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Personality traits and stress perception as predictors of students' online engagement during the COVID-19 pandemic

Martyn Quigley [a,*], Alexander Bradley [b], David Playfoot [a], Rachel Harrad [a]

[a] Swansea University, United Kingdom
[b] University of Portsmouth, United Kingdom

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ABSTRACT

The COVID-19 pandemic coupled with increasing student numbers means online learning will remain a prevalent feature of the university experience, therefore it is vital that we understand how personality can influence student online engagement. The current study examined whether students' personality traits and stress perception predicted their online engagement with their studies during the COVID-19 pandemic. A sample of 301 first year psychology students completed the Big Five Inventory, Challenge and Hindrance Stress Scales, and the Online Student Engagement Scale, which measured students': engagement skills, emotional engagement, participation and performance. Results revealed that conscientiousness positively predicted all types of online engagement. Extraversion predicted participation and performance. Neuroticism predicted engagement skills, emotional engagement and performance, whilst agreeableness and openness to experience respectively predicted participation and emotional engagement. Additionally, stress perceived as a hindrance negatively predicted performance. These results reveal that students' personality traits and stress perception influence their online engagement and might enable educators to identify those who may require support in engaging with their studies.

1. Introduction

As a result of the COVID-19 pandemic Higher Education Institutions (HEIs) across the world have been required to move their teaching online which has resulted in a considerable change to the learning experience (Crawford et al., 2020; Sahu, 2020). This change is also likely to remain a prevalent feature of the university experience henceforth, as HEIs seek to adopt a "blended" approach to learning and teaching (Jackson, 2020). That is, a combination of virtual and in-person teaching and assessments (Hrastinski, 2019). Given this trajectory it is important to understand whether individual differences such as personality traits and stress perception can predict students' academic online engagement. In an online learning environment engagement is dependent on students' dispositions to a greater extent than in an in-person session, as there are fewer sources of external reinforcement and motivation (e.g., in-person attendance checking, specified study locations and social reinforcers from peers). As such, understanding the relationship between personality traits, stress perception and academic online engagement will enable better identification of students that may require support in engaging with their online learning. The current study therefore sought to examine the relationship between personality traits, stress perception and different forms of student online engagement during the COVID-19 pandemic.

1.1. Student engagement

Student engagement, although difficult to define, is a term which refers to the effort displayed by a student towards their studies and their sense of interest and connectedness to their course (e.g., Axelson & Flick, 2010; Coates, 2006). Fredricks et al. (2004) distinguished between three different types of student engagement: behavioural (i.e., attending sessions, completing work requested of them), cognitive (i.e., developing self-regulated learning strategies) and emotional (i.e., experiencing positive/negative affective states in response to their learning). All three of these types of engagement have been shown to have a positive relationship with academic performance (Lei et al., 2018). The positive effects of student engagement also extend beyond improved academic performance. For instance, it has been suggested that engagement can impact on how fondly students feel towards the university after completing their degree (e.g., Henning, 2012) and the well-being of

* Corresponding author at: School of Psychology, Swansea University, Swansea SA2 8PP, United Kingdom.
E-mail address: m.c.quigley@swansea.ac.uk (M. Quigley).

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students (Boulton et al., 2019). Moreover, student engagement, or lack thereof, can impact upon student continuation rates (e.g., Tight, 2020) which feeds into key metrics for HEIs. In the United Kingdom all three national ranking league tables (i.e., The Complete University Guide; The Guardian; The Good University Guide) use a measure of continuation rates in some form (i.e., how many students complete their degree) to determine their overall ranking of a university. As such, disengagement - which leads to discontinuation - has the potential to impact a universities' league table positions. Given the impact of student engagement on the success of universities and students it is important to understand the personality traits which might influence student engagement.

1.2. Personality traits, academic success and engagement

Personality traits have been identified as reliable predictors of academic success in a range of educational contexts (e.g., Chamorro-Premuzic & Furnham, 2003; Conard, 2006; O'Connor & Paunonen, 2007). The most common framework used to measure personality traits is the Five Factor Model (FFM) or the "Big Five" (Digman, 1990; Goldberg, 1993). According to the FFM, variations in personality can be measured according to five key dimensions: conscientiousness (e.g., being organised, paying attention to detail), agreeableness (e.g., being trusting and helpful), neuroticism (e.g., being anxious, easily stressed), openness to experience (e.g., being creative and curious) and extraversion (e.g., being outgoing and adventurous) (McCrae & John, 1992). Meta-analyses (e.g., Mammadov, 2021; O'Connor & Paunonen, 2007; Poropat, 2009; Vedel, 2014) have consistently demonstrated that conscientiousness has a positive effect on academic performance. Agreeableness and openness to experience have also been reported to have a positive effect on academic performance, although with some conflicting results (e.g., Mammadov, 2021; O'Connor & Paunonen, 2007; Poropat, 2009). The findings pertaining to extraversion and neuroticism are more heterogeneous (e.g., Chamorro-Premuzic & Furnham, 2003).

Although a considerable body of literature has studied the link between the FFM and academic performance in traditional in-person settings, less research has examined the relationship between the FFM and student engagement in an online context. Understanding the relationship between these variables in an online context, however, is particularly important given the increased usage of online or "blended" approaches to learning and teaching. In the absence of in-person attendance checking, specified study locations and the social environment of in-person teaching sessions, students may lack external reinforcement to engage in their studies or may only superficially engage with their studies (e.g., they may choose to engage in other activities simultaneously). The lack of in-person sessions may also prevent a sense of connectedness or "relatedness" developing with peers and instructors which is one of the three key criteria necessary for individuals to feel motivated to engage with their studies according to self-determination theory (SDT; Deci & Ryan, 1985). As such, there is a much greater reliance on the dispositions of students to engage with their degree programme when delivered online. Previous studies in relation to online learning courses such as Massive Open Online Courses (MOOCs) have found that attrition has been a particular problem relative to traditional in-person settings (Daniel, 2012). However, personality traits that have been linked to academic performance in traditional settings such as conscientiousness, extraversion, agreeableness and openness have been identified as useful predictors of students' intention to complete online courses (Gupta, 2021).

1.3. Current study

The current study sought to explore the relationship between personality traits and students' online engagement during the COVID-19 pandemic using validated survey measures. The study sought to identify those who are likely to engage with their online learning and those that may require further support. Audet et al. (2021) recently explored the relationship between personality traits and students' online engagement, however, engagement was measured by two custom made self-report items. In the current study engagement was measured using the Online Student Engagement Scale (OSE; Dixson, 2015) which provides measures of: engagement skills, emotional engagement, participation and performance, thus allowing examination of how the FFM may relate to different types of online engagement. Additionally, the current study also administered a measure of stress perception to assess if students' stress perception impacted their online engagement. LePine et al. (2004) previously demonstrated that stress which is perceived as a *challenge* (i.e., stress associated with learning challenges; e.g., the difficulty of work) positively relates with learning performance, yet stress that is viewed as a *hindrance* (i.e., stress associated with hindrances to a students' learning; for example, the hassle involved when completing an assignment) negatively relates with learning performance. A secondary goal of the study was to assess if challenge and hindrance stress also influenced online engagement along with the Big Five Personality traits. Given the relatively limited research on the relationship between these variables in an online environment during an unprecedented time, the current study was primarily exploratory in nature.

2. Method

2.1. Participants

Three hundred and one first year undergraduate students from a University in the United Kingdom took part in the study. All students studied single or joint hons Psychology. Participants ranged from 18 to 47 years of age ($M = 19.79$; $SD = 3.21$). Most of the sample identified as female ($n = 229$, 76.08%), with 71 (23.58%) participants identifying as male and one participant identifying as non-binary (0.33%). Students were asked to take part in the study in relation to a pedagogic exercise for a core first year psychology module. Ethical approval for the study was received from a UK University's School of Psychology Ethics Committee.

2.2. Procedure and design

A correlational cross-sectional design was employed. The outcome variable was students' online engagement with their studies as measured by the Online Student Engagement Scale (Dixson, 2015). Predictor variables included the Big Five personality traits as measured by the Big Five Inventory (BFI; John & Srivastava, 1999) and stress perception as measured by the Challenge and Hindrance Stress scales (LePine et al., 2004). Participants completed the study between the 31st of January 2021 and 19th March 2021. During this time the UK was in lockdown and the public were mandated to stay at home except for essential reasons (e.g., obtaining food, daily outdoor exercise and medical emergencies). As a result, all learning activities took place online with a mixture of weekly synchronous online sessions (e.g., live lectures, seminars and mentor meetings) and pre-recorded asynchronous lectures.

Prior to taking part in the study students enrolled on the module were sent an email requesting them to complete the survey. Upon clicking on the link participants were taken to the survey which was hosted on Qualtrics. All elements of the study were online. Participants were first presented with an information sheet and consent form, before providing demographic details such as their age, gender, year of study and degree programme. They then completed the Big Five Inventory (BFI) and the Challenge and Hindrance Stress Scales, before proceeding to the Online Student Engagement Scale (OSES). Once they completed these measures, they were then presented with a debrief form. The survey took approximately 15 mins to complete.

2.3. Measures

2.3.1. Big Five Inventory (BFI)

To measure the Big Five personality traits (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism), the *Big Five Inventory* (BFI; John & Srivastava, 1999) was administered to participants. The BFI consists of 44 statements such as "I see myself as someone who is talkative" and "I see myself as someone who does a thorough job". A five-point Likert scale is provided for participants to rate the extent to which they agree with each of the statements (1 = Disagree strongly; 5 = Agree strongly). The BFI is a commonly used measure with good reliability and validity (John & Srivastava, 1999). Cronbach alphas for each subscale were as follows: openness (α = 0.71), conscientiousness (α = 0.82), extraversion (α = 0.88), agreeableness (α = 0.76) and neuroticism (α = 0.85).

2.3.2. Challenge and Hindrance stress

The Challenge and Hindrance stress scale is a 10-item self-report scale developed by LePine et al. (2004) to measure how stressful individuals would find certain circumstances in an academic environment. The scale consists of two subscales, the Challenge Stress scale and the Hindrance Stress scale, each containing five-items. Example questions for each subscale include: "The difficulty of the work required in your classes" (Challenge Stress) and "The amount of hassles you need to go through to get projects/assignments done" (Hindrance Stress). Participants rate each statement on a five-point Likert scale (1 = No stress; 5 = A great deal of stress). One of the original items in the hindrance scale, "The amount of time spent on 'busy work' for your classes", was rephrased. Instead, participants were presented with the statement: "The amount of time spent finding information about the logistics of your classes (i.e., when and where they will happen)". The internal consistency (α) was 0.86 for the Challenge Stress scale and 0.69 for the Hindrance Stress scale.

2.3.3. Online student engagement scale (OSES)

The Online Student Engagement Scale (OSES; Dixson, 2010, 2015) is a 19-item self-report scale. The OSES measures students' behaviours, thoughts, and feelings in relation to their online engagement with their degree programme. There are four sub-scales to the questionnaire, these are: Skills Engagement, Emotional Engagement, Participation and Performance. Skills Engagement refers to key learning skills and is measured by items like "staying up on reading". Emotional Engagement refers to students' emotional participation in their learning and includes items like "finding ways to make material interesting". Participation refers to the extent to which a student engages in educational activities both with instructors and fellow peers (e.g, "having fun in online chats"). Finally, Performance captures marks and grades on the course with two items "doing well on the tests" and "getting a good grade". Participants provided responses on a five-point Likert scale (1 = Not at all characteristic of me; 2 = Not really characteristic of me; 3 = Moderately characteristic of me; 4 = Characteristic of me; 5 = Very characteristic of me). The scale has been shown to be valid and reliable (Dixson, 2010, 2015). The internal consistency for the scale in this study was of a good standard (α = 0.86).[1]

3. Results

Analyses were conducted in JASP (version 0.14.0.0) and SPSS (version 28). The datasets can be found on the Open Science Framework (https://osf.io/mrfyp/?view_only=1f0f4828e6974b2fb107fd6b61a04d5c). Table 1 displays the mean scores and standard deviations for the sub-scales of each of the measures (i.e., the BFI, OSES and the stress scales) and the Pearson correlation coefficients between these measures. As can be seen in Table 1, Conscientiousness and Agreeableness positively correlated with all aspects of students' online engagement (smallest $r = 0.15$, $p < .01$). Extraversion positively correlated with student's participation in their online studies and their emotional engagement and performance (smallest $r = 0.13$, $p < .05$), whilst Openness positively correlated with students' emotional engagement with their online studies ($r = 0.33$, $p < .001$). Neuroticism negatively correlated with students' participation ($r = -0.14$, $p < .05$), whilst Stress Hindrance negatively correlated with performance ($r = -0.13$, $p < .05$) and Stress Challenge negatively correlated with students' emotional engagement ($r = -0.13$, $p < .05$).

To examine whether personality traits and stress perception were able to predict the different types of engagement measured by the OSES, multiple regressions were performed with the Big Five Personality Traits and Challenge Stress and Hindrance stress as predictors of the different types of online engagement.[2]

3.1. Skills engagement

A standard multiple regression (using the "enter" method) was performed with the Big Five personality traits and stress perception scores as predictors of students' online engagement skills (e.g., the extent to which they studied regularly and were organised). The regression model was significant F (7, 293) = 29.76, $p < .001$, adjusted $R^2 = 0.40$. Conscientiousness ($\beta = 0.61$, $p < .001$) and Neuroticism ($\beta = 0.16$, $p < .01$) were significant predictors of the students' online engagement skills. All other predictors were non-significant (all $p > .05$).

3.2. Emotional engagement

An identical multiple regression was conducted to examine whether the same predictor variables could predict students' emotional engagement with their learning (e.g., whether they had a real desire to learn). The model was significant F (7, 293) = 16.08, $p < .001$, adjusted $R^2 = 0.26$. Conscientiousness ($\beta = 0.35$, $p < .001$), Openness ($\beta = 0.38$, $p < .001$), Neuroticism ($\beta = 0.14$, $p < .05$) and Challenge Stress ($\beta = -0.15$, $p < .05$) were significant predictors of students' emotional engagement with their learning. All other predictors were non-significant ($p > .05$).

3.3. Participation

Another multiple regression with the same predictor variables was performed to examine their potential ability to predict students' participation in their online learning (e.g., whether they participate in forums and online conversations). The model was significant, F (7, 293) = 8.40, $p < .001$, adjusted $R^2 = 0.15$. Significant predictors included Extraversion ($\beta = 0.33$, $p < .001$), Conscientiousness ($\beta = 0.12$, $p < .05$) and Agreeableness ($\beta = 0.12$, $p < .05$). All other predictors were non-significant ($p > .05$).

3.4. Performance

To examine whether the Big Five personality traits and stress perception scores predicted students' performance (e.g., whether they did well on tests and got good grades), an ordinal regression was performed. An ordinal regression was conducted as the performance subscale only consisted of two items and the data was negatively skewed. The model was significant, $\chi 2$ (7) = 31.08, $p < .001$, McFadden's pseudo

[1] The Cronbach alpha for each of the subscales are as follows: skills engagement (α = 0.77); emotional engagement (α = 0.80); participation (α = 0.84). The performance subscale consists of only two items.

[2] Regression analyses were also conducted with age and gender as predictors. Age did not predict any type of engagement. However, females provided higher skills engagement and performance scores. Additional analyses are reported in the supplementary materials.

Table 1
Mean scores (standard deviations) for the subscales of the Big Five Inventory, the Online Student Engagement Scale and the Stress Hindrance and Challenge Scales, and the Pearson correlation coefficients between these measures.

Scale	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11
BFI												
Openness (1)	35.09 (5.40)	–	−0.13*	0.08	0.02	−0.04	−0.02	0.33***	0.07	0.00	0.00	0.01
Conscientiousness (2)	29.43 (6.15)		–	0.09	0.33***	−0.12*	0.61***	0.32***	0.18**	0.26***	−0.13*	−0.08
Extraversion (3)	25.32 (6.81)			–	0.14*	−0.33***	0.03	0.13*	0.36***	0.14*	−0.15*	−0.09
Agreeableness (4)	33.86 (5.46)				–	−0.17**	0.27***	0.15**	0.20***	0.15**	0.02	0.08
Neuroticism (5)	27.28 (6.71)					–	0.08	−0.02	−0.14*	−0.02	0.46***	0.38***
OSES												
Skills (6)	20.07 (4.32)						–	0.47***	0.31***	0.38***	0.05	−0.02
Emotional (7)	16.83 (3.92)							–	0.32***	0.27***	−0.09	−0.13*
Participation (8)	14.96 (4.98)								–	0.17**	−0.07	−0.03
Performance (9)	7.90 (1.51)									–	−0.13*	−0.04
Stress scales												
Stress hindrance (10)	14.25 (3.79)										–	0.56***
Stress challenge (11)	16.13 (4.54)											–

Note.
* Denotes statistical significance <0.05.
** Denotes statistical significance <0.01.
*** Denotes statistical significance <0.001.

$R^2 = 0.03$. Significant individual predictors included: Conscientiousness ($B = 0.07$, $SE = 0.02$, $OR = 1.07$, $p < .001$), Extraversion ($B = 0.04$, $SE = 0.02$, $OR = 1.04$, $p < .05$), Neuroticism ($B = 0.04$, $SE = 0.02$, $OR = 1.04$, $p < .05$) and Stress Hindrance ($B = -0.08$, $SE = 0.04$, $OR = 0.92$, $p < .05$).

4. Discussion

The current study examined the relationship between the Big Five personality traits, stress perception and students' online engagement during the COVID-19 pandemic, when teaching activities were delivered online. Four key findings emerged. Firstly, conscientiousness positively predicted all forms of online engagement, further cementing its status as a desirable trait in students. Secondly, extraversion positively predicted students' participation and performance in their online studies which contrasts with some previous studies (e.g., Furnham et al., 2013). Thirdly, neuroticism served as a predictor of skills engagement, emotional engagement and performance, whilst agreeableness and openness respectively predicted participation and emotional engagement. Fourthly, stress hindrance negatively predicted students' performance, whilst challenge stress negatively predicted emotional engagement. These findings demonstrate the importance of personality traits and stress perception in predicting students' online engagement which is likely to become increasingly important given the trend towards blended learning (Jackson, 2020).

Given that conscientiousness is typified by hard work, organisation, and self-discipline it is perhaps unsurprising that it is associated with all forms of online engagement measured in this study. Conscientiousness has consistently been reported as a positive predictor of academic performance and success using a variety of outcome measures (e.g., Mammadov, 2021; O'Connor & Paunonen, 2007; Poropat, 2009; Vedel, 2014). Indeed, it is possible that engagement moderates the relationship between the two (see Conard, 2006) although this requires further study. The finding that extraversion positively predicted participation and performance is perhaps more surprising given that previous studies have demonstrated a negative relationship between extraversion and academic performance (e.g., Furnham et al., 2013). One explanation of the negative relationship between these variables is that students with higher levels of extraversion are more likely to engage in the many social opportunities at university at the expense of their academic engagement and performance (Chamorro-Premuzic & Furnham, 2014). The fact that this was not observed in the current study might be explained by the COVID-19 lockdown conditions which removed social opportunities that could distract extraverted students from engaging in their studies. This might be particularly relevant for first year students living on campus as they were unable to take part in the usual social activities on campus. Instead, their online studies now provided them with a way to meet many students and create a sense of connectedness with others, which according to self-determination theory (SDT; Deci & Ryan, 1985) provides them with motivation to engage with their studies.

The finding that neuroticism predicted engagement skills, emotional engagement and performance is noteworthy as previous studies have shown a heterogeneous relationship between neuroticism and academic performance (e.g., O'Connor & Paunonen, 2007; Vedel, 2014). Importantly though neuroticism accounted for a relatively small percentage of the variance in all instances relative to other predictors and appeared to arise because of suppressor effects within the regression models. Bivariate correlations exploring the relationships did not corroborate the findings. The finding that agreeableness only predicted participation suggests that whilst students scoring higher in agreeableness may be more willing to engage in forums and online chats when requested, this does not extend to deeper forms of engagement (e.g., enhanced emotional engagement). Similarly, whilst openness may result in greater emotional engagement, it does not relate to other forms of engagement and performance which contrasts with some previous findings (e.g., see Mammadov, 2021). Finally, the findings in relation to stress perception provide some support for the notion of challenge and hindrance stress proposed by LePine et al. (2004). Stress hindrance did negatively predict performance. However, challenge stress did not positively predict performance or other forms of engagement which might be expected (see, LePine et al., 2004). The direction of the relationship between the variables is also unclear and only longitudinal studies will be able to address this.

Taken together these findings show that personality traits and stress perception are important factors which influence students' online engagement with their studies. Interestingly, Audet et al. (2021) have also reported a link between personality traits and students' online engagement during the COVID-19 pandemic. However, these authors found that only openness to experience predicted students' online engagement. In their study though engagement was only measured by two self-report items and different types of engagement were not measured which may account for the differences reported in our study. Yu (2021), however, have recently produced some conceptually similar results to those we report here. In their survey-based study with students

enrolled in a Chinese public university, the authors found that conscientiousness, agreeableness, and openness to experience, positively correlated with learning outcomes which included student engagement. In their study though learning outcomes was a composite score of students' engagement, attendance and performance and therefore prevented analysis of the relationship between the FFM and specific types of engagement that are measured in the current study.

4.1. Implications and limitations

Considering the increased usage of online delivery methods, it is important to be able to identify students who are at risk of failing to engage with their online learning. The current results suggest students who are low in conscientiousness (predictive of all types of engagement) and extraversion are at particular risk of low engagement. These factors have been identified as predictors of academic success in traditional settings, however, given the lack of external reinforcers in online settings personality traits arguably play an even greater role in online learning (see Trapmann et al., 2007). The results therefore suggest there is merit to the idea of students completing psychometric tests of personality (e.g., during the admissions process) to identify those who are at risk of poor online engagement. The inclusion of psychometric tests as part of the admissions process is something which has been considered previously (e.g., Trapmann et al., 2007) but has been dismissed due to potential gaming of the tests. An alternative approach is to provide students with a pedagogic exercise where they complete these tests and are informed of the personality traits which are associated with engagement, the benefits of engagement, and their performance relative to established norms on these tests. This could provide students (and staff) with valuable insights into aspects of their personality and their potential to influence their engagement and performance.

There are limitations from the current study though. For instance, this study relies on self-report measures and has not been linked to objective measures such as time spent by students within their virtual learning environment. These data also relate to a single UK institution and students studying psychology thus limiting their generalisability. Examination of the sample means for each personality trait compared to the means for an American general population (Srivastava et al., 2003), also revealed that whilst extraversion and neuroticism scores were comparable ($ps > 0.05$), scores for conscientiousness and openness were lower than the general population and scores for agreeableness were higher than the general population ($ps < 0.001$). As such, future research should seek to examine whether the same patterns of results would be observed when objective measures are used from a range of institutions both within the UK and elsewhere and incorporate explicit attention checks for students completing self-report measures.

In conclusion, the current study demonstrated the importance of personality traits and stress perception in influencing students' online engagement during the COVID-19 pandemic, thus demonstrating the value of taking these factors into account when considering students who are likely to engage and those who may require further support.

CRediT authorship contribution statement

Martyn Quigley: Conceptualization, Data curation, Formal analysis, Writing – original draft. **Alexander Bradley:** Formal analysis, Writing – review & editing. **David Playfoot:** Formal analysis, Writing – review & editing. **Rachel Harrad:** Conceptualization, Data curation, Writing – review & editing.

Appendix A. Supplementary analyses

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2022.111645.

References

Audet, É. C., Levine, S. L., Metin, E., Koestner, S., & Barcan, S. (2021). Zooming their way through university: Which Big 5 traits facilitated students' adjustment to online courses during the COVID-19 pandemic. *Personality and Individual Differences, 180*. https://doi.org/10.1016/j.paid.2021.110969

Axelson, R. D., & Flick, A. (2010). Defining student engagement. *Change: The Magazine of Higher Learning, 43*(1), 38–43.

Boulton, C. A., Hughes, E., Kent, C., Smith, J. R., & Williams, H. T. (2019). Student engagement and wellbeing over time at a higher education institution. *Plos One, 14* (11), Article e0225770. https://doi.org/10.1371/journal.pone.0225770

Chamorro-Premuzic, T., & Furnham, A. (2003). Personality traits and academic examination performance. *European Journal of Personality, 17*(3), 237–250. https://doi.org/10.1002/per.473

Chamorro-Premuzic, T., & Furnham, A. (2014). *Personality and intellectual competence*. Psychology Press.

Coates, H. (2006). *Student engagement in campus-based and online education: University connections*. Routledge.

Conard, M. A. (2006). Aptitude is not enough: How personality and behavior predict academic performance. *Journal of Research in Personality, 40*(3), 339–346. https://doi.org/10.1016/j.jrp.2004.10.003

Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R. Lam, S., … (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching, 3*(1), 1–20. https://doi.org/10.37074/jalt.2020.3.1.7

Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of Interactive Media in Education, 2012*(3), 18. https://doi.org/10.5334/2012-18

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2), 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology, 41*(1), 417–440.

Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging? *Journal of the Scholarship of Teaching and Learning, 10*(2).

Dixson, M. D. (2015). Measuring Student Engagement in the Online Course: The Online Student Engagement Scale (OSE). Online learning. *19*(4).

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Furnham, A., Nuygards, S., & Chamorro-Premuzic, T. (2013). Personality, assessment methods and academic performance. *Instructional Science, 41*(5), 975–987. https://doi.org/10.1007/s11251-012-9259-9

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist, 48*(1), 26. https://doi.org/10.1037/0003-066X.48.1.26

Gupta, K. P. (2021). Understanding learners' completion intention of massive open online courses (MOOCs): Role of personality traits and personal innovativeness. *International Journal of Educational Management, 35*(4), 848–865. https://doi.org/10.1108/IJEM-01-2020-0042

Henning, G. W. (2012). Leveraging student engagement for student and institutional success. *About Campus, 17*(4), 15–18. https://doi.org/10.1002/abc.21088

Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends, 63*, 564–569. https://doi.org/10.1007/s11528-019-00375-5

Jackson, A. (2020, August 10th). Learners around the world expect HE to change after COVID-19. WONKE. Retrieved from https://wonkhe.com/blogs/learners-around-the-world-expect-he-to-change-after-COVID-19/.

John, O. P., & Srivastava, S. (1999). The Big-Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin, & O. P. John (Eds.), *2. Handbook of personality: Theory and research* (pp. 102–138). New York: Guilford Press.

Lei, H., Cui, Y., & Zhou, W. (2018). Relationships between student engagement and academic achievement: A meta-analysis. *Social Behavior and Personality: An International Journal, 46*(3), 517–528. https://doi.org/10.2224/sbp.7054

LePine, J. A., LePine, M. A., & Jackson, C. L. (2004). Challenge and hindrance stress: Relationships with exhaustion, motivation to learn, and learning performance. *Journal of Applied Psychology, 89*(5), 883. https://doi.org/10.1037/0021-9010.89.5.883

Mammadov, S. (2021). Big five personality traits and academic performance: A meta-analysis. *Journal of Personality*. https://doi.org/10.1111/jopy.12663

McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality, 60*(2), 175–215. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x

O'Connor, M. C., & Paunonen, S. V. (2007). Big five personality predictors of post-secondary academic performance. *Personality and Individual Differences, 43*(5), 971–990. https://doi.org/10.1016/j.paid.2007.03.017

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*(2), 322. https://doi.org/10.1037/a0014996

Sahu, P. (2020). Closure of universities due to coronavirus disease 2019 (COVID-19): Impact on education and mental health of students and academic staff. *Cureus, 12*(4). https://doi.org/10.7759/cureus.7541

Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology, 84*(5), 1041–1053. https://doi.org/10.1037/0022-3514.84.5.1041

Tight, M. (2020). Student retention and engagement in higher education. *Journal of Further and Higher Education, 44*(5), 689–704. https://doi.org/10.1080/0309877X.2019.1576860

Trapmann, S., Hell, B., Hirn, J. O. W., & Schuler, H. (2007). Meta-analysis of the relationship between the big five and academic success at university. *Journal of Psychology, 215*(2), 132–151. https://doi.org/10.1027/0044-3409.215.2.132

Vedel, A. (2014). The Big Five and tertiary academic performance: A systematic review and meta-analysis. *Personality and Individual Differences, 71*, 66–76. https://doi.org/10.1016/j.paid.2014.07.011

Yu, Z. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education, 18*(1), 1–17. https://doi.org/10.1186/s41239-02