



An examination of personality traits as a predictor of the use of self-regulated learning strategies and considerations for online instruction

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Abstract

Each learner brings a unique mix of personality traits, preferences, and talents to the educational setting. These factors can influence the extent to which learners are able to effectively deploy skills and strategies to achieve their academic goals. Gaining a deeper awareness of how specific personality traits play a role in the choice and deployment of SRL strategies provides opportunities to anticipate which learners might be effective or ineffective self-regulators. Doing so would enable instructional designers, educators, or higher education administrators to better plan and deliver effective educational experiences for a wide range of learners. The purpose of this study was to investigate the extent to which the use of SRL strategies was impacted by learner differences in Big Five personality traits. This mixed methods study examined the potential of utilizing the Big Five Inventory classification as a predictor of self-regulated strategy use. Specifically, the study investigated the relationship between the existence of openness, conscientiousness, extraversion, agreeableness, and neuroticism traits as possible predictors of learner use of SRL strategies. Results indicated that learners high in openness, conscientiousness, extraversion, and agreeableness were shown to be more skilled self-regulators than those high in neuroticism. Those high in neuroticism were less skilled self-regulators and tended to use help-seeking strategies more frequently than those in other personality trait categories. The qualitative findings highlighted the need for effective time management as an important self-regulation strategy, a preference for face to face versus an on-line delivery format, and a lack of motivation. However, responses did not seem to systematically vary by personality trait.

Keywords Self-regulated learning · Online instruction · Personality traits

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Introduction

The use of self-regulated learning (SRL) strategies is influenced by a myriad of factors. Instructional content in addition to learners' previous knowledge and skills, characteristics, attitudes, and motivation all play a role in the SRL process (Zimmerman 2005). Determining the extent to which various factors influence the use of SRL strategies is necessary to effectively design appropriate educational environments. This study was designed to explore the interplay between personality traits and the use of self-regulated learning strategies to help facilitate a deeper, more comprehensive view of the learner. Doing so will help address real-life educational concerns related to the development of more effective online environments.

Individuals who are motivated to learn, foster the formation and promotion of decisions to act. Those who further cultivate these decisions through purposeful strategies and actions are more effective self-regulators (McMahon and Luca 2001). Motivation is often triggered by external stimuli, such as rewards, and is generally susceptible to change as more desirable choices or obstacles can promote or hinder progress. In contrast, proficient self-regulation necessitates that learners take specific actions to focus their attention and efforts on content and strategies to support their goals and block out contradictory materials or responses. In essence, self-regulation can be defined as "self-generated thoughts, feelings, and actions undertaken to attain academic goals" (Zimmerman 1998, p. 73).

Most self-regulated learning models share a set of common assumptions. One assumption is that learners are viewed as active participants in the learning process who employ a variety of cognitive and metacognitive strategies based on the information available to them in order to regulate and manage their learning (Abrami et al. 2011; Mega et al. 2014; Nicol and Macfarlane-Dick 2006; Pintrich 1999, 2004; Pintrich and DeGroot 1990; Valle et al. 2008). Moreover, learners are thought to use various standards or criteria by which to determine whether the learning process should continue as is or if adjustments are needed (Azevedo and Cromley 2004; Mezirow 1990; Zimmerman 2002, 2005).

Finally, it is assumed that the learner's self-regulatory activities serve as mediators that affect achievement or performance. In essence, the extent to which learners perform well in their academic settings is in part influenced by the self-regulatory activities exhibited within those environments (Barnard-Brak et al. 2010; Nelson et al. 2015; Pintrich 2004; Pintrich et al. 1994).

Personality traits have emerged as an area of interest regarding the learning environment, particularly the relationship between these traits and academic achievement. Indeed, the majority of research related to personality and learning has focused on its relationship to achievement (Bonaccio and Reeve 2010; Chamorro-Premuzic and Furnham 2003; Kesici et al. 2011; Wilson and Narayan 2016). Consequently, little attention has been given to connections between personality traits and the use of SRL strategies, thus creating opportunities to address an area that has to date been under-researched.

Research exists on the relationships between of personality traits and self-regulation (Dörrenbächer and Perels 2016; Komarraju et al 2009; Tezci et al. 2016; Yukselturk and Top 2013), personality traits and online learning (Cohen and Baruth 2017; Keller and Karau 2013; Omheni et al. 2017; Varela et al. 2012), and online learning and self-regulation (Barak et al. 2016; Kanuka 2002; Muilenburg and Berge 2005; Whipp and Chiarelli 2004; Wilson and Narayan 2016). While these studies and the resultant SRL profiles provide a means by which to categorize learners' use of SRL strategies and skills, they fail to explore how these profiles may be used to develop a better understanding of learner

needs in higher education settings, particularly in the online environment. The purpose of this study was to investigate the relationship between personality traits and the use of SRL strategies in an online learning environment.

Literature review

Conceptualization of the use of SRL strategies into discreet phases was proposed by Heckhausen and Kuhl (1985), whereby they maintained the process consisted of a pre-actional, actional, and post-actional phase. Zimmerman (1998, 2002) advocated a similar conceptualization, positing forethought, performance, and self-reflection as the three major phases defining the SRL process. Adding a fourth phase, Pintrich's (2002) theory of SRL included forethought, monitoring, control, and reflection.

There were clear similarities among these well supported theories that approached SRL from cyclical, distinct phases. The first phase, typically labeled as forethought, refers to SRL processes that set the stage for learning achievement, such as goal setting and strategic planning (Barnard-Brak et al. 2010; Efklides 2011; Hattie 2009; Khaled et al. 2016; Puustinen and Pulkkinen 2001; Winne and Hadwin 1998; Zimmerman 1998, 2002). Zimmerman's second phase, as well as the combination of Pintrich's second and third phases, is commonly labeled performance or action and refers to the strategies and activities that occur during the learning process. Actions at this phase include self-instruction, attention focusing, monitoring and cognitive strategies (Abrami et al. 2011; Brookfield 2009; Hattie 2009; Zimmerman 2002). The third phase, often labeled self-reflection or evaluation, refers to the strategies and actions that occur after the learning cycle has ended (Boekaerts 1997; Borkowski 1996; Pintrich and DeGroot 1990; Winne 1996). In this phase, learners "self-evaluate based upon social comparisons and adjust the implementation of skills and strategies in the forethought and performance control phases for the next learning task" (Barnard-Brak et al. 2010, p. 63).

Types of self-regulated learning strategies

Although a wider array of SRL strategies can occur during the forethought (FT), performance control (PC), and self-evaluation (SE) phases, Table 1 provides the description and phase placement of six commonly exhibited strategies (Effeney et al. 2013; Zimmerman and Martinez-Pons 1990). Measurement of the use of these six strategies is the foundation for the instrument used in the present study (OSLQ). The questionnaire and its psychometric properties will be discussed in more depth in subsequent sections.

Each of the strategies in Table 1 has been investigated empirically in reference to their use and effectiveness (Bernard et al. 2009). A comprehensive review of each of these strategies is beyond the scope of this paper but mention of the most investigated strategies as exemplars provides support for the instrument selected in this study.

Goal setting has been heavily researched, with findings indicating that goal setting appears to be used more frequently in the forethought phase by high achieving students (Bannert et al. 2014; Effeney et al. 2013; Ridley et al. 1992). Moreover, goal setting is an extremely effective strategy in Massive Open Online Course (MOOC) environments, likely because learners must take it upon themselves to set and meet goals within the MOOC's less structured environment (Kizilcec et al. 2017).

Table 1 SRL strategies and associated phases

SRL strategy	Strategy description	Forethought phase	Performance control phase	Self-evaluation phase
Goal setting	Learner efforts to establish goals and subgoals to help plan the sequencing, timing, and completion of academic tasks			
Environmental structuring	Learner efforts to select and arrange the physical or technical setting to make learning easier			
Task strategies	Learner efforts to actively utilize specific strategies to achieve desired goals			
Time management	Learner efforts to consider what must be done and devote an appropriate amount of time to each task			
Help seeking	Learner efforts to secure additional task information from a variety of sources, such as an instructor, classmate, or outside resource			
Self-evaluation	Learner efforts to gauge the progress and quality of their work towards desired goals			

The effectiveness of time management strategies is also a common research focus, with most findings indicating that effective deployment of time management strategies has a positive influence on academic achievement and self-control (Britton and Tesser 1991; Broadbent 2017; Eilam et al. 2009). Regarding the emotional and affective state of post-secondary learners, effective time management strategies have been shown to alleviate computational anxiety in statistics classes, increase positive attitudes towards mathematics, and reduce perceived stress levels (Häfner et al. 2015; Kesici et al. 2011). Self-evaluation has been studied in the context of calibration accuracy where learners make metacognitive judgements on how well they have learned the targeted content or task (Hacker and Bol 2019). Lower achieving students are much less accurate and overconfident when compared to their higher-achieving counterparts. This overconfidence has been linked to ego defense or self-serving attribution bias (Bol et al. 2005). Karabenick (2011) has extensively studied help-seeking behaviors. Learners who seek help when experiencing difficulties in their task related understanding or skills are more likely to be more proficient in self-regulation and perform at higher levels. Knowing when and how to seek help contributes to a self-regulated learning profile indicative of learner success.

Self-regulated learning profiles

Despite the value of a clear understanding of SRL within the instructional process, research in the area of specific classifications, or profiles, is limited. Barnard-Brak et al. (2010) identified five distinct profiles in terms of the extent to which SRL strategies and skills were employed by the learner. They ranged from Profile 1 to Profile 5—used moderately to highly across all subscales but less than Profile 4. Learners in profile 4 reflected more discrimination in terms of strategic use of SRL strategies. Shell and Soh (2013) investigated SRL profiles as a function of motivation and also identified five distinct profiles ranging from Profile 1—highly motivated, by-any-means performer; to Profile 5—motivated but unable to effectively self-regulate performer. In a more recent study, Dörrenbächer and Perels (2016) attempted to identify subgroups of learners based on their SRL strategy use, motivational level, and personality traits. They identified four SRL profiles that ranged from (a) low SRL with moderate motivation, (d) high SRL with high motivation.

Big five personality traits

The Big Five Personality Traits are broad domains which define human personality and account for individual differences (John 1990). The Big Five include openness, conscientiousness, extraversion, agreeableness, and neuroticism. People who exhibit openness typically like to learn new things, are insightful and imaginative, and have a wide variety of interests. People who exhibit conscientiousness are typically reliable, prompt, organized, methodic, and thorough. Extraverts are described as deriving energy from interacting with others, as well as being energetic, talkative, and assertive. Those exhibiting agreeableness are typically friendly, cooperative, compassionate, kind, affectionate, and sympathetic. Finally, neuroticism typically exhibits as emotional instability or negative emotions, moodiness, and tension or anxiety.

The classification and value of these traits have been researched and refined over several decades. Seminal work in the area of personality traits can be traced back to Allport and Odbert (1936) and Thurstone (1934, 1951), whose works focused on estimating or identifying the number of personality-related words in the English language. Subsequent

research typically focused on attempts to categorize and refine personality-related terms into consistent groups (Cattell and Coan 1957; Digman 1972; Fiske 1949; Norman 1967; Peabody and Goldberg 1989; Thurstone 1934; Tupes and Christal 1958, 1961).

Self-regulated learning and personality traits

Personality traits, including those comprising the Big Five, have been associated with self-regulated learning phases and strategies across various delivery methods and populations. Table 2 provides a summary of SRL studies highlighting the variables investigated within various instructional environments.

The primary outcome variables for most studies included in Table 2 were academic achievement and their correlates. Chief among these correlates were self-efficacy, test anxiety, perception of future goals, time management skills, homework practices, past performance, and epistemic beliefs. Although recognizing learners' personality traits has been characterized as foundational for understanding individual differences within the learning environment (Eilam et al. 2009; Geisler-Brenstein et al. 1996; Zimmerman 1989), a search of the literature revealed few studies that focused on personality traits as predictors of the use of SRL strategies. Therefore, there is little evidence to support the specific, effective strategies for instructional design and course development.

In a review of the literature connecting personality traits and learning, De Raad and Schouwenburg (1996) covered nearly a decade's worth of research related to personality traits and academic achievement. In generalizing the findings, the authors discovered that all Big Five factors appeared to have some impact on learning, although the extent and scope of each factors' impact differed among studies. The authors concluded that prior research did indeed indicate that various personality traits are at the core of the domain of learning and education; however, none of the studies reviewed by the authors focused on personality traits as a predictor for the use of SRL strategies.

An exception was a study conducted Dörrenbächer and Perels (2016). They administered the Big Five Inventory, along with measures of SRL strategy use, to survey 337 undergraduate students from a variety of disciplines, including pre-service teaching, psychology, language and cultural studies, economics, law, and natural sciences. Findings indicated that learners characterized by lower levels of neuroticism reported moderate to high SRL strategy use. Likewise, learners characterized by higher levels of extraversion, conscientiousness, agreeableness, and openness also reported moderate to high SRL strategy use. Achievement was significantly higher for students with high SRL use and high motivation. Finally, students who were most effective at employing SRL strategies were found to exhibit lower neuroticism, as well as higher extraversion, agreeableness, and openness to experiences.

Self-regulated learning in online environments

Online learning environments present a different set of challenges than do traditional settings (Andrade and Bunker 2009; Deimann and Bastiaens 2010; Deimann and Keller 2006; McBrien et al. 2009). Differences include how information is accessed and organized, learner control over instructional scope and pace, and how to address technical issues associated with the online environment.

Table 2 SRL studies, associated variables, and delivery of instruction

Author(s)	Year	Variables explored	Delivery method and audience
Bonaccio and Reeve	2010	Test anxiety, perceptions of test, self-perception, perception of test-taking situations	Face-to-Face, College undergraduates
Chamorro-Premuzic and Furnham	2003	Personality traits, academic achievement (absenteeism, writing and exam scores)	Face-to-Face, College undergraduates
Fadlelmula, Cakiroglu and Sungur	2015	Motivational beliefs, self-efficacy, SRL strategy use, achievement	Face-to-Face, 7th grade Turkish students
Kesici, Baloglu and Deniz	2011	SRL strategy use, statistics anxiety	College undergraduates
Muis	2017	Epistemic beliefs, SRL strategy use	Meta-analysis
Pintrick and DeGroot	1990	Motivational orientation, SRL strategy use, academic performance	Face-to-Face, 7th grade students
Said	2013	Executive functions, time management, metacognitive strategies, self-efficacy	Face-to-Face, College undergraduates
Steiner	2016	Deliberate practice of active reading, time management, environment structuring, metacognitive reflection	Face-to-Face, College undergraduates
Tabachnick, Miller and Relyea	2008	Distal future goals, subgoals, perception of task instrumentality, SRL strategy use	Face-to-Face, College undergraduates
Valle et al	2008	SRL profiles/categories based on time management, metacognition, environment structuring, organization, elaboration	Face-to-Face, College undergraduates
Wilson and Narayan	2016	SRL strategy use, self-efficacy, academic performance	Blended learning, College undergraduates
Zimmerman and Kitsantas	2005	Homework practices and self-efficacy	Face-to-Face, 9-12th grades, Parochial school
Zimmerman and Martinez-Pons	1990	Perceived use of SRL strategies, verbal proficiency, math efficacy	Face-to-Face 5, 8, and 11th grade students

Although research suggests that the need for strong and well-developed self-regulation strategies in online learning environments is essential, distance learners are often found to be less self-regulated than learners in traditional settings (Bol and Garner 2011; King et al. 2000; Muilenburg and Berge 2005; Shih and Gamon 2002; Yukselturk and Bulut 2007).

In a study aimed at enhancing teaching and learning in online courses, Kanuka (2002) noted three important principles to facilitate the use of SRL strategies related to building meaning around course content. Strategy 1 involved providing activities where learners could make sense of the information to be presented, which aligns with Zimmerman's forethought/ phase of SRL. Strategy 2 involved providing activities where learners could generate relationships from the information presented, which related to the performance control phase. Strategy 3 involved providing activities where learners could engage in reflection about the information presented, which related to the self-reflection phase. Moreover, the study highlighted the importance of providing opportunities for learners to develop and use a variety of learning strategies to enhance meaningful understandings.

Lynch and Dembo (2004) identified five self-regulatory skills that were found to be predictive of academic success in online environments: intrinsic goal orientation, self-efficacy for learning, time and study management, help-seeking, and Internet self-efficacy. In subsequent studies, goal setting, self-efficacy, time and study environment, and effort management strategies were established as factors leading to better academic performance in distance education environments (Puzziferro 2008).

Whipp and Chiarelli (2004) provided additional insight into how SRL strategies may be adapted and used in online learning environments. Their findings indicated that although learners used many traditional SRL strategies in online courses, a number of these strategies were adapted to fit the unique requirements of an online environment. They highlighted several adaptations to the use of SRL strategies during the performance phase, such as sorting discussion posts, locating fast computer and Internet connections, utilizing web-based technical support, and frequently checking their scores in the online grade book.

Purpose of the study

The purpose of this study was to investigate the relationship between the Big Five personality traits and the use of SRL strategies. Specifically, sought to extend research on the specific personality traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism as possible predictors of SRL strategy use. Doing so would provide a clearer, more robust portrait of the learner, and allow evidence-based recommendations for instructional designers. The study investigated the extent to which the use of SRL strategies may be impacted by learner differences in terms of Big Five personality traits. This study supports a line of inquiry regarding the predictability of the use of SRL strategies based on the presence of specific personality traits (Bidjerano and Dai 2007; Dörrenbächer and Perels 2016). The following research questions informed the design of the study:

Research Question 1: Do learners who exhibit higher levels of openness, conscientiousness, extraversion, or agreeableness score higher on SRL strategy use than those who exhibit lower levels?

Hypothesis 1a Learners exhibiting higher levels of extraversion, conscientiousness, agreeableness, or openness would report more frequent use of SRL strategies.

Hypothesis 1b Learners exhibiting higher levels of neuroticism would report less frequent use of SRL strategies.

Research Question 2: What are the relationships between personality traits, the number of online courses taken, and the use of SRL strategies?

Hypothesis 2: Learners within an online environment would likely exhibit less frequent use of SRL strategies than those within a face-to-face setting.

Research Question 3: How do learners with different personality trait types describe their SRL strategy?

Hypothesis 3: Interview results with online learners would reflect strategy adaptations particular to on-line contexts not prevalent within a traditional classroom environment.

Method

Research design

The researchers employed a correlational design to explore the interrelatedness between personality traits and the use of self-regulated learning strategies. This research approach is appropriate in that the study aims to explore possible correlations between the two factors as they exist in the learner participant population, rather than changing or modifying existing characteristics (Leedy and Ormrod 2009).

Participants

Participants in this study included 452 graduate students currently enrolled in at least one campus, online, or hybrid course at a large public university in the southeast region of the United States. Table 3 provides an overview of the demographic information. A sub-set of participants ($n=15$), representing the various personality categories, were invited to participate in a follow-up interview.

Instruments

Big five inventory

The BFI (John 1990) is a 44-item measure consisting of five personality scales: extraversion (represented by 8 items), agreeableness (9 items), conscientiousness (9 items), openness (10 items), and neuroticism (8 items). The instrument relies on phrases such as, "I am someone who..." followed by the item statement (e.g., "Has an assertive personality"). Based on a 5-point Likert scale ranging from 1 (Disagree Strongly) to 5 (Agree Strongly), respondents were asked to indicate to what degree they agree with the statement provided.

Reliability and validity of the instrument have been examined across age, gender, and culture (Soto and John 2009; Worrell et al. 2004). Reliability studies yielded coefficient alphas ranging from .70 to .80 and test-retest reliabilities ranging from .75 to .90 across

Table 3 Participants demographics

Survey item	Frequency of responses
Age	
18–25	58
26–35	139
36–45	104
46–55	44
Over 55 non-response	1790
Gender	
Male	119
Female	249
Non-response	84
College	
Arts and letters	31
Business	33
Education	164
Engineering and technology	38
Health sciences	53
Sciences	46
Non-response	87
Level	
Graduate certificate	140
Masters	207
Doctoral	19
Non-response	86
Online courses taken	
1 course	78
2 courses	52
3 courses	28
4 courses	26
5 courses	25
6 or more courses	152
Non-response	91

scale scores. Scores land within acceptable ranges prescribed by Cortina (1993) in terms of instrument length and reliability, intercorrelation, and precision.

Online self-regulated learning questionnaire section

Barnard et al. (2009) developed the Online Self-regulated Learning Questionnaire (OSLQ), which consists of 24 self-report items. Questionnaire items are divided across six subscales: (a) environment structuring, (b) goal setting, (c) time management, (d) help-seeking, (e) task strategies, and (f) self-evaluation. Higher scores on the assessment indicate better self-regulation in online learning environments.

The OSLQ was developed from an 86-item pool and then examined for internal consistency. The results from two confirmatory factor analyses (Barnard et al. 2009) indicated a significant chi-square goodness-of-fit statistic, with $\chi^2(246)=758.79$, $p < .05$ in the first study and $\chi^2(246)=680.57$, $p < .05$ in the second. Moreover, the ratio of chi-square to degrees of freedom was less than 5 for each study ($\chi^2/f=3.08$ and 2.77 respectively), indicating an acceptable fit between the survey and sample data. Furthermore, the values of Tucker Lewis Index and the Comparative Fit Index were .95 and .96 respectively for the first study and .93 and .95 for the second, thus lending additional credence to the fit indices. For ease of administration and completion expediency, BFI and OSLQ items were combined into one survey instrument within separate sections. Sections began with a brief description and general purpose for the items in that section.

Semi-structured interview

Participants who indicated a willingness to participate in a follow-up telephone interview were asked a series of questions to further describe and elaborate upon their experiences with SRL strategy use in more depth. Responses were contrasted by personality trait.

Procedure

Following IRB approval, the recruitment process began with an email sent to all graduate students currently enrolled at the university. All master's and post-master's students enrolled in at least one course during the spring semester were invited to participate in the study.

Participants were informed that they would be asked to reflect on their study habits and attitudes regarding their educational activities to rate their use of various self-regulation strategies.

At the next phase, participants were asked to indicate their willingness to participate in a follow-up telephone interview. The goal was to purposefully sample three participants from each of the Big Five personality trait categories to be interviewed, for a total of 15 interviewees. Selecting the interview sample in this manner necessitated analyzing data from the Big Five survey, determining, and identifying personality trait categories for each participant, and then randomly selecting participants from each category.

Data analysis

Data analysis began by testing assumptions regarding normality of the data. Assumptions of normality were tested via Shapiro–Wilk to further analyze the distribution of differences (Thorndike and Thorndike–Christ 2009). Linear regression analysis was used to investigate the relationship between levels of openness, conscientiousness, extraversion, agreeableness, and neuroticism, overall OSLQ scores, and the use of OSLQ subscales: goal setting, environmental structuring, task strategy, time management, help-seeking, and self-evaluation. Regression analysis was also used to explore the relationship between personality traits, the number of online courses taken, overall OSLQ scores, and the use of goal setting, environmental structuring, task strategy, time management, help-seeking, and self-evaluation SRL strategies.

The use of semi-structured interviews allowed participants to further describe and add meaning to their experiences with the use of self-regulated learning strategies.

Table 4 Means and standard deviations of online strategies for Learning Questionnaire

Subscales	Mean	SD
Goal setting	4.07	.706
Environmental structuring	4.15	.734
Task strategies	2.97	.806
Time management	3.15	.969
Help seeking	3.33	.864
Self-evaluation	3.11	.903

Minimum and maximum scores are based on 5-point Likert scale (1 = Disagree strongly and 5 = Agree Strongly)

Table 5 Means and standard deviations of big five personality inventory

Trait	Mean	SD
Extraversion	26.8	7.50
Agreeableness	35.4	5.35
Conscientiousness	34.3	4.97
Neuroticism	22.7	5.93
Openness	37.4	5.76

Minimum and maximum scores are based on 5-point Likert scale (1 = Disagree strongly and 5 = Agree Strongly)

This interview approach also allowed the researchers to clarify responses or probe more deeply when needed (Gill et al. 2008).

When conducting follow-up interviews, validity, trustworthiness, and credibility were facilitated through a variety of methods. Interviews were conducted within a minimal time gap following completion of the online survey instrument to strengthen the confirmatory potential of the interview. We conducted member checking by restating and clarifying individual responses with each interviewee at the conclusion of the interview. Interview data were analyzed using a breakdown of core themes via connecting related categories and concepts (Strauss and Corbin 1998).

Quantitative results

As presented in Table 4, mean scores for the 24-item OSLQ ranged from 2.97 to 4.15 with standard deviations falling between .706 and .969. Among the six OSLQ subscales, environmental structuring and goal setting strategies were used most frequently by participants (means of 4.15 and 4.07, respectively), while task strategies and self-evaluation were evidenced the least (means of 2.97 and 3.11, respectively). Test for normality indicated that OSLQ data were normally distributed with a $p = .457$.

As shown in Table 5, means scores for the 44-item Big Five Inventory ranged from 22.7 to 37.4, with standard deviations between 4.97 and 7.50. Among the five personality traits measured by the instrument, openness was exhibited most frequently by participants (mean = 37.4), while neuroticism was evidenced by the least (mean = 22.7).

Relationship between personality and self-regulated learning strategy use

Linear regression was used to examine the relationship between overall OSLQ score and each of the four personality traits related to the first research question and hypothesis. The results of the regression analyses indicated that each of the four traits was significantly related to overall OSLQ score gains, although no more than 8% of the variability could be attributed to any particular trait. Openness explained just 1.6% of overall OSLQ score, $F(1, 333)=5.295$, $p < .05$; Conscientiousness explained 7.8%, $F(1,333)=28.103$, $p < .05$; Extraversion explained 3.8%, $F(1, 333)=13.135$, $p < .05$; and Agreeableness explained 5%, $F(1, 333)=17.708$, $p < .05$.

Further regression analyses were conducted to examine the relationship between individual OSLQ subscale scores and each of the four positive personality traits specified in the first research question. As presented in Table 6, openness and conscientiousness explained 50% of the variance in goal setting, $F(5,3423)=22.71$, $p < .05$. Openness and conscientiousness explained 20% of the variance in environmental structuring, $F(5,343)=7.58$, $p < .05$. Agreeableness explained just 3% of the variance in task strategy, $F(5,341)=2.05$, $p < .05$. Conscientiousness explained 5.5% of the variance in time management, $F(5,343)=4.00$, $p < .05$. Extraversion and agreeableness explained approximately 24% of the variance in help-seeking, $F(5,344)=9.46$, $p < .05$. Finally, Extraversion explained 6.5% of the variance in self-evaluation, $F(5,337)=4.65$, $p < .05$.

The second research questions and corresponding hypothesis (1b) pertained to neuroticism as a negative predictor of SRL strategies. Linear regression was used to examine the relationship between overall OSLQ score and neuroticism. Results of the regression indicated that neuroticism was a significant but weak predictor of overall OSLQ score and explained less than 2% of the variance, $F(1,333)=4.250$, $p < .05$. Further regression analyses were conducted to examine the relationships among individual OSLQ subscale scores and the personality trait. Neuroticism was shown to explain 12% of the variance in help seeking, $F(5,341)=2.05$, $p < .05$.

Relationship between personality traits, self-regulated learning, and online instruction

Regression analysis was conducted to examine the relationship between overall OSLQ score, Big Five personality traits, and the number of online courses taken. Results indicated that personality trait and the number of online courses taken was not a significant

Table 6 Influence of personality trait on OSLQ subscales

Personality trait	Subscale	P	R ²
Openness	Goal setting	.034	.249
Openness	Environmental structuring	.018	.100
Conscientiousness	Goal setting	.000	.249
Conscientiousness	Environmental structuring	.000	.100
Conscientiousness	Time management	.016	.055
Extraversion	Help seeking	.000	.121
Extraversion	Self-evaluation	.003	.065
Agreeableness	Task structuring	.018	.029
Agreeableness	Help seeking	.003	.121

predictor of overall OSLQ score, $F(2,339)=1.00$, $p=.368$, $R^2=.006$. However, further regression analysis of individual subscales showed a collective significant effect between personality traits, the number of online courses taken, and one or more subscales.

As shown in Table 7, the combination of high conscientiousness and number of online courses taken was the strongest predictor of goal setting, $F(2,340)=48.71$, $p<.05$, accounting for 22% of the variance. Conscientiousness and the number of online courses taken was the strongest contributor to environmental structuring, $F(2,340)=13.22$, $p<.05$, although the combined effect explained only 7% of the variance. Although statistically significant, agreeableness and number of online courses taken explained less than 3% of the variance in task strategy scores $F(2,340)=4.53$, $p<.05$. Conscientiousness and number of online courses taken was also a significant predictor of time management, $F(2,340)=6.17$, $p<.05$, although the combined effect was weak at just under 4%. Extraversion and the number of online courses taken was the strongest predictor of help-seeking strategy use, $F(2,341)=18.34$, $p<.05$, accounting for nearly 10% of the variance. Finally, extraversion and the number of online courses taken were shown to predict self-evaluation, $F(2,334)=6.75$, $p<.05$, but accounted for only 4% of the variance for that strategy.

Table 7 Combined effect of big five category and number of online courses taken on OSLQ subscales

Personality category	P	R ²
Openness		
Goal setting	.000	.047
Environmental structuring	.022	.022
Conscientiousness		
Goal setting	.000	.223
Environmental structuring	.000	.072
Time management	.002	.035
Help seeking	.004	.031
Self-evaluation	.032	.020
Extraversion		
Goal setting	.000	.048
Help seeking	.000	.097
Self-evaluation	.001	.039
Agreeableness		
Goal setting	.000	.079
Environmental structuring	.004	.031
Task strategies	.011	.026
Time management	.022	.022
Help seeking	.001	.037
Self-evaluation	.035	.035
Neuroticism		
Goal setting	.000	.072
Time management	.020	.023

Qualitative results

Follow-up interviews were conducted to allow participants to further describe and add meaning to their experiences with the use of self-regulated learning strategies. Two to four respondents from each personality trait category were invited to participate in a follow-up interview.

As noted earlier, clustering of topics was used to develop categories which in turn were clustered to develop themes (Strauss and Corbin 1998). The major themes with subcategories emerged: barriers to the successful completion of coursework and how to best prepare for a new course. The responses were coded via personality type (E=extroversion, O=openness, A=agreeableness, C=conscientiousness, and N=Neuroticism).

Barriers to successfully completing coursework

Interviewees from each personality type cited very similar barriers to completing coursework. Among them were work and family obligations that conflicted with coursework, competing deadlines when taking more than one course at a time, and an inability to properly prioritize their work. One interviewee stated that "*Schoolwork tends to be the thing that gives when priorities conflict*" (Participant E2). These issues are related to managing or self-regulating time in the face of conflicting obligations. Another interviewee noted lack of motivation as a barrier to completing coursework, stating that he "*loses motivation to continue with coursework if feedback on previous assignments isn't timely*" Participant E1). An additional obstacle identified by one interviewee was technical issues that could present a barrier to completion of coursework, stating that "*I live in a rural area, so my Internet connection is unreliable*" (Participant E1).

Finally, health issues were identified as a potential barrier to the successful completion of coursework. One interviewee stated that "*family health issues always spring up that take precedence over coursework*" (Participant O2), while another interviewee mentioned general medical issues as having a "*large impact on how much work I can get done*" (Participant C3). Not all interviewees considered barriers associated with conflicting obligations and the resulting time constraints as negative. As noted by one interviewee, "*pressure helps me get it done*" (Participant A1).

Preference for delivery format

Nearly twice as many learners indicated they felt better suited for face-to-face environments than online, while one interviewee indicated equal suitability for both delivery formats. Observations of the lack of social constructs were expressed in terms of missing or inadequate instructor and peer interactions, as well as the absence of nonverbal cues. These findings are consistent with previous research that suggested each of these factors wielded a negative impact on learner perceptions of and satisfaction with online courses (Bambara et al. 2009; El Mansour and Mupinga 2007; Jaggars 2014). To combat the lack of social constructs within an online environment, instructors could include opportunities for synchronous class interactions via optional live sessions that are recorded for those who cannot attend.

Lack of motivation

Perceptions of lack of motivation were expressed in terms of missing or inadequate opportunities for quality feedback and class interactions. These comments are consistent with those garnered in previous studies related to motivation and engagement in online environments, which found that the lack of motivation often led to interrupted engagement, negative emotions, and lower course satisfaction (Artino 2008; Cho and Heron 2015; Cho and Shen 2013; Kauffman 2015). Responses during follow-up interviews were also consistent with Kim and Hodges' (2012) assertion that face-to-face interactions designed to promote positive emotions may be much more difficult to replicate within an online environment. Lack of motivation within the online environment is an area in which the course designer or instructor has several opportunities to help increase learner motivation and engagement.

Preparation at the start of a new course

In response to questions related to preparation at the start of a new course, interviewees again responded quite similarly across personality types. In fact, 13 of the 15 interviewees indicated that their first step in preparation for a new course was to review the syllabus and add due dates to their calendars. Interviewees from several personality classifications described additional approaches to working with their calendars at the start of a new course. One interviewee stated that she "*uses highlighters to denote important dates and deadlines,*" (Participant C2). Another interviewee stated that she "*puts assignment due dates on a calendar that hangs on the frig so that I can see it often*" and added that she generally "*notes due dates as two or three days earlier than actually due*" (Participant A1). Again, this response reflects the importance of time management as self-regulation strategy utilized to prepare for new courses.

Discussion

Opportunities to enhance existing self-regulated learning strategies

Results confirmed our first hypothesis and mirrored those reported by Dörrenbächer and Perels (2016), Bidjerano and Dai (2007), and Ghyasi et al. (2013) in that learners high in openness, conscientiousness, extraversion, and agreeableness were shown to be more skilled self-regulators as measured by strategy use scales. These findings were not surprising, given the various descriptors associated with each personality trait. Learners classified in the openness category are typically considered deep and complex, with a positive attitude toward learning challenges. These characteristics enable them to be flexible and rise to challenges as they occur. The conscientiousness trait is characterized by dependability and responsibility, which enables learners to plan, organize, and persist. Those in the extraversion category are thought to be energetic and enjoy interacting with others, which enables them to excel in class discussions and group projects. Finally, characteristics associated with the agreeableness category include a spirit of cooperativeness and compliance, which enables learners to follow guidelines and respect due dates. Overall, the characteristics and

behaviors associated with the personality traits addressed in RQ1 engender learners who are well-poised to employ a variety of SRL strategies.

Responses during follow-up interviews reinforced these findings, in that those classified high in openness, extraversion, agreeableness, and conscientiousness described frequent and varied use of SRL strategies, particularly time management activities at the forethought phase commonly-cited strategies among all personality traits included syllabus review, marking due dates on a calendar, highlighting different assignment types across different courses, creating to-do lists, spreading work evenly over the term, working ahead on written assignments, setting mini goals, and creating subtasks. These are aligned with task analyses, planning, and goal setting in advance of course demands and tasks.

Regarding the six OSLQ subscales, results indicated that learners high in openness deployed goal setting and environmental structuring strategies more often than those lower in openness. Those high in conscientiousness used goal setting, environmental structuring, and time management more frequently than those lower in conscientiousness. Learners high in extraversion utilized help-seeking and self-evaluation strategies more often than those lower in extraversion, while those high in agreeableness exhibited greater use of task structuring and help-seeking than those lower in agreeableness. These associations are consistent with previous research that showed a positive relationship between various personality traits and commonly deployed SRL strategies (Bidjerano and Dai 2007; Dörrenbächer and Perels 2016; Ghyasi et al. 2013; Mirhashemi and Goodarzi 2014). The confirmatory nature of the current findings relates to the more frequent use of SRL strategies based on high openness, extraversion, agreeableness, and conscientiousness. These previously reported, favorable characteristics have important implications for course designers and educators. Namely, these results provide a research-based foundation from which to approach course development and teaching. That is, these findings highlight the fact that most learners in any given course will likely fall into either the openness, conscientiousness, extraversion, or agreeableness personality trait categories.

Although each learner is unique and individual differences exist, recognizing which strategies most learners are likely to employ allows course designers and instructors to focus on ways to enhance these natural tendencies and foster more effective strategy use. For example, goal setting skills could be fostered with assignments that require learners to submit a plan of action for various stages of the activity. Likewise, time management strategies could be encouraged with assignments that are submitted and graded in phases so that learners cannot wait until the last minute to complete a project.

Opportunities to develop new self-regulated learning strategies

Results supported our hypothesis that learners exhibiting higher levels of neuroticism would report less frequent use of SRL strategies. The hypothesis was partially supported in that those learners classified high in neuroticism were shown to have significantly lower overall OSLQ scores. However, the strength of the relationship was weak, with neuroticism accounting for less than 2% of the variance in overall OSLQ score.

A much stronger relationship was seen between high neuroticism and the use of help-seeking strategies. This finding is not surprising and aligns with previous research indicating that those high in neuroticism are typically underconfident, self-critical, nervous, easily distracted from tasks, and vulnerable when coping with stress or life events (Bidjerano and Dai 2007; Diseth 2003; Kachman 1987; Komaraju et al. 2009; Omheni et al. 2017), all of which can facilitate a need to seek help, guidance, or reassurance. The implications of this

finding for course designers and educators are quite important; that is, they highlight the need to provide opportunities for learners to seek help through a variety of means and can serve to inform dimensions of the design and instructional process.

For example, a course could be designed with a Frequently Asked Questions forum, optional weekly synchronous sessions to facilitate help-seeking for all learners, which could be recorded for those who are unable to attend. Moreover, design and instructional practices similar to those described in the previous section could benefit high neuroticism learners by allowing them opportunities to develop new SRL skills, such as goal setting and time management, which are not part of the typical neuroticism repertoire. Purposeful inclusion of opportunities for knowledge, skill acquisition, and practice of new SRL skills through course materials or activities could greatly benefit high neuroticism learners.

However, admitting the need for help and then seeking it out can be hampered by several variables. As noted by Mahasneh et al. (2012), learners are often hesitant to seek help because of their desire for autonomy, concerns about social embarrassment, structure and presentation of the learning material, social climate of the learning environment, and the threat to their perceived level of competence or ability. As such, it is difficult to determine if those high in neuroticism in the current study use help-seeking strategies but are uncomfortable discussing them (Chan 2009). It may be possible to address this uncertainty in two ways for future studies: (1) conduct follow-up interviews with a larger pool of high neuroticism participants to see if similar response patterns emerge, and (2) include additional interview questions more directly aligned with and related to the use of help-seeking strategies.

Implications for instructional design practices

Research suggests that strong and effective self-regulation in online learning environments is essential for better academic achievement and attainment of learning goals (Cohen and Baruth 2017; Lynch and Dembo 2004; King et al. 2000; Puzifferro 2008; Shih and Gamon 2002). As their familiarity with the online environment increased, learners high in agreeableness made use of goal setting, environmental structuring, task strategy, time management, help-seeking, and self-evaluation more frequently. The findings are informative, in that they provide additional data to further the line of inquiry related to the agreeableness personality trait and its impact on the use of SRL strategies. As noted by Dörrenbächer and Perels (2016), previous research yielded ambiguous conclusions, although results have indicated that agreeableness seems to be a positive factor in learning (Komarraju et al. 2009).

Those high in openness and extraversion, coupled with several online courses taken, deployed some SRL strategies more frequently. Participant responses provided support for these findings as they related to goal setting and time management. However, activities related to environmental structuring were seldom described by participants high in openness or extraversion. Most surprising was that those high in neuroticism reported more frequent use of goal setting and time management as they became more accustomed to online learning. This finding is particularly interesting because goal setting and time management are not strategies commonly deployed by those high in neuroticism, thus highlighting the potential mitigating effect of familiarity and experience within the online environment on goal setting and time management utilization by those high in neuroticism.

Given that the combination of each personality trait and the number of online courses taken was a significant predictor of increased SRL strategy use, it is incumbent upon

schools to provide new online learners with a robust orientation. Rather than using orientations to simply provide cursory information about the school or program, they should be designed to introduce learners to the concepts of SRL and provide opportunities for skill acquisition and practice. Designing orientations in this manner would also allow learners to get their first online course ‘under their belt’ at the beginning of their program of study. Doing so leverages the potential for increased SRL strategy use as subsequent online courses are taken. These findings also have implications for the investment of university resources, in that schools may need to focus more of their design and instructional staff on SRL-specific remediation for online learners.

Feedback could also be delivered via audio or video to enhance interest and learner engagement. Finally, assessments designed to mimic authentic, job-related activities would provide numerous benefits: (1) allow learners to meet some of their professional responsibilities while completing coursework, thus eliminating some of the barriers discussed previously, (2) increase motivation and engagement, (3) positively impact learner autonomy and metacognition, (4) prepare learners for professional employment or improved practice, and (5) facilitate the development of new literacies (Herrington et al. 2006; Palmer 2004; Swaffield 2011; Villarroel et al. 2018; Wiggins 1990).

Lack of accountability was expressed in terms of missing or inadequate pressure from the instructor. Learners admitted to feeling a greater sense of accountability and a heightened desire to do well when they were required to physically attend class and see their instructor and classmates in person. These comments are consistent with previous studies that highlighted some advantages and challenges of online learning, specifically with learners acknowledging the fact that without an instructor physically present to provide pace, order, and conversational cues, accountability waned (Driscoll et al. 2012; Sapp and Simon 2005; Tichavsky et al. 2015). To help combat the lack of accountability felt by online learners, various strategies could be incorporated into the design and instructional processes. Most effective among these strategies are (1) increased learner choice related to learning materials and activities, (2) opportunities for social networking, (3) inclusion of media-rich materials, (4) instructor scaffolding through modeling and timely feedback, (5) student-led discussion forums, (6) peer review of assignments, and (7) group projects with assigned roles and responsibilities (Ardi 2017; Hu and Zhang 2017; Lee 2016; Reinders 2018).

Limitations

There are universal issues related to the use of self-report measures. In completing the Big Five Inventory and the OSLQ, participants were asked to report what they believed to be true about themselves. The accuracy of these self-reports could be called into question, particularly when asked about exhibiting actions or traits that may be construed as negative (Chan 2009). Another issue pertains to external validity. Despite the large sample size, we cannot be certain that the present finding will generalize to non-college populations.

Future research

Acknowledging that learners are capable of thinking and acting in ways that fall outside their dominant personality style provides an interesting avenue for future research related to new SRL skill acquisition. It is important to explore and better understand how under-deployed or ineffective SRL strategies can be improved, as well as how to develop strategies and skills that may be missing in learners. Future research should focus on the

continued pursuit of a full and detailed picture of each learner, particularly as it relates to nonacademic characteristics such as personality type and dominant behaviors. Doing so could afford learner insight in better understanding how their personality traits could affect their performance. Likewise, educators armed with knowledge related to who their learners are from a personality perspective could better develop and facilitate individualized student training related to more effective use of SRL strategies (Illovsky 2010).

Conclusion

Understanding more about the interplay between personality and the use of SRL strategies can enable educators and developers to tailor their course design, instructional methods, learning objects, and assessments based on the dominant personality traits of their learners. For example, a learning environment characterized by novelty, flexibility, and deep learning experiences would likely appeal to those high in openness (Bakker et al. 2015; Chamorro-Premuzic and Furnham 2009; Keller and Karau 2013; Komarraju et al. 2009; Patrick 2011). In contrast, those lower in openness would likely benefit more from an environment that promotes familiar academic experiences and hypothetical–deductive ways of thinking and rewards highly traditional forms of knowledge and skill acquisition (Cohen and Baruth 2017; Keller and Karau 2013).

Determining whether various personality traits are indicative of more frequent deployment of one or more SRL strategies could impact how students are taught. This study has indicated that a propensity towards a particular personality trait can provide a basis to inform the course design, instruction, or support for graduate students. Furthermore, the study indicated that as the number of online courses taken increases, various strategies seem to be employed more frequently. Clarity regarding the relationship between these factors could aid in the development of more effective means by which graduate students are evaluated, oriented, and remediated during their academic careers.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

- Abrami, P. C., Bernard, R. M., Bures, E. M., Borokhovski, E., & Tamim, R. M. (2011). Interaction in distance education and online learning: Using evidence and theory to improve practice. *Journal of Computing in Higher Education*, 23(2–3), 82–103.
- Allport, G. W., & Odbert, H. S. (1936). Trait-names: A psycho-lexical study. *Psychological Monographs*, 47(1), i–171.
- Andrade, M. S., & Bunker, E. L. (2009). A model for self-regulated distance language learning. *Distance Education*, 30(1), 47–61.
- Ardi, P. (2017). Promoting learner autonomy through schoology m-learning platform in an EAP class at an Indonesian University. *Teaching English with Technology*, 17(2), 55–76.
- Artino, A. R. (2008). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. *Journal of Computer Assisted Learning*, 24, 260–270.
- Azevedo, R., & Cromley, J. G. (2004). Does training on self-regulated learning facilitate students' learning with hypermedia? *Journal of Educational Psychology*, 96(3), 523–535.

- Bakker, A. B., Vergel, A. I. S., & Kuntze, J. (2015). Student engagement and performance: A weekly diary study on the role of openness. *Motivation and Emotion, 39*(1), 49–62.
- Bambara, C. S., Harbour, C. P., Davies, T. G., & Athey, S. (2009). The lived experience of community college students enrolled in high-risk online courses. *Community College Review, 36*(3), 219–238.
- Bannert, M., Reimann, P., & Sonnenberg, C. (2014). Process mining techniques for analysing patterns and strategies in students' self-regulated learning. *Metacognition & Learning, 9*(2), 161–185.
- Barak, M., Dori, Y., & Hussein-Farraj, R. (2016). On-campus or online: Examining self-regulation and cognitive transfer skills in different learning settings. *International Journal of Educational Technology in Higher Education, 13*(1), 1–18.
- Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *The Internet and Higher Education, 12*(1), 1–6.
- Barnard-Brak, L., Paton, V. O., & Lan, W. Y. (2010). Profiles in self-regulated learning in an online learning environment. *International Review of Research in Open and Distance Learning, 11*(1), 61–77.
- Bidjerano, T., & Dai, D. Y. (2007). The relationship between the big-five model of personality and self-regulated learning strategies. *Learning & Individual Differences, 17*(1), 69–81.
- Boekaerts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policy makers, educators, teachers, and students. *Learning & Instruction, 7*(2), 161–186.
- Bol, L., & Garner, J. (2011). The challenges of supporting self-regulation in distance education environments. *Journal of Computing in Higher Education, 23*(2–3), 104–123.
- Bol, L., Hacker, D. J., O'Shea, P., & Allen, D. (2005). The influence of overt practice, achievement level, and explanatory style on calibration accuracy and performance. *The Journal of Experimental Education, 73*, 269–290.
- Bonaccio, S., & Reeve, C. L. (2010). The nature and relative importance of students' perceptions of the sources of test anxiety. *Learning & Individual Differences, 20*(6), 617–625.
- Borkowski, J. G. (1996). Metacognition: Theory or chapter heading? *Learning & Individual Differences, 8*, 391–402.
- Britton, B. K., & Tesser, A. (1991). Effects of time-management principles on college grades. *Journal of Educational Psychology, 83*(3), 405–410.
- Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *Internet and Higher Education, 33*, 24–32.
- Brookfield, S. (2009). Self-directed learning. In R. Maclean, D. Wilson, & S. Brookfield (Eds.), *International handbook of education for the changing world of work* (pp. 2615–2627). Dordrecht: Springer.
- Cattell, R. B., & Coan, R. W. (1957). Personality factors in middle childhood as revealed in parents' ratings. *Child Development, 28*(4), 439–458.
- Chamorro-Premuzic, T., & Furnham, A. (2003). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality, 37*, 319–338.
- Chamorro-Premuzic, T., & Furnham, A. (2009). Mainly openness: The relationship between the Big Five personality traits and learning approaches. *Learning and Individual Differences, 19*(4), 524–529.
- Chan, D. (2009). So why ask me? Are self-report data really that bad? In C. E. Lance, & R. J. Vandenberg (Eds.), *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences* (pp. 309–336).
- Cho, M. H., & Heron, M. L. (2015). Self-regulated learning: The role of motivation, emotion, and use of learning strategies in students' learning experiences in a self-paced online mathematics course. *Distance Education, 36*(1), 80–99.
- Cho, M. H., & Shen, D. (2013). Self-regulation in online learning. *Distance Education, 34*, 290–301.
- Cohen, A., & Baruth, O. (2017). Personality, learning, and satisfaction in fully online academic courses. *Computers in Human Behavior, 72*, 1–12.
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78*(1), 98–104.
- De Raad, B., & Schouwenburg, H. C. (1996). Personality in learning and education. *European Journal of Personality, 10*, 303–336.
- Deimann, M., & Bastiaens, T. (2010). The role of volition in distance education: An exploration of its capacities. *The International Review of Research in Open and Distance Learning, 11*(1), 1–16.
- Deimann, M., & Keller, J. (2006). Volitional aspects of multimedia learning. *Journal of Educational Multimedia and Hypermedia, 15*(2), 137–158.
- Digman, J. M. (1972). High school academic achievement as seen in the context of a longitudinal study of personality. *Proceedings of the Annual Convention of the American Psychological Association, 7*(Part 1), 19–20.

- Diseth, Å. (2003). Personality and approaches to learning as predictors of academic achievement. *European Journal of Personality*, *17*(2), 143–155.
- Dörrenbächer, L., & Perels, F. (2016). Self-regulated learning profiles in college students: Their relationship to achievement, personality, and the effectiveness of an intervention to foster self-regulated learning. *Learning & Individual Differences*, *51*, 229–241.
- Driscoll, A., Jicha, K., Hunt, A. N., Tichavsky, L., & Thompson, G. (2012). Can online courses deliver in-class results? A comparison of student performance and satisfaction in an online versus a face-to-face introductory sociology course. *Teaching Sociology*, *40*(4), 312–331.
- Effency, G., Carroll, A., & Bahr, N. (2013). Self-regulated learning: Key strategies and their sources in a sample of adolescent males. *Australian Journal of Educational & Developmental Psychology*, *13*, 58–74.
- Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: The MASRL model. *Educational Psychologist*, *46*(1), 6–25.
- Eilam, B., Zeidner, M., & Aharon, I. (2009). Student conscientiousness, self-regulated learning, and science achievement: An explorative field study. *Psychology in the Schools*, *46*(5), 420–432.
- El Mansour, B., & Mupinga, D. M. (2007). Students' positive and negative experiences in hybrid and online classes. *College Student Journal*, *41*(1), 242–248.
- Fiske, D. W. (1949). Consistency of the factorial structures of personality ratings from different sources. *The Journal of Abnormal and Social Psychology*, *44*(3), 329.
- Geisler-Brenstein, E., Schmeck, R. R., & Hetherington, J. (1996). An individual difference perspective on student diversity. *Higher Education*, *31*(1), 73–96.
- Ghyasi, M., Yazdani, M., & Farsani, M. A. (2013). The relationship between personality types and self-regulated learning strategies of language learners. *International Journal of Applied Linguistics and English Literature*, *2*(4), 74–82.
- Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: Interviews and focus groups. *British Dental Journal*, *204*(6), 291–295.
- Hacker, D. J., & Bol, L. (2019). Calibration and self-regulated learning: Making the connections. In J. Dunlosky & K. Rawson (Eds.), *Cambridge handbook on cognition and education*. Cambridge, UK: Cambridge University Press.
- Häfner, A., Stock, A., & Oberst, V. (2015). Decreasing students' stress through time management training: An intervention study. *European Journal of Psychology of Education*, *30*(1), 81–94.
- Herrington, J., Reeves, T. C., & Oliver, R. (2006). Authentic tasks online: A synergy among learner, task, and technology. *Distance Education*, *27*(2), 233–247.
- Hattie, J. (2009). *Visible learning*. London: Routledge.
- Heckhausen, H., & Kuhl, J. (1985). From wishes to actions: The dead ends and short cuts on the long way to action. In M. Frese & J. Sabini (Eds.), *Goal-directed behavior: The concept of action in psychology* (pp. 134–159). Hillsdale, NJ: Erlbaum.
- Hu, P., & Zhang, J. (2017). A pathway to learner autonomy: A self-determination theory perspective. *Asia Pacific Education Review*, *18*(1), 147–157.
- Illovsky, M. E. (2010). Psychological comparisons of undergraduate and graduate college of education students. *International Journal of Teaching & Learning in Higher Education*, *22*(3), 238–245.
- Jaggars, S. S. (2014). Choosing between online and face-to-face courses: Community college student voices. *American Journal of Distance Education*, *28*(1), 27–38.
- John, O. P. (1990). The "Big Five" factor taxonomy of personality in the natural language and in questionnaires. In L. A. Pervin (Ed.), *Handbook of personality theory and research* (pp. 66–100). New York: Guilford.
- Kachman, D. J. (1987). The effects of rational emotive education on the rationality, neuroticism and defense mechanisms of adolescents. *Doctoral diss.*, Dissertations, 2256.
- Kanuka, H. (2002). Guiding principles for facilitating higher levels of web-based distance teaching and learning in post-secondary settings. *Distance Education*, *23*(2), 163–182.
- Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*. <https://doi.org/10.3402/rlt.v23.26507>.
- Karabenić, S. A. (2011). Classroom and technology-supported help seeking: The need for converging research paradigms. *Learning and Instruction*, *21*, 290–296.
- Keller, H., & Karau, S. J. (2013). The importance of personality in students' perceptions of the online learning experience. *Computers in Human Behavior*, *29*(6), 2494–2500.
- Kesici, S., Baloglu, M., & Deniz, M. E. (2011). Self-regulated learning strategies in relation with statistics anxiety. *Learning & Individual Differences*, *21*(4), 472–477.

- Khaled, A., Gulikers, J., Biemans, H., & Mulder, M. (2016). Occurrences and quality of teacher and student strategies for self-regulated learning in hands-on simulations. *Studies in Continuing Education*, 38(1), 101–121.
- Kim, C., & Hodges, C. B. (2012). Effects of an emotion control treatment on academic emotions, motivation and achievement in an online mathematics course. *Instructional Science*, 40, 173–192.
- King, F. B., Harner, M., & Brown, S. W. (2000). Self-regulatory behavior influences in distance education. *International Journal of Instructional Media*, 27(2), 147.
- Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Computers & education*, 104, 18–33.
- Komaraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. *Learning & Individual Differences*, 19(1), 47–52.
- Lee, L. (2016). Autonomous learning through task-based instruction in fully online language courses. *Language Learning & Technology*, 20(2), 81–97.
- Leedy, P. D., & Ormrod, J. E. (2009). *Practical research: Planning and design*. Upper Saddle River, NJ: Pearson.
- Lynch, R., & Dembo, M. (2004). The relationship between self-regulation and online learning in a blended learning context. *International Review of Research in Open & Distance Learning*, 5(2), 1–13.
- Mahasneh, R. A., Sowan, A. K., & Nassar, Y. H. (2012). Academic help-seeking in online and face-to-face learning environments. *E-Learning and Digital Media*, 9(2), 196–210.
- McBrien, J. L., Jones, P., & Cheng, R. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *International Review of Research in Open & Distance Learning*, 10(3), 1–17.
- McMahon, M., & Luca, J. (2001). Assessing students' self-regulatory skills. *Australasian Society for Computers in Learning in Tertiary Education*, 427–434.
- Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, 106(1), 121.
- Mezirow, J. (1990). How critical reflection triggers transformative learning. Fostering critical reflection in adulthood. *A Guide to Transformative and Emancipatory Learning*, 1, 20–25.
- Mirhashemi, M., & Goodarzi, H. (2014). Self-regulated learning strategies: The role of personal factors (motivational beliefs and Personality). *Journal of Educational and Management Studies*, 4(1), 152–161.
- Muilenburg, L. Y., & Berge, Z. L. (2005). Student barriers to online learning: A factor analytic study. *Distance Education*, 26(1), 29–48.
- Nelson, K. G., Shell, D. F., Husman, J., Fishman, E. J., & Soh, L. K. (2015). Motivational and self-regulated learning profiles of students taking a foundational engineering course. *Journal of Engineering Education*, 104(1), 74–100.
- Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, 31(2), 199–218.
- Norman, W. T. (1967). 2800 personality trait descriptors: Normative operating characteristics for a university population. *U.S. Department of Health, Education, and Welfare, Report 014738*.
- Omheni, N., Kalboussi, A., Mazhoud, O., & Kacem, A. H. (2017). Recognition of learner's personality traits through digital annotations in distance learning. *International Journal of Distance Education Technologies*, 15(1), 28–51.
- Palmer, S. (2004). Authenticity in assessment: Reflecting undergraduate study and professional practice. *European Journal of Engineering Education*, 29(2), 193–202.
- Patrick, C. L. (2011). Student evaluations of teaching: Effects of the Big Five personality traits, grades and the validity hypothesis. *Assessment & Evaluation in Higher Education*, 36(2), 239–249.
- Peabody, D., & Goldberg, L. R. (1989). Some determinants of factor structures from personality-trait descriptors. *Journal of Personality and Social Psychology*, 57(3), 552.
- Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research*, 31(6), 459–470.
- Pintrich, P. R. (2002). The role of metacognitive knowledge in learning, teaching, and assessing. *Theory into Practice*, 41(4), 219–225.
- Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review*, 16(4), 385–407.
- Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82, 33–40.

- Pintrich, P. R., Roeser, R. W., & De Groot, E. A. (1994). Classroom and individual differences in early adolescents' motivation and self-regulated learning. *The Journal of Early Adolescence, 14*(2), 139–161.
- Puustinen, M., & Pulkkinen, L. (2001). Models of self-regulated learning: A review. *Scandinavian Journal of Educational Research, 45*(3), 269–286.
- Puzziferro, M. (2008). Online technologies self-efficacy and self-regulated learning as predictors of final grade and satisfaction in college-level online courses. *American Journal of Distance Education, 22*(2), 72–89.
- Reinders, H. (2018). *Technology and autonomy. The TESOL encyclopedia of English language teaching*. New York: Wiley.
- Ridley, D. S., Schutz, P. A., Glanz, R. S., & Weinstein, C. E. (1992). Self-regulated learning: The interactive influence of metacognitive awareness and goal-setting. *Journal of Experimental Education, 60*(4), 293–306.
- Sapp, D. A., & Simon, J. (2005). Comparing grades in online and face-to-face writing courses: Interpersonal accountability and institutional commitment. *Computers and Composition, 22*(4), 471–489.
- Shell, D. F., & Soh, L. K. (2013). Profiles of motivated self-regulation in college computer science courses: Differences in major versus required non-major courses. *Journal of Science Education and Technology, 22*(6), 899–913.
- Shih, C. C., & Gamon, J. A. (2002). Relationships among learning strategies, patterns, styles, and achievement in web-based courses. *Journal of Agricultural Education, 43*(4), 1–11.
- Soto, C. J., & John, O. P. (2009). Ten facet scales for the Big Five Inventory: Convergence with NEO PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in Personality, 43*(1), 84–90.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Grounded theory procedures and techniques*. Thousand Oaks, CA: Sage.
- Swaffield, S. (2011). Getting to the heart of authentic assessment for learning. *Assessment in Education: Principles, Policy and Practice, 18*(4), 433–449.
- Tezci, E., Sezer, F., Aktan, S., & Gurgan, U. (2016). Do lifestyles shape self-regulated learning strategies? *Eurasian Journal of Educational Research, 65*, 239–258.
- Thorndike, R. M., & Thorndike-Christ, T. M. (2009). *Measurement and evaluation in psychology and education* (8th ed.). Boston, MA: Pearson.
- Thurstone, L. L. (1934). The vectors of mind. *Psychological Review, 41*, 1–32.
- Thurstone, L. L. (1951). The dimensions of temperament. *Psychometrika, 16*, 11–20.
- Tichavsky, L. P., Hunt, A. N., Driscoll, A., & Jicha, K. (2015). It's just nice having a real teacher: Student perceptions of online versus face-to-face instruction. *International Journal for the Scholarship of Teaching and Learning, 9*(2), 2.
- Tupes, E. C., & Christal, R. C. (1958). *Stability of personality trait rating factors obtained under diverse conditions*. Wright Air Development Center, Wright-Patterson AFB, OH. (No. WADC-TN-58-61).
- Tupes, E. C., & Christal, R. C. (1961). *Recurrent personality factors based on trait ratings*. Wright-Patterson AFB, OH: Wright Air Development Center.
- Valle, A., Núñez, J. C., Cabanach, R. G., González-Pianda, J. A., Rodríguez, S., Rosário, P., et al. (2008). Self-regulated profiles and academic achievement. *Psicothema, 20*(4), 724–731.
- Varela, O. E., Cater, J. J., & Michel, N. (2012). Online learning in management education: An empirical study of the role of personality traits. *Journal of Computing in Higher Education, 24*(3), 209–225.
- Villarroel, V., Bloxham, S., Bruna, D., Bruna, C., & Herrera-Seda, C. (2018). Authentic assessment: Creating a blueprint for course design. *Assessment & Evaluation in Higher Education, 43*(5), 840–854.
- Whipp, J. L., & Chiarelli, S. (2004). Self-regulation in a web-based course: A case study. *Educational Technology Research and Development, 52*(4), 5–21.
- Wiggins, G. (1990). The case for authentic assessment. *Practical Assessment, Research & Evaluation, 2*(2), 28–37.
- Wilson, K., & Narayan, A. (2016). Relationships among individual task self-efficacy, self-regulated learning strategy use and academic performance in a computer-supported collaborative learning environment. *Educational Psychology, 36*(2), 236–253.
- Winne, P. H. (1996). A metacognitive view of individual differences in self-regulated learning. *Learning & Individual Differences, 8*, 327–353.
- Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated engagement in learning. In D. Hacker, J. Dunlosky, & A. Graesser (Eds.), *Metacognition in educational theory and practice*. Hillsdale, NJ: Erlbaum.
- Worrell, F. C., & Cross, W. E. (2004). The reliability and validity of Big Five Inventory Scores with African American college students. *Journal of Multicultural Counseling and Development, 32*, 18–32.

- Yukselturk, E., & Bulut, S. (2007). Predictors for student success in an online course. *Journal of Educational Technology & Society*, *10*(2), 71–83.
- Yukselturk, E., & Top, E. (2013). Exploring the link among entry characteristics, participation behaviors and course outcomes of online learners: An examination of learner profile using cluster analysis. *British Journal of Educational Technology*, *44*(5), 716–728.
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*, 329–339.
- Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, *33*(2–3), 73–86.
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70.
- Zimmerman, B. J. (2005). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Burlington, MA: Elsevier.
- Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology*, *82*(1), 51–59.

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