_4	1.608	Q3_4	3.062
Q1_11	2.084	Q1_4	1.938	Q3_6	3.141
Q1_12	3.033	Q1_5	2.117	Q3_7	3.141
Q1_12	2.714	Q1_5	2.873	Q4_1	3.189
Q1_13	2.822	Q1_6	1.786	Q4_2	4.183
Q1_13	3.187	Q1_6	2.228	Q4_4	4.135
Q1_14	2.716	Q1_8	2.853	Q4_5	3.359
Q1_14	2.391	Q1_8	2.347	Q4_6	2.94
Q1_15	2.470	Q1_9	2.611	Q4_7	3.313
Q1_15	2.309	Q1_9	2.312	Q4_9	3.581
Q1_16	2.494	Q2_1	1.702		
Q1_16	3.371	Q2_2	1.86		

Note: STCD items are shown doubled as PLS-SEM design requires them to be included in both the 1st and 2nd order constructs.

Table 3.3 – Discriminant validity (HTMT)

	Boredom Attention	Boredom Time	CoProduct	Engagement	Expected Grade	STCD
Boredom_Attention	-					
Boredom_Time	0.903	-				
CoProduct	0.058	0.083	-			
Engagement	0.682	0.726	0.156	-		
ExpectedGrade	0.427	0.468	0.009	0.416	-	
STCD	0.667	0.695	0.236	0.892	0.403	-
CoProduct x STCD	0.083	0.100	0.135	0.244	0.070	0.165

3.3 Descriptive and bivariate statistics

Table 3.4 – The means, standard deviation and bivariate Pearson correlations

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	23.37	3.56	1														
2. Gender	-	-	-0.080	1													
3. Educational Level	1.65	0.60	0.462**	-0.030	1												
4. Class size	3.08	1.22	-0.059	-0.032	-0.100	1											
5. Class duration	2.13	0.93	0.136	0.000	0.238**	-0.119	1										
6. STCD_Aut	3.90	1.24	0.107	0.123	-0.006	-0.187**	0.005	1									
7. STCD_Tsk	3.95	1.22	0.098	0.037	0.064	-0.222**	0.065	0.666**	1								
8. STCD_SkV	3.79	1.17	0.008	0.080	-0.031	-0.212**	-0.032	0.640**	0.679**	1							
9. STCD_Sig	3.90	1.28	0.112	0.059	0.024	-0.203**	0.146*	0.596**	0.694**	0.719**	1						
10. STCD_Fbk	3.85	1.27	0.008	-0.008	-0.102	-0.295**	0.033	0.580**	0.699**	0.700**	0.613**	1					
11. STCD_gen	3.88	1.05	0.078	0.068	-0.012	-0.263**	0.053	0.817**	0.877**	0.874**	0.852**	0.844**	1				
12. ClassEngagement	3.40	1.31	0.063	0.002	0.097	-0.189**	0.064	0.685**	0.785**	0.733**	0.744**	0.669**	0.848**	1			
13. Bor_Attention	3.58	1.38	-0.177*	-0.062	-0.094	0.216**	-0.135	-0.545**	-0.642**	-0.447**	-0.501**	-0.512**	-0.622**	-0.646**	1		
14. Bor_Time	3.58	1.49	-0.128	-0.036	-0.086	0.201**	-0.177*	-0.513**	-0.614**	-0.505**	-0.592**	-0.513**	-0.643**	-0.685**	0.823**	1	
15. Expected grade	15.14	2.50	0.145*	0.041	0.137	-0.074	0.042	0.367**	0.352**	0.331**	0.353**	0.264**	0.391**	0.417**	-0.409**	-0.445**	1
16. CoProduction	4.59	0.78	-0.022	0.015	-0.111	-0.003	-0.061	0.217**	0.104	0.178*	0.173*	0.182**	0.201**	0.134	0.032	-0.034	-0.006

* $p < 0.05$, ** $p < 0.01$

3.4 Structural model

The model has good explanatory power on all the endogenous variables as indicated by Stone-Geisser's Q^2 and adjusted R^2 (Table 3.5). 19.8% of variance in expected grade is accounted for in the model, together with 46% and 48.4% variance for boredom attention, and boredom time respectively. 73.6% of variance in class engagement is explained by STCD.

Table 3.5 – Model's predictive power

	SSO	SSE	$Q^2 (=1-SSE/SSO)$	R^2
BoredomAttention	606	366.795	0.395	46.0%
BoredomTime	404	226.779	0.439	48.4%
Engagement	1414	612.347	0.567	73.6%
ExpectedGrade	202	175.679	0.130	19.8%

SSE=Sum of squared prediction errors,
SSO=Sum of squared observations

The model has some indication of variance inflation due to common method / source, but a single common factor has no acceptable model fit (SRMR=.108, NFI=0.632). Bootstrapped values for lower bound and upper bound 95% confidence intervals were generated to test the hypotheses. Table 3.6 shows the association coefficients for all the direct, indirect, and interaction effects implied in the hypotheses. For parsimony's sake the full values for all paths tested (including control variables) is shown only in Annex B.

Findings show a non-significant association between boredom attention and expected grade thus not supporting H1a. However, the coefficient for boredom time is significant ($B=-0.257$, 95% CI [-0.475; -0.034]) which supports H1b, suggesting the stronger the feeling of time dragging in classes, the lower the estimated expected grade. Findings pertaining to the direct effect between STCD and both boredom dimensions show significant coefficient with boredom attention ($B=-0.264$, 95% CI [-0.419; -0.095]) as well as with boredom time ($B=-0.243$, 95% CI [-0.405; -0.070]) which fully supports H2 suggesting that classes designed according to STCD model create lower likelihood of students experiencing a sense of boredom. As regards to indirect effects hypothesized, student engagement was found to mediate both the relation between STCD and boredom attention (effect=-0.373, 95% CI [-0.519; -0.229]) as well between STCD and boredom time (effect=-0.409, 95% CI [-0.556; -0.267]). This fully supports H3 highlighting the central role of student engagement in the process.

The integration of process variables in the model is established by H4 which proposes a sequential mediation of class engagement and boredom dimension in the process enacted by STCD in explaining expected grades. Findings show a non-significant effect when the process flows through boredom attention (effect=0.018, 95% CI [-0.056; 0.114]) although it does show a significant effect through boredom time (effect=0.105, 95% CI [0.021; 0.228]). This supports H4b but it fails to support H4a.

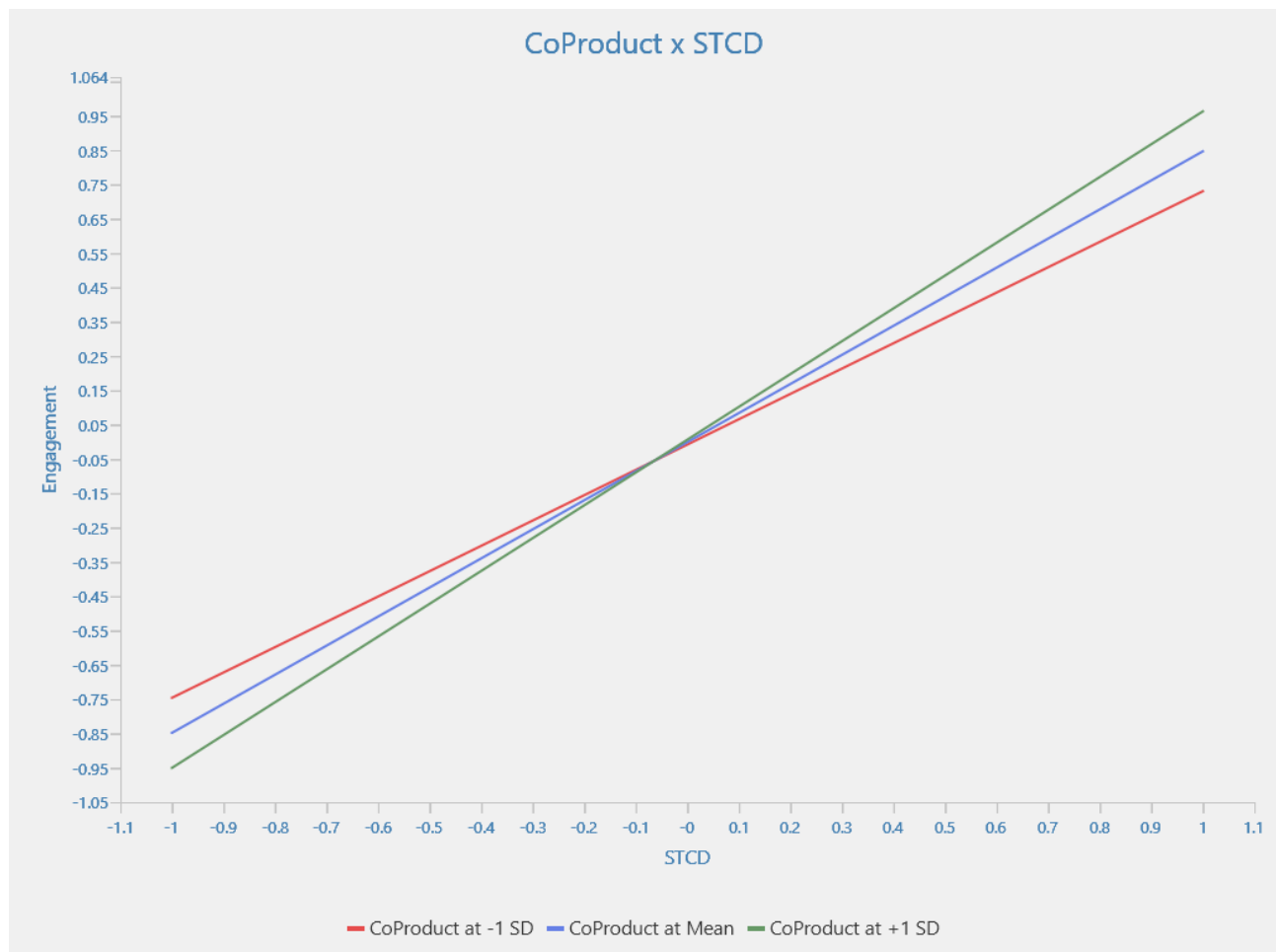
Table 3.6 – PLS-Structural Model coefficients (Bias corrected)

	Original sample (O)	Sample mean (M)	Bias	CI 5.00%	CI 95.00%	f ²	HH	Test
BoredomAttention -> ExpectedGrade	-0.049	-0.045	0.004	-0.272	0.161	0.001	H1a	n.s.
BoredomTime -> ExpectedGrade	-0.257	-0.255	0.003	-0.475	-0.034	0.024	H1b	supported
STCD -> BoredomAttention	-0.264	-0.266	-0.002	-0.419	-0.095	0.034	H2a	supported
STCD -> BoredomTime	-0.243	-0.244	-0.001	-0.405	-0.070	0.030	H2b	supported
STCD -> Engagement -> BoredomAttention	-0.373	-0.376	-0.003	-0.519	-0.229		H3a	supported
STCD -> Engagement -> BoredomTime	-0.409	-0.410	-0.001	-0.556	-0.267		H3b	supported
STCD -> Engagement -> BoredomAttention -> ExpectedGrade	0.018	0.018	0	-0.056	0.114		H4a	n.s.
STCD -> Engagement -> BoredomTime -> ExpectedGrade	0.105	0.105	0	0.021	0.228		H4b	supported
CoProduct x STCD -> BoredomAttention	0.089	0.085	-0.004	-0.036	0.203	0.015	H5a	n.s.
CoProduct x STCD -> BoredomTime	0.066	0.062	-0.003	-0.033	0.177	0.009	H5b	n.s.
CoProduct x STCD -> Engagement -> BoredomAttention	-0.048	-0.045	0.003	-0.094	-0.017		H6a	supported
CoProduct x STCD -> Engagement -> BoredomTime	-0.053	-0.050	0.002	-0.105	-0.018		H6b	supported
CoProduct x STCD -> ExpectedGrade	-0.004	-0.007	-0.003	-0.124	0.117	0.000	H7	n.s.
CoProduct x STCD -> Engag -> BoredomAttention -> ExpectedGrade	0.002	0.002	0	-0.006	0.016		H8a	n.s.
CoProduct x STCD -> Engagement -> BoredomTime -> ExpectedGrade	0.014	0.013	-0.001	0.003	0.042		H8b	supported

By integrating co-production beliefs as a boundary condition, the complexity to the previously stated findings is increased. The first interaction effect of co-production beliefs with STCD in explaining boredom attention is not significant ($B=0.089$, 95% CI $[-0.036; 0.203]$) and the same was found for boredom time ($B=0.066$, 95% CI $[-0.033; 0.177]$). Thus, none of the sub-hypotheses received support, which rejects H5.

Still, this is an unlikely explanation for the lack of the interaction effect, when one considers findings from H6. The sixth hypothesis stated the indirect effect previewed in hypothesis 3 would be modulated by co-production beliefs and findings do support both sub-hypotheses. That is, the interaction is significant for the STCD->Engagement->Boredom attention ($B=-0.048$, 95% CI $[-0.094; -0.017]$) as well as for STCD->Engagement->Boredom time ($B=-0.053$, 95% CI $[-0.105; -0.018]$). The graph depicting the interaction effect (Figure 3.1) shows a positive stronger slope between STCD and engagement for those students that have higher co-production beliefs.

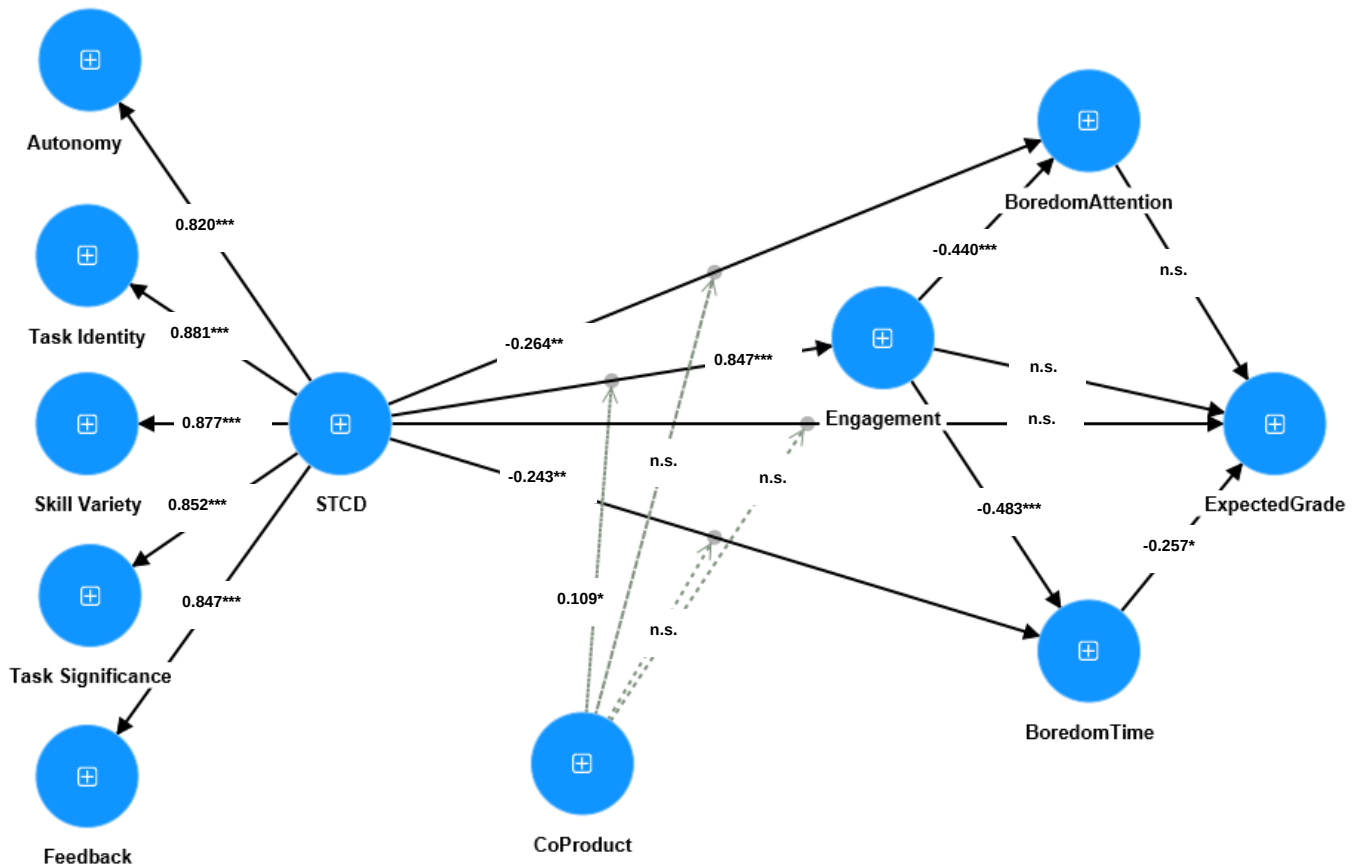
Figure 3.1 – Interaction effect of co-production beliefs in STCD-Engagement



Focusing on an eventual direct effect between the independent variable and the dependent variable conditioned by co-production beliefs (which would bypass the full process proposed) findings do rule out such an effect ($B=-0.004$, 95% CI $[-0.124; 0.117]$) which does not support H7.

By testing the interaction of co-production beliefs with the full sequence model (as stated in Hypothesis 4), findings consistently show no significant effect when the process flows through boredom attention ($B=0.002$, 95% CI $[-0.006; 0.016]$) but such effect is significant when the process flows through boredom time ($B=0.014$, 95% CI $[0.003; 0.042]$). This does not support H8a, but it does support H8b. Path coefficients are shown in PLS-SEM structural model below (Figure 3.2) and for parsimony's sake the full values for all paths tested (including control variables) is shown in Annex C.

Figure 3.2 – Path coefficients from PLS-SEM



IV. DISCUSSION OF RESULTS AND CONCLUSION

This study was motivated by testing the effectiveness of designing classes following socio-technical principles in preventing students' boredom experience while ascertaining the role co-production plays in enhancing positive effects or mitigating negative effects. The background of this model is the comparative analysis of the importance of class design (ascribed mostly to teachers) and student beliefs as either passive or active producers of the learning context and experience. From an organizational literature viewpoint this discussion mirrors the leader-centric versus follower-centric ongoing research as role or process entailed in leadership/followership.

The model itself departs from SCTD to propose a sequence of psychological states that should be conducive to better academic performance, namely student engagement, student boredom, and expected grade. The model also considers the reinforcing effects stemming from students' believing they play an active role in the class, thus preventing their own negative psychological states (mostly, preventing boredom and lack of engagement). The ultimate effect concerns a moderated sequential mediation where co-production beliefs was expected to modulate the capacity SCTD classes have to leverage student's expected grade by means of engaging them and providing a stimulating learning context (as opposed to a boring one).

Firstly, findings show that boredom is not necessarily related to expected grade as the attentional dimension has no association at all (thus rejecting H1a) while the temporal dimension does have a negative association, as hypothesised (thus supporting H1b). The psychological nature of attention and time perception may help explaining this divergent finding. Attention is a cognitive process that can be consciously controlled and directed (Westgate & Wilson, 2018), while time perception is more closely related to emotional processes (Zakay, 2014). Therefore, acknowledging one may not have paid enough attention in class can be compensated by a determination to self-study more, closer to the examination date or revisit the subjects (Smith et al., 2023). However, a feeling that classes entailed a negative time experience may act at a deeper level, closest to emotional processes, which would leave a lasting impression about the overall like-dislike of the subject, which can prevent the student of believing they can compensate for such a feeling. Additionally, the projected grade is not occurring in the immediate time horizon (such as if it would pertain to a quiz) but rather in a deferred time which is known to produce a weaker effect between attention flaws and academic performance (Wammes et al., 2016).

The direct effects found between STCD and boredom dimensions fully supported H2. This suggests how effective STCD can be in enacting a state of flow as closely covers the nine flow facets proposed by Csikszentmihalyi (2000) and being a psychological state, the direct effect is not going counter to the process proposed by JCR (Hackman & Oldham, 1975) as there is no theory ruling the possible intercorrelations between meaningfulness, sense of responsibility and awareness of own performance through feedback.

The support given to H3 which stated the indirect positive effect of STCD on boredom through student engagement suggests that it is one of the mechanisms by which socio-technical class design reduces boredom. Although not reported, it is helpful to contrast the explained variance in both boredom dimension with and without this intervening variable. So, without the mediation of student engagement (excluding all other control variables and the moderator) the models account for 38.7% (boredom attention) and 41.4% (boredom time) while its inclusion adds up to 42.6% and 47% respectively without indication of multicollinearity. When classes are designed with socio-technical principles in mind, students are more likely to feel engaged and invested in the learning process. This is consistent with Sonnentag (2003) suggesting that engaged workers are more likely to be receptive to discovering new ways of thinking which would result in a higher active learning behaviour and generally a more proactive behaviour. This engagement, in turn, provides students with a sense of purpose and motivation (Schaufeli et al., 2006) therefore reducing feelings of boredom. Focusing on student engagement is a critical component of creating effective and engaging learning environments. Additionally, it is important to consider the broader social and contextual factors that influence student learning and engagement, rather than focusing solely on the technical aspects of educational design.

The sequential mediation effects concerning H4 suggest that the relationship between STCD and expected grades is partially mediated by the sequential pathway of class engagement and boredom time. These findings closely relate to the explanation provided for H1. Similar to H1, whilst boredom attention reflects how fully one's attention is captured by the activity at hand (Fahlman et al. (2013), boredom time reflects a perception of time flow that can feel very slow. As stated, attentional processes can be purposively compensated by revisiting learning material closer to examination date while time perception has a stronger emotional basis that conditions the overall attitude towards studying those subjects. Thus, albeit student engagement may run high and harm attention in classroom, students can always believe on their own ability to compensate afterwards. Still, the same process is implied in these findings as high levels of student engagement can lead to greater academic achievement and success (Reyes et al., 2012).

Findings concerning a possible interaction of co-production beliefs with STCD in preventing boredom experience showed otherwise, that STCD seems to be effective independently of how much students hold co-production beliefs which rejected H5. In other words, the impact of STCD on boredom is consistent regardless of whether students have high or low levels of co-production beliefs. This result is somewhat surprising, as co-production beliefs are thought to play an important role in shaping both distant and immediate outcomes of follower and leader behaviours (Crossman & Crossman, 2011), in this case an immediate outcome of students' attitudes towards their learning environments. However, it may be that other factors are more important in shaping the relationship between STCD and student boredom may. One point worth mentioning is the relatively smaller standard deviation found for co-production beliefs (mean=4.59, sd=0.78) which runs counter to the

ideal situation for any variance-based data analysis. On the one hand, it is a positive finding that out of 6 points, the mean is approximately 4.6 but on the other hand, the low dispersion harms the ability to find interaction effects due to the minimal data variance.

Hypothesis 6 proposed the relationship between STCD, student engagement, and boredom is moderated by co-production beliefs. Findings fully supported it as both sub-hypotheses were corroborated. Specifically, students who have high levels of co-production beliefs are more responsive to the effects of STCD on engagement and boredom, while students with low levels of co-production beliefs are less responsive. These findings reinforce the thesis that by fostering a sense of collaboration and shared responsibility between students and teachers, co-production beliefs may help to promote greater engagement and motivation among students, even in situations that might otherwise be boring or unstimulating. This is congruent with co-production beliefs being defined as “the extent to which individuals believe the follower role involves partnering with leaders to advance the mission and achieve optimal levels of productivity” (Carsten & Uhl-Bien, 2015, p. 211). Additionally, these findings highlight STCD as a particularly effective design for students who are already inclined towards a collaborative and participatory approach to learning. Likewise, it highlights the importance of building such co-production beliefs to grasp the full extent of STCD effects.

As a caveat, when a process model is being proposed, the direct effect should be tested firstly because it is admissible from a theoretical point of view (STCD could directly lead to higher grade expectations) and secondly because it shows the true added value that the process variables bring to the model. Hypothesis 7 fulfilled this purpose. Findings suggest that there is no direct effect of STCD on student outcomes, independent of the effects mediated by student engagement and boredom which reject the hypothesis. This result is important because it indicates that the relationship between class design and student outcomes cannot be understood by looking only at direct effects. Instead, it is necessary to consider the complex processes and factors that contribute to student engagement and performance.

The more complex hypothesis concerns the possible interaction effect of co-production beliefs on the overall sequential mediation model stated in hypothesis 4. Findings suggest that the relationship between STCD, student engagement, and expected grades is moderated by co-production beliefs, but in a more nuanced way than originally hypothesized. Specifically, the interaction between co-production beliefs and the full sequence model does not have a significant effect on boredom attention, but it does have a significant effect on boredom time. This suggests that co-production beliefs may play a more important role in shaping the relationship between STCD, engagement, and expected grades when students are experiencing a sense of boredom that is related to the passage of time, rather than a lack of attention or interest. Again, the same explanations for H1 and H4 apply here. Hence, students with stronger co-production beliefs may be more likely to cope with or mitigate the negative effects of boredom time on academic performance.

In other words, students who believe in the value of working together with their teachers and peers to achieve educational goals may be more likely to stay engaged and motivated even in boring classroom situations, which in turn could lead to better academic outcomes which aligns with Carsten et al. (2018) perspective that higher a followers co-production belief more one carries a sense of duty to advance the objectives, vision and behaviours set out by the leader.

All in all, the proposed model does offer support to the benefits of designing classes following the socio-technical principles, but it also suggests students beliefs play an important role in ensuring they are engaged during classes.

4.1 Implications

These findings have important implications for educators, as they suggest that incorporating STCD principles of the job characteristics model (Steers & Mowday, 1977) into the design of educational environments can help to reduce boredom among students. Boredom has been linked to negative outcomes such as reduced academic achievement (Tze et al., 2016) so addressing this issue is critical for promoting positive learning outcomes. STCD can help to create more interactive learning environments that better meet the needs and interests of students.

Likewise, finding no association between boredom attention and expected grade may suggest all efforts to engage students (SCTD and fostering co-production beliefs) may be inconsequential as students will deploy strategies to compensate lack of attention. Still, this focus neglects the fact that both SCTD and co-production beliefs played a role in preventing boredom time and, as well, it neglects the fact that the lack of attention may not be outside the reach of those who design classes. Indeed, remedial individual strategies are out of the reach of STCD but e.g. the choice for evaluating students' performance in a time distant moment can be considered as against introducing multiple evaluation points with a more immediate temporal perspective. As reported by Wammes et al. (2016) mind wandering has a stronger effect on academic performance when it is occurring in an immediate fashion (e.g. quizzes) rather than when it is deferred. An implication from our findings concerns considering evaluation points as an expression of socio-technical principles. So, providing multiple evaluation points is more in line with STCD principle of timely and clear feedback than having a single overall evaluation point and it should be part of STCD.

For theory, this study offers novelty as we could not locate any study that was based on a work-related model (JCR) applying it to the learning experience at school. This transposition implies some substantial adjustments to the original items from JCR and the psychometrics of such adjusted scale seem to suggest it was a sound choice. Still, the theoretical contribution is a promising one for developing educational design bridging it with work settings. Alongside, findings also highlight the role co-production plays, and this is consequential for the emerging followership literature as it

provides another example on how group and individual outcomes are not entirely (and eventually mostly) dependent on some leading figure.

4.2 Limitations and future studies

As a JCM has established itself in organizational research, so has the changing context challenged the comprehensiveness of the original proposal by Hackman and Oldham (1975). The authors themselves have revisited the model by highlighting the role social dimension can play in explaining work motivation and non-task outcomes such as contextual performance (Oldham & Hackman, 2010).

Future studies may benefit from including scales to measure co-production beliefs that are more sensitive, i.e. that offer a larger number of options (instead of a Likert 6 points, scales can cover e.g. 10 points).

This is the main take away from results, but such findings only show one face of the coin. The other face concerns the social dimension that Oldham and Hackman (2010) explored as avenues for future research and JCM updating. Namely, social influence via shared beliefs that students may hold as a collective and not individually have not been previewed in this model. Although learning is individually manifested, it is collectively produced and therefore, co-production beliefs held at the group level may play a stronger role than the construct measured at the individual level as this study did.

One important phenomenon that was not reported as a finding is the relatively high level of drop out during the data collection process (56% response rate as compared to average 68% in literature, Holtom et al., 2022). This is a significant parallel finding as quitting can also be an expression of a low co-production belief. As a student, we thought that being able to participate in research on learning experience in class would per se be motivating but post hoc we realize that co-production beliefs would also take a toll in research participation and therefore, we trust our sample is biased towards the higher end of co-production beliefs. Future research may consider how to avoid this situation while still preserving the voluntary character of the survey. The fundamental question then is: what makes a student belief or not in co-production? How to change such beliefs? Where does the leader-centric culture come from? How to foster a followership culture in class? Implicit leadership theories and Implicit followership theories (Lord et al., 2020) may offer an answer and place the focus of attention at a much higher level than the one a teacher can deal with in STCD. It is plausible that such implicit sets of beliefs are nurtured at a very early stage of the learning experience a student has in life as well as in the social representation of professors as holders of knowledge instead as of facilitators of its learning.

The results suggest that different levels of co-production beliefs do play a role in mitigating one side of the feeling of boredom, hence impacting academic performance. It is important that managers

take these aspects into consideration when managing their teams and training courses as the trend towards individual learning (e.g. with asynchronous design) outweighs the community as a favourable context (Nicol et al., 2003) in learning, where peer interactions enable co-production, where social stimulation may foster engagement and counter boredom. As the organizations evolve towards more complexity and work settings become sophisticated and tech-savvy so must actors acknowledge STCD as a desirable premise and co-production as a facilitator of the process and outcomes so that boredom becomes more of an exception rather than the rule. All in all, findings offer to educators as well as corporate managers valuable insights into different factors of a learning environment such as engagement and boredom but as well, reinforce the call for a new approach towards followership.

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ANNEXES

Annex A: Survey

ISCTE  **Instituto Universitário de Lisboa**

English (United Kingdom) ▼

My name is Lloyd Harriman, and I am taking the Master in Management at Iscte - University Institute of Lisbon and conducting a study to explore learning experiences in college classes. I would appreciate if you could participate by filling in a brief questionnaire (4 minutes maximum). Your participation is entirely voluntary and protected by anonymity and confidentiality. The data are intended solely for research purposes and statistical processing. You will never be asked to identify yourself at any time during the study. Thank you in advance for your collaboration. Should you have any doubts or questions please contact me at lhndl@iscte-iul.pt. If you wish to continue, please press the arrow to advance. Thank you, Lloyd.

→

ISCTE  **Instituto Universitário de Lisboa**

English (United Kingdom) ▼

Not all courses are taught the same way and provide the same feeling as regards to having an exciting learning or boring learning experience. Please think about one of the courses you are taking / you have just taken. Think about the classes of that course that you actually attended and how your experience was in such classes. Chose a course that you have had only a single professor in the entire semester. Also, chose a course that is mandatory in your curriculum.

Can you please indicate the course you are thinking about ?

→

Please indicate how well the following statements describe your learning experience in the chosen course.

Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
①	②	③	④	⑤	⑥

	1	2	3	4	5	6
These classes allow me to learn the way I'd like to.	☐	☐	☐	☐	☐	☐
In these classes I am given a chance to use my personal initiative or judgment.	☐	☐	☐	☐	☐	☐
In these classes I am given considerable opportunity for independence and freedom of thinking.	☐	☐	☐	☐	☐	☐
These classes usually tell a story/lesson that has a beginning and an end.	☐	☐	☐	☐	☐	☐
The in-class activities allow me to gain a sense of achievement for having completed them.	☐	☐	☐	☐	☐	☐
After each class I am capable of summarizing the main ideas and topics we explored.	☐	☐	☐	☐	☐	☐
I can see a common thread connecting the sequence of classes from this course.	☐	☐	☐	☐	☐	☐
The in-class activities require me to develop or use a variety of skills.	☐	☐	☐	☐	☐	☐
The in-class activities require me to use a number of complex or high-level skills.	☐	☐	☐	☐	☐	☐
Classes include many different types of in-class activities.	☐	☐	☐	☐	☐	☐
I learn things in these classes that will significantly affect the lives and well-being of other people.	☐	☐	☐	☐	☐	☐
How much I learn from these classes will impact my professional performance.	☐	☐	☐	☐	☐	☐
Considering the big picture, these classes are very significant and important.	☐	☐	☐	☐	☐	☐
In-class activities offer feedback on how well I am doing.	☐	☐	☐	☐	☐	☐
Whenever I finish an in-class activity I can tell whether I performed well.	☐	☐	☐	☐	☐	☐
These classes allow me to gain positive and constructive feedback.	☐	☐	☐	☐	☐	☐

Now think generally of how you see the students' role within a university.

Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
①	②	③	④	⑤	⑥

	1	2	3	4	5	6
Students should be on the lookout for suggestions they can offer in class to professors.	☐	☐	☐	☐	☐	☐
Students should proactively identify problems that could affect the university.	☐	☐	☐	☐	☐	☐
As part of their role, students must be willing to challenge professor's assumptions.	☐	☐	☐	☐	☐	☐
Students should be proactive in thinking about things that could go wrong.	☐	☐	☐	☐	☐	☐
Students should communicate their opinions, even when they know professors may disagree.	☐	☐	☐	☐	☐	☐



Please consider how you usually feel during the classes of this course. How well do the following items describe your own experience in class.

Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
①	②	③	④	⑤	⑥

[illegible]

How well do the following items describe your own experience in class.

Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
①	②	③	④	⑤	⑥

[illegible]

What is your age ?

What is your gender ?

Male

☐

Female

☐

Other

☐

Which educational level are you attending ?

Bachelors

☐

Masters

☐

Phd

☐

Other

☐

What is the name of the degree you are taking ?

What is the average class size in those classes ?

☐ 1 to 10 students

☐ 31 to 40 students

☐ 11 to 20 students

☐ 41 to 50 students

☐ 21 to 30 students

☐ over 50 students

What is the typical duration of each class ?

1 hour 30 minutes

☐

2 hours

☐

3 hours

☐

4 hours

☐

What is the normal schedule you have had those classes ?

Morning

☐

Afternoon

☐

Evening

☐

How many hours do you usually sleep each night ?

What is your expected grade in this course ? From 0 to 20

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We thank you for your time spent taking this survey.
Your response has been recorded.

Annex B: PLS-Structural Model coefficients

	Original sample (O)	Sample mean (M)	Bias	5.00%	95.00%
Engagement -> BoredomAttention -> ExpectedGrade	0.021	0.021	0	-0.066	0.134
CoProduct x STCD -> Engagement -> BoredomAttention	-0.048	-0.045	0.003	-0.094	-0.017
STCD -> Engagement -> BoredomTime	-0.409	-0.41	-0.001	-0.556	-0.267
Educ -> BoredomAttention -> ExpectedGrade	-0.002	-0.002	0.001	-0.033	0.005
CoProduct x STCD -> Engagement -> ExpectedGrade	0.012	0.012	0	-0.008	0.057
Age -> Engagement -> BoredomAttention -> ExpectedGrade	-0.002	-0.002	0	-0.015	0.004
CoProduct -> Engagement -> ExpectedGrade	0.001	0.002	0.001	-0.01	0.02
STCD -> BoredomAttention -> ExpectedGrade	0.013	0.011	-0.002	-0.04	0.085
CoProduct x STCD -> BoredomAttention -> ExpectedGrade	-0.004	-0.005	0	-0.044	0.01
Class Size -> BoredomAttention -> ExpectedGrade	-0.003	-0.001	0.002	-0.029	0.006
Class Size -> Engagement -> BoredomAttention	-0.019	-0.02	-0.001	-0.057	0.006
Age -> BoredomTime -> ExpectedGrade	0.021	0.018	-0.003	-0.004	0.076
Age -> Engagement -> BoredomTime -> ExpectedGrade	-0.01	-0.01	0	-0.034	-0.001
Class Duration -> Engagement -> ExpectedGrade	0.002	0.001	-0.001	-0.004	0.022
Gender -> Engagement -> BoredomTime	0.051	0.049	-0.002	-0.001	0.127
Educ -> Engagement -> BoredomAttention	-0.063	-0.062	0.002	-0.109	-0.036
CoProduct -> Engagement -> BoredomTime	-0.003	-0.005	-0.001	-0.039	0.045
Educ -> Engagement -> BoredomTime -> ExpectedGrade	0.018	0.017	0	0.005	0.046
STCD -> Engagement -> BoredomAttention	-0.373	-0.376	-0.003	-0.519	-0.229
CoProduct -> BoredomAttention -> ExpectedGrade	-0.007	-0.008	-0.001	-0.066	0.015
Class Duration -> Engag -> BoredomAttention -> ExpectedGrade	0	0.001	0	-0.002	0.007
Educ -> BoredomTime -> ExpectedGrade	-0.01	-0.007	0.002	-0.054	0.011
CoProduct -> Engagement -> BoredomAttention	-0.003	-0.005	-0.001	-0.037	0.041
Class Size -> Engagement -> BoredomTime -> ExpectedGrade	0.005	0.005	0	0	0.023
Age -> BoredomAttention -> ExpectedGrade	0.007	0.005	-0.002	-0.017	0.055
Engagement -> BoredomTime -> ExpectedGrade	0.124	0.124	-0.001	0.025	0.265
Educ -> Engagement -> BoredomAttention -> ExpectedGrade	0.003	0.003	0	-0.009	0.02
STCD -> Engagement -> BoredomTime -> ExpectedGrade	0.105	0.105	0	0.021	0.228
Gender -> Engagement -> BoredomAttention -> ExpectedGrade	-0.002	-0.003	0	-0.025	0.004
Gender -> Engagement -> ExpectedGrade	-0.011	-0.011	0	-0.071	0.005
Educ -> Engagement -> BoredomTime	-0.07	-0.068	0.002	-0.12	-0.039
CoProduct x STCD -> Engag -> BoredomAttention -> ExpectedGrade	0.002	0.002	0	-0.006	0.016
CoProduct -> BoredomTime -> ExpectedGrade	-0.021	-0.019	0.002	-0.082	0.003
Age -> Engagement -> ExpectedGrade	-0.009	-0.008	0.001	-0.046	0.005
Gender -> Engagement -> BoredomTime -> ExpectedGrade	-0.013	-0.012	0.001	-0.048	-0.001
STCD -> Engagement -> BoredomAttention -> ExpectedGrade	0.018	0.018	0	-0.056	0.114
Gender -> Engagement -> BoredomAttention	0.047	0.044	-0.003	0	0.116
CoProduct -> Engagement -> BoredomTime -> ExpectedGrade	0.001	0.001	0	-0.011	0.013
CoProduct x STCD -> BoredomTime -> ExpectedGrade	-0.017	-0.016	0.001	-0.067	0.004
Class Duration -> BoredomAttention -> ExpectedGrade	0.003	0.004	0	-0.006	0.036
STCD -> BoredomTime -> ExpectedGrade	0.063	0.061	-0.001	0.011	0.161
Gender -> BoredomAttention -> ExpectedGrade	0.005	0.007	0.002	-0.011	0.065
Class Duration -> Engagement -> BoredomAttention	-0.007	-0.007	-0.001	-0.037	0.021
STCD -> Engagement -> ExpectedGrade	0.09	0.088	-0.003	-0.117	0.297
Age -> Engagement -> BoredomTime	0.039	0.037	-0.002	0.009	0.087
Class Size -> Engagement -> ExpectedGrade	0.005	0.004	0	-0.003	0.032

Class Size -> BoredomTime -> ExpectedGrade	-0.008	-0.009	-0.001	-0.045	0.009
CoProduct x STCD -> Engagement -> BoredomTime -> ExpectedGrade	0.014	0.013	-0.001	0.003	0.042
Class Duration -> Engagement -> BoredomTime	-0.007	-0.008	-0.001	-0.04	0.023
Class Duration -> BoredomTime -> ExpectedGrade	0.029	0.029	0	0.003	0.088
Gender -> BoredomTime -> ExpectedGrade	0.011	0.009	-0.002	-0.025	0.077
Educ -> Engagement -> ExpectedGrade	0.015	0.015	0	-0.016	0.058
Class Size -> Engagement -> BoredomAttention -> ExpectedGrade	0.001	0.001	0	-0.002	0.013
Class Duration -> Engagement -> BoredomTime -> ExpectedGrade	0.002	0.002	0	-0.004	0.014
Age -> Engagement -> BoredomAttention	0.036	0.034	-0.002	0.007	0.078
CoProduct -> Engagement -> BoredomAttention -> ExpectedGrade	0	0	0	-0.004	0.007
Class Size -> Engagement -> BoredomTime	-0.021	-0.022	-0.001	-0.06	0.007
CoProduct x STCD -> Engagement -> BoredomTime	-0.053	-0.05	0.002	-0.105	-0.018

Annex C: Model Path coefficients from PLS-SEM

