Creating Memories and Engagement in College Student Through Virtual Reality

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Abstract. This study intends to extend the understanding of drivers of student engagement in the educational context and analyse mindfulness as a moderator of the different associations in the proposed model. The proposed model regards VR experiences as stimuli, telepresence, pleasantness of the experience and memory as an organism and student engagement as the response. A sample of 136 participants allowed us to test the model. Findings revealed that all hypotheses were supported except H6 linking pleasantness of the experience with student engagement. Only the relationship between pleasantness and memory is higher for mindful students than non-mindful ones. These findings mean that students do not need to feel pleasure about what they are learning to be engaged

Keywords: virtual reality, student engagement, telepresence, pleasantness of the experience, memory, mindfulness

1. Introduction

In higher education environments students are mainly from younger generations who are digital natives (Mulvey, Lever, & Elliot, 2019) and the use of technologies are becoming a core topic. The current study focuses on the topic of students' engagement in learning environments, which we propose to assess through virtual reality (VR).

The major concern of faculty members -when thinking about the obstacles in their course- is regarded to the level of intellectual challenges needed to master the course content. They expect students to be engaged in learning and think critically to overcome the learning challenge. However, students who are not in tune with the true goal of education may not see it this way (Smith-Robbins, 2011). College students tend to consider some current teaching methods as, inadequate and outdated, especially when there is little use of some tools and learning technologies in the "classroom environment" (CIES-ISCTE, 2008). Some lecturers also tend to consider the application of new methodologies as a waste of time, mainly due to an incomplete understanding of them. According to Huang and Soman, (2013), the main reasons for dropouts or low performance include a lack of engagement or boredom, a pattern of growing absenteeism where each absence makes the person less willing to return to classes. How to handle this issue? The use of VR can be part of the answer.

VR has been increasingly implemented as a tool for simulation and entertainment in several industries, for instance, retailing (Krasonikolakis, Vrechopoulos, & Pouloudi,

2014), tourism (e.g., Kim et al., 2018; Tussyadiah, Wang, Jung, & tom Dieck, 2018) and above all in medical issues (Loureiro et al., 2018).
Several studies are more focused on how consumers experience VR through concepts of engagement, attachment and purchase (e.g., Bilro et al., 2019; Grewal, Roggeveen, & Nordfält, 2017; Itani, Kassar, & Loureiro, 2019; Krasonikolakis et al., 2014; Prentice, Wang, & Loureiro, 2019; tom Dieck et al., 2018), where the S(stimuli)-O(organism)-R(response) framework (Roschk, Loureiro, & Breitsohl, 2017) is greatly employed as the basic theoretical background. Therefore, more research is needed to understand how VR experience can enhance college students' engagement in learning. Hence, the current study purposes and validate a model portraying the influence of VR experience on student engagement, extending the S-O-R framework. The contribution of the study is twofold: (i) extending the understanding of drivers of student engagement in the educational context; (ii) analysing mindfulness as a moderator of the different associations in the proposed model.
Virtual reality experience, telepresence, pleasantness of the experience and memory are regarded as drivers of student engagement. Telepresence, pleasantness of the experience and memory are considered as mediators between virtual reality experience and student engagement. Mindfulness is explored as a moderator through a multi-group analysis.

2. Literature Review

The proposed model is founded in the S-O-R framework, where VR experiences are regarded as stimuli. Experiences have been studied through two major conceptualizations: experience economy and brand experience. This last perspective conduct to Schmitt (2009) points out that experiences comprise *sensory, emotional, cognitive, behavioural, and relational value*s. Yet, for Pine and Gilmore (1998), experiences represent the possibility to live in a different situation from the daily routine, being an event, which should be unique and special.
Experiences depend on the consumers, tourists, or students' individual interpretation of the event (Lemon & Verhoef, 2016; Meyer & Schwager, 2007). Therefore, even when two individuals consider that a certain experience made them feel happy, their level of happiness will be felt in different ways. Even more, it is also very unlikely that the experience will be retained in both memories for the same period of time because it depends on the intensity and strength with which it is handled (Lemon & Verhoef, 2016; Loureiro, 2014). Hence, experiences have been associated with behavioural intentions, memories, emotional attachment (Loureiro, 2014; tom Dieck, Jung, & Rauschnabel, 2018).
In the current study, the experience lived through virtual reality is expected to influence pleasure and memory creation through telepresence. The concept of telepresence focus on the fact that VR stirs up the sensation of presence, aggregating interactivity, and vividness (Cummings & Bailenson, 2016). Telepresence provides to those who live a certain experience a vivid memory of the place and an illusion that they are invited to be there (Choi, Ok, & Choi, 2016a; Loureiro, Guerreiro, et al., 2019). A favourable and immersive VR experience will be associated with a sense of being there, a sense that participants are invited to be there. Telepresence is the initial component of organism because it refers to the college students' subjective

experience and feelings that are present in VR experience. Therefore, we suggest the following hypothesis:
H1: VR Experience is positively associated with Telepresence
VR technology may facilitate student engagement thorough telepresence (Choi et al., 2016a; tom Dieck, Jung, & Rauschnabel, 2018). Telepresence generates an attraction to the place, which in this case is a virtual environment that allows learning (Choi et al., 2016a). Pleasantness of the experience represents positive feelings due to the VR experience and the learning process that such technology increments (Kaltcheva & Weitz, 2006). Thus, we formulate:
H2: Telepresence is positively associated with Student Engagement.
H3: Telepresence is positively associated with Pleasantness of the Experience
As telepresence refers to the use of VR to have the appearance of being present, enriching the experience, then it is expected to contribute to creating memories in consumers' minds. In this vein, we suggest:
H4: Telepresence is positively associated with Memory
Given that emotions are needed to create memories (Loureiro 2014; Ramkissoon et al. 2013), we argue that a virtual experience generates a sensation of pleasure in students will influence the creation of memories. The following hypothesis is proposed:
H5: Pleasantness of the Experience is positively associated with Memory

Student engagement is the main outcome proposed in the current study. The pleasure of being in a VR environment may develop in students a motivation to be more cognitively, emotionally and behaviourally open to learn (Criado & Such, 2011; Isiaq & Jamil, 2017). We suggest that:
H6: Pleasantness of the Experience is positively associated with Student Engagement
As emotions contribute to generating memories and may develop the motivation to be engaged, memories of positive events are vehicles that lead students to repeat the experiences and keep them motivated and open to learning more (Itani et al. 2019; Loureiro 2014). We propose:
H7: Memory is positively associated with Student Engagement
The way students live the VR experiences, feel emotions, create memories, and become more or less engaged in learning may be moderated by the extent to which students are mindful. Mindfulness has been regarded as a state of mind and connected to situational factors and intrapersonal traits (openness to novelty, sensitivity to different places and contexts, awareness of multiple opportunities, possibilities or perspectives, and more receptive attention to current experiences) (Langer & Moldoveanu, 2000; Loureiro et al., 2019a). Mindful individuals tend to be more open to new information, have a greater sensitivity to the environment and create new categories in memory that allow them to structure their perceptions in a way that they are more effective in problem-solving (Loureiro et al., 2019a; Loureiro, Stylos, & Miranda, 2019b). Mindful people have high sensitivity and awareness of the environment and pay attention to the current experience (Brown, Ryan, & Creswell, 2007). Mindfulness influences individuals' cognitive, affective and behavioural responses (e.g., Bishop et al., 2004; Kabat-Zinn, 2003; Loureiro et al., 2019b).
The current study follows the perspective of the Langer Mindfulness Scale (LMS) (Langer, 2004), which comprises four domains: novelty-seeking (represents a student who perceives any experience as an opportunity to learn something new), engagement

(the students' ability and willingness to notice details about their experience and relationship with the environment), novelty producing (describe students that generates new information to understand the current experience), and flexibility (the tendency to accept a change that come from the environment) (Loureiro & Fialho, 2017). Hence, mindfulness would suggest that the student's degree of mindfulness influences the favourable effect of VR experience on telepresence, pleasantness of the experience, memories and even student engagement. The focus on the stimuli of the moment (through the experience using VR) and the flexibility to be open to new experiences of more mindful students may strengthen the relationship among the constructs in the model than in the case of less mindful students. Thus, the following hypothesis emerges:
H8: There are significant differences in the relationships between latent variables in the structural paths between less mindful students and mindful students

3. Methods

The experiment took place in a room used solely for the experiment, and with a spacious area for the installation and setup of the equipment. In terms of equipment installation, the only specific requirements were those related to the VR headset model (Oculus Rift), which requires specific steps to be taken to adjust the viewing space (installation of the sensors and safety zone delimitation). After installation of the system software, the VR app from Oculus and setting up an Oculus account, the pc only needed an Internet connection for software updates. The chosen video was the "GoPro VR: Swimming with Wild Dolphins in the Ocean", with a duration of 2:11 minutes and publicly available on YouTube. This video was selected to provide the participants with a new learning situation in order to all of them being in the same path. All the participants (n=124) in this study started by visualizing the VR video, through the appropriate equipment, and finished their experience by answering a questionnaire to collect their opinions. From the group of participants 58.1% were female and they were well-distributed among a first-degree course, master course and PhD/DBA course
The questionnaire was first prepared in English due to the fact that the measures of the constructs are in English and then translated to Portuguese and back-translated to ensure that both had the same content and information (Sekaran, 1983). A pilot sample of 10 students was contacted to ensure that the content, design, and structure of the questionnaire were clear and to allow for any final adjustments. Measures of the constructs are adapted from past studies (see Table 1). The questionnaire also contains socio-demographic variables.

Table 1. Sources of the constructs of the questionnaire

Construct	Source
VR experience (Dimensions: Aesthetics, Education, Entertainment, Escapism)	(Loureiro, 2014; Oh et al., 2007)
Memory	(Loureiro, 2014; Oh et al., 2007)
Pleasantness of the experience	(Kaltcheva & Weitz, 2006)
Telepresence	(Choi, Ok, & Choi, 2016b)

Student Engagement	(Criado & Such, 2011; Isiaq & Jamil, 2017)
Mindfulness (Domains: novelty seeking, novelty producing, engagement, flexibility)	(Langer, 2004; Loureiro & Fialho, 2017)

The literature contains several scales to measure Mindfulness. For instance, the Kentucky Inventory of Mindfulness Skills, the Mindful Attention Awareness Scale, the Five Factor Mindfulness Questionnaire, or the Langer Mindfulness Scale (LMS). However, LMS emerges as the most suitable because (i) the current study measures individuals' general cognitive state (university student cognitive state) and not the collective cognitive state within an organization; (ii) the scale does not consider a particular context and therefore can be used in different situations, and (iii) there is good test-retest reliability, factor validity, and construct validity demonstrated in other studies and particularly in the scale validation carried out by Langer and others over the years.

4. Findings

A PLS model should be analysed in two stages. First, the measurement model by evaluating the reliability of the individual measures, convergent validity, and discriminant validity of the constructs. Second, the structural model is evaluated. The measurement model does not pose any problematic situation, where item loading, reliability and convergent validity are within the criteria stablished. Regarding discriminant validity, this is examined through two criteria: Fornell-Larcker and Heterotrait-Monotrait ratio. For the first, the square root of AVE (Average Variance Extracted) was greater than the correlation between the construct and other constructs in the model (Fornell & Larcker, 1981). Considering the Heterotrait-Monotrait ratio of correlations, all results took values below 0.90 and so we can claim that the discriminant validity of the constructs has been established.

In the current study a non-parametric approach, called Bootstrap (5000 re-sampling), is used to estimate the precision of the PLS estimates and support the hypotheses (Hair et al., 2017). All path coefficients are found to be significant at the 0.001 level, except hypothesis H6 (see Table 2).

Table 2. Structural results

	Path Coefficient	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Value	
VR Experience -> Telepresence	0.687***	0.046	15.075	0.000	H1: supported
Telepresence -> S. Engagement	0.269***	0.100	2.676	0.008	H2: supported
Telepresence -> Pleasantness	0.420***	0.097	4.323	0.000	H3: supported
Telepresence -> Memory	0.509***	0.103	4.925	0.000	H4: supported
Pleasantness -> Memory	0.320***	0.101	3.173	0.002	H5: supported
Pleasantness -> S. Engagement	-0.033 ns	0.080	0.421	0.674	H6: not supported

Memory -> S. Engagement	0.371***	0.101	3.686	0.000	H7: supported

Note: ***p<0.001; ns not significant

Concerning the mediating effects of pleasantness, memory and both, we examine the direct and indirect effects and interval of confidence. Therefore, memory is a full mediator between pleasantness and student engagement and a partial moderator between telepresence and student engagement (see Table 3).

Table 3. Mediation effects

Relationship	Indirect effect	T Statistics (|O/STDEV|)	P Values	Bias Corrected Bootstrap 95% Confidence Level		Direct effect	
	Path Coefficient			Lower	Upper	Path Coefficient	
Telepresence -> Pleasantness -> Memory	0.135	1.862	0.063	0.042	0.280	0.509***	No mediation
Pleasantness -> Memory -> S. Engagement	0.119	2.650	0.008	0.041	0.208	-0.033 ns	**Full mediation**
Telepresence -> Pleasantness -> Memory -> S. Engagement	0.050	1.776	0.076	0.013	0.116	0.269***	No mediation
Telepresence -> Memory -> S. Engagement	0.189	2.791	0.005	0.071	0.361	0.269***	**Partial mediation**
Telepresence -> Pleasantness -> S. Engagement	-0.014	0.377	0.707	-0.073	0.073	0.269***	No mediation

Finally, the multigroup-analysis reveals that overall, there is a tendency for the path pleasantness -> memory (β=0.275, p<0.10) be higher for low mindful students than for high mindful students (see Table 4). Thus, H8 was not supported.

Table 4. Multigroup analysis: mindfulness with Parametric Test

	Path Coefficients Original (Mindfulm (1.0 low)	Path Coefficients Original (Mindfulm (2.0 high)	t-Values (Mindfulm (1.0 low)	t-Values (Mindfulm (2.0 high)	p-Values (Mindfulm (1.0 low)	p-Values (Mindfulm (2.0 high)	Path Coefficients-diff (Mindfulm (1.0 Low) Mindfulm (2.0 high)	p-Value (Mindfulm (1.0 low) vs Mindfulm (2.0 high)
Experience VR -> Telepresence	0.664	0.688	8.338	11.953	0.000	0.000	0.024	0.587

Memory -> S. Engagement	0.347	0.353	2.134	2.908	0.033	0.004	0.006	0.505
Pleasantness -> Memory	0.425	0.150	4.078	0.992	0.000	0.321	**0.275**	**0.065**
Pleasantness -> S. Engagement	0.014	-0.040	0.106	0.422	0.916	0.673	0.055	0.374
Telepresence -> Memory	0.411	0.580	3.264	4.256	0.001	0.000	0.170	0.827
Telepresence -> Pleasantness	0.457	0.309	5.371	1.966	0.000	0.050	0.148	0.197
Telepresence -> S. Engagement	0.271	0.241	1.882	1.910	0.060	0.057	0.031	0.436

5. Discussion and conclusions

In the current study educational and escapism are the most significant facets in shaping the overall VR experience. This is a valuable result because we start to point out the importance of using VR equipment to enhance the learning process, leading university students to be immersed in a different but enriching experience. VR is known to be very immersive, where participants are invited to be in a different context from their daily lives. Telepresence can be directly associated with student engagement, meaning that the strong sensation of being present positively contributes to engaging students in the learning process through VR. Indeed, VR can even encourage a desire to search for more information about a certain topic through other sources of information. This aspect highlights the importance of engaging participants in a certain cause, as in past research (e.g., Bilro et al. 2019). Although pleasantness of the experience - regarded as the positive feeling and emotions during the experience - is important in the process of creating and maintaining the memory in students' minds, this study shows that memory is a truly mediator between telepresence and student engagement. VR acts as an extrinsic motivation to be engaged (Ryan & Deci, 2000).

All hypotheses were supported except H6, linking pleasantness of the experience with student engagement. Hence, this study shows the valuable influence of creating favourable memories and this seems to increase the willingness to become engaged more efficiently rather than just having positive emotions or being satisfied. Therefore, memories play an important role in the process of engaging students. Mindful students tend to get more memories when they feel pleasure in the learning process than less mindful ones. As expressed in past research, memories are activated and stored through emotions (Itani et al., 2019; tom Dieck et al., 2018; Loureiro 2014), yet the sensation of being in the VR environment also contributes to creating memories and both telepresence and memory are strong drivers of student engagements.

The study adds to theory by presenting a model that extends the S-O-R framework proposing drivers of student engagement. VR experiences act as a motivational factor to enhance telepresence and this, in turn, influences student engagement, through

creating memories. VR experiences are considered effective for college students in acquiring new skills because contribute to creating favourable memories in students' mind about the topic they visualize and hear through VR equipment.

Regarding the higher education institutions (HEI) and faculty members, it seems clear that most of their time is dedicated to students' learning and academic success, through challenging and engaging activities. This is not always an easy task, not because they do not know how to do so, but, mostly because they do not know how to handle some of the existing tools that can help them achieve their teaching goals. We also know that students in HEIs are open for using new technology-based tools and to explore new ways of interaction and learning through these tools. Thus, HEIs should explore new teaching methods, attempting to fill the gap between more traditional teaching methods and technology-based tools and methods.

Faculty members should be aware that students show greater motivation and desire to explore new sources of information and working on their own learning experience. VR can positively influence students' interest, even among those who are not creative or willing to look for new ways of doing things. VR promotes a better learning outcome among students.

The sample of participants is a convenience sample usually employed in experiment studies. The target population was contacted, and the sample represents college students who are in the process of learning in management and marketing courses. Future studies should use more diverse college studies in different cultural contexts to consolidate the findings. Yet, the sample size (n= 136) is appropriated to an experiment. Experiment studies conducted in laboratory usually employ smaller sample size (some employ only 20 participants), as we can see, for instance in Mobascher et al. (2009) or Posada-Quintero et al. (2016). Our sample size is also appropriated to the PLS technique employed. Indeed, Hair, Ringle, and Sarstedt (2011) suggest a sample size at a minimum of ten times the bigger set of arrows heading towards any construct, what in this case the sample should be minimum 30 (10 × 3 arrows). Even when considering the power analysis (Cohen, 1988; Joseph F Hair, Hult, Ringle, & Sarstedt, 2017), the recommend sample size is 136, by utilizing power analysis for a statistical power of 80% (and also 5% level of significance with minimum R^2 equal to 0.10 most conservative case), and maximum number of arrows pointing at a latent variable being equal to 3. However, a larger sample size could be important in the future to consolidate the findings, introduce other interesting variables that enrich the model and create more complexity and even to compare among different cultures.

The VR film should be created and prepared with different material allowing to be adapted to different educational courses. It is important to create the films in VR taken in consideration the pedagogic material of a certain module of the course. In the creative process to make a VR film it will also be possible to introduce some gamification effects to enhance the positive emotions and be able to effectively engage less mindful college students. We also suggest considering AVATARs that could interact with students during the VR experience. The AVATAR may contribute to develop a sense of connection, eventually increasing the positive emotions and the engagement process.

Another suggestion lies in the use of other senses than sight and hearing to increase the sensation of vividness, presence and ultimately the immersion. This will be

particularly important to college students less focused on the topic of the courses. Other constructs may be recommended to be incorporated in the model. For instance, sense of power meaning a perception of control over a certain situation (Madzharov, Block, & Morrin, 2015). This perception may alter the sensation of telepresence in using VR experience because it is expected that college students with high sense of power will be more critic of everything that then can receive from the VR experience than students with lower sense of power. Another example is the construct of "cool". Can the use of VR experience be regarded as a "cool" tool to learn? Or how a less "cool" leaning material become cool through the use of VR equipment or using the combination of VR and Augmented Reality (Warren, Batra, Loureiro, & Bagozzi, 2019)?

References

Bilro, R. G., Loureiro, S. M. C., & Guerreiro, J. (2019). Exploring online customer engagement with hospitality products and its relationship with involvement, emotional states, experience and brand advocacy. *Journal of Hospitality Marketing and Management*, *28*, 147–171.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., … Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*, 230–241.

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*, 211–237.

Choi, J., Ok, C. (Michael), & Choi, S. (2016a). Outcomes of Destination Marketing Organization Website Navigation: The Role of Telepresence. *Journal of Travel and Tourism Marketing*, *33*, 46–62.

Choi, J., Ok, C. (Michael), & Choi, S. (2016b). Outcomes of Destination Marketing Organization Website Navigation: The Role of Telepresence. *Journal of Travel and Tourism Marketing*, *33*, 46–62.

CIES-ISCTE. (2008). *Os Estudantes e os seus Trajectos no Ensino Superior: Sucesso e Insucesso, Factores e Processos, Promoção de Boas Práticas - Relatório Final*. Lisboa: Centro de Investigação e Estudos de Sociologia.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. In *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Criado, N., & Such, J. M. (2011). Preparing students for group assessment. *Proceedings of the 2011 7th International Conference on Next Generation Web Services Practices, NWeSP 2011*, 421–426.

Cummings, J. J., & Bailenson, J. N. (2016). How Immersive Is Enough? A Meta-Analysis of the Effect of Immersive Technology on User Presence. *Media Psychology*, *19*, 272–309.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*, 39–50.

Grewal, D., Roggeveen, A. L., & Nordfält, J. (2017). The Future of Retailing. *Journal of Retailing*, *93*, 1–6.

Hair, Joe F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet.

Journal of Marketing Theory and Practice, *19*, 139–151.
Hair, Joseph F, Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). SAGE.
Huang, W. H.-Y., & Soman, D. (2013). A Practitioner's Guide To Gamification Of Education. In *Rotman School of Management*. Toronto.
Isiaq, O., & Jamil, M. G. (2017). Exploring student engagement in programming sessions using a simulator. *ICICTE 2017*, 206–215.
Itani, O. S., Kassar, A. N., & Loureiro, S. M. C. (2019). Value get, value give: The relationships among perceived value, relationship quality, customer engagement, and value consciousness. *International Journal of Hospitality Management*, *80*, 78–90.
Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, *10*, 144–156.
Kaltcheva, V., & Weitz, B. A. (2006). The Moderating Influence of Motivational Orientation on the Relationship Between Shopping Environment Arousal and Behavior. *Journal of Marketing*, *70*, 107–118.
Kim, M. J., Lee, C. K., & Jung, T. (2018). Exploring Consumer Behavior in Virtual Reality Tourism Using an Extended Stimulus-Organism-Response Model. *Journal of Travel Research*, *December 2*, 1–21.
Krasonikolakis, I., Vrechopoulos, A., & Pouloudi, A. (2014). Store selection criteria and sales prediction in virtual worlds. *Information and Management*, *51*, 641–652.
Langer, E.J. (2004). *Langer Mindfulness Scale user Guide and Technical Manual*. Worthington: IDS Publishing Corporation.
Langer, Ellen J., & Moldoveanu, M. (2000). The construct of mindfulness. *Journal of Social Issues*, *56*, 1–9.
Lemon, K. N., & Verhoef, P. C. (2016). Understanding Customer Experience Throughout the Customer Journey. *Journal of Marketing*, *80*, 69–96.
Loureiro, S. M. C. (2014). The role of the rural tourism experience economy in place attachment and behavioral intentions. *International Journal of Hospitality Management*, *40*, 1–9.
Loureiro, S. M. C., Breazeale, M., & Radic, A. (2019). Happiness with rural experience: Exploring the role of tourist mindfulness as a moderator. *Journal of Vacation Marketing*, *25*, 279–300.
Loureiro, S. M. C., & Fialho, A. F. (2017). The role of intrinsic in-flight cues in relationship quality and behavioural intentions: segmentation in less mindful and mindful passengers. *Journal of Travel and Tourism Marketing*, *34*, 948–962.
Loureiro, S. M. C., Guerreiro, J., Eloy, S., Langaro, D., & Panchapakesan, P. (2019). Understanding the use of Virtual Reality in Marketing: A text mining-based review. *Journal of Business Research*, *100*, 514–530.
Loureiro, S. M. C., Miranda, F. J., & Breazeale, M. (2014). Who needs delight?: The greater impact of value, trust and satisfaction in utilitarian, frequent-use retail. *Journal of Service Management*, *25*, 101–124.
Loureiro, S. M. C., Stylos, N., & Miranda, F. J. (2019). Exploring how mindfulness may enhance perceived value of travel experience. *Service Industries Journal*.

Madzharov, A. V., Block, L. G., & Morrin, M. (2015). The cool scent of power: Effects of ambient scent on consumer preferences and choice behavior. *Journal of Marketing*, *79*, 83–96.

Meyer, C., & Schwager, A. (2007). Understanding Customer Experience. *Harvard Business Review*, *85*, 116–124.

Mobascher, A., Brinkmeyer, J., Warbrick, T., Musso, F., Wittsack, H. J., Saleh, A., … Winterer, G. (2009). Laser-evoked potential P2 single-trial amplitudes covary with the fMRI BOLD response in the medial pain system and interconnected subcortical structures. *NeuroImage*, *45*, 917–926.

Mulvey, M. S., Lever, M. W., & Elliot, S. (2019). A Cross-National Comparison of Intragenerational Variability in Social Media Sharing. *Journal of Travel Research*.

Oh, H., Fiore, A. M., & Jeoung, M. (2007). Measuring Experience Economy Concepts: Tourism Applications. *Journal of Travel Research*, *46*, 119–132.

Pine, B. J., & Gilmore, J. H. (1998). Welcome to the experience economy. *Harvard Business Review*, *76*, 97–105.

Posada-Quintero, H. F., Florian, J. P., Orjuela-Cañón, A. D., Aljama-Corrales, T., Charleston-Villalobos, S., & Chon, K. H. (2016). Power Spectral Density Analysis of Electrodermal Activity for Sympathetic Function Assessment. *Annals of Biomedical Engineering*, *44*, 3124–3135.

Prentice, C., Wang, X., & Loureiro, S. M. C. (2019). The influence of brand experience and service quality on customer engagement. *Journal of Retailing and Consumer Services*, *50*, 50–59.

Ramkissoon, H., Smith, L. D. G., & Weiler, B. (2013). Testing the dimensionality of place attachment and its relationships with place satisfaction and pro-environmental behaviours: A structural equation modelling approach. *Tourism Management*, *36*, 552–566.

Roschk, H., Loureiro, S. M. C., & Breitsohl, J. (2017). Calibrating 30 Years of Experimental Research: A Meta-Analysis of the Atmospheric Effects of Music, Scent, and Color. *Journal of Retailing*, *93*, 228–240.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*, 54–67.

Schmitt, B. (2009). The concept of brand experience. *Journal of Brand Management*, *16*, 417–419.

Sekaran, U. (1983). Methodological and Theoretical Issues and Advancements in Cross-Cultural Research. *Journal of International Business Studies*, *14*, 61–73.

Smith-Robbins, S. (2011). This Game Sucks: How to improve the Gamification of Education. *EDUCAUSE Review*.

tom Dieck, M. C., Jung, T. H., & Rauschnabel, P. A. (2018). Determining visitor engagement through augmented reality at science festivals: An experience economy perspective. *Computers in Human Behavior*, *82*, 44–53.

tom Dieck, M. C., Jung, T. H., & tom Dieck, D. (2018). Enhancing art gallery visitors' learning experience using wearable augmented reality: generic learning outcomes perspective. *Current Issues in Tourism*, *21*, 2014–2034.

Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism*

Management, *66*, 140–154.
Warren, C., Batra, R., Loureiro, S. M. C., & Bagozzi, R. P. (2019). Brand Coolness. *Journal of Marketing*, *83*, 36–56.