The Cognitive Agility and its relationship to Self-Regulation and Self-efficacy among pre-service Teachers[1]

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Abstract.

This research was designed to analyze the relationship between cognitive agility and both self-regulation and self-efficacy among pre-service teachers. The study was conducted on a sample of 210 pre-service teachers (97 males/ 113 females). Three scales were applied: the first is the Cognitive Agility Scale (CAS), which consists of five dimensions; cognitive flexibility, cognitive openness, attention focus, common sense, and emotional flexibility, the second is the self-regulation Questionnaire (SRQ) which consists of four dimensions: planning, monitoring, adjusting, and reflecting, and the third is the self-efficacy Questionnaire (SEQ) to measure pre-service teachers' social, academic, and emotional self-efficacy (developed by the researcher). For this study, using the descriptive approach and appropriate statistical methods The scores of the dimensions of self-regulation and self-efficacy of pre-service teachers were positively related to the scores of the dimensions of cognitive agility and the total score, there are statistically significant differences between males and females in common sense and emotional agility in favor of females, while in cognitive flexibility, cognitive openness, attention focus and cognitive agility in favor of males; there are differences between high and low levels in self-regulation and self-efficacy, in cognitive agility in favor of high levels, and the two-way interactions between: gender and levels of self-regulation, gender and levels of self-efficacy, levels of self-regulation and levels of self-efficacy affect in the cognitive agility. This study provides insights into the interactive effects of self-regulation, self-efficacy and cognitive agility. This may help in developing self-regulation and self-efficacy strategies to enhance the dimensions of cognitive agility and the total score of pre-service teachers.

Keywords: cognitive agility, self-regulation, self-efficacy.

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Introduction

Good's definition of mental agility provided at the beginning of this article seems narrow. Therefore, we will proceed by adding Hutton and Turner's (2019) thoughts on the constructs associated to cognitive agility. Among other things, they discuss an important new dimension into their view of cognitive agility, and that is "the value of experience and experiential learning in supporting the development of adaptive expertise (2019). Researching the work on adaptive expertise, Hutton et al. (2017) found it worthy to highlight the importance of sole experience in the construct of cognitive agility, a concept which is not explicitly included in any of the models proposed by Good (2009). As can be understood from Hutton et al. (2017), the concept of adaptive expertise includes three scientific domains that were covered in their literature-synthesis: adaptively, skilled performance, and skill development. Even though all three can be related back to focused attention, cognitive openness, and cognitive flexibility (and these constructs are indeed precursors and topics of interests in said areas) experience is an inevitable human factor that cannot be neglected when discussing cognitive agility. Just as each person has their own distinctive way of answering a personality questionnaire, and it is their way of answering that makes up what is called a personal equation, one's experience is a factor that could have an impact on how a person could react and adapt in a given situation. For this reason, cognitive agility, when discussed about in terms of models or in terms of its development, must include an individual aspect, not just a formula with generalized constructs for use.

Cognitive agility is cognitive flexibility, and flexibility means speed, flexibility and accuracy, and it is a skill and mastery, and one of the distinctive aspects of cognitive flexibility is the ability to adapt in dynamic environments in real time by dismantling the concepts that form cognitive structures, or simplifying concepts and taking the necessary measures to meet the need when adapting mental structures. The multidimensionality that combines cognitive openness, cognitive flexibility and focus of attention increases high levels of individual performance (Ross, Miller and Doster, 2018).

Research Problem

Ellis believes that a person results from his ways of thinking and dealing, and the main cause of emotional disorders that a person suffers from is due to the irrational methods by which the individual perceives his surroundings (Abu

Kaizan and Al-Shayyab, 2017), The individual's thoughts and perception of his experiences and emotions are reflected in his behavior patterns that lead to adaptation, and explain aspects of his ability to adapt the cognitive structure (Business, 2009) that faces the factor of time and the impact of individual differences in filtering, and coding the information that needs to be interpreted. Operations with a balanced and appropriate amount require a long time and distributed training, thus classifying distributed deep learning systems (Langer et all., 2020).

Students of curricula and cognitive scholars have begun to focus on the agility of moving and presenting knowledge, and the agility of building knowledge has become an important requirement that has a role in the reality of performance. (LePine et. al.2000 Good,2009; Gordon,2009) Some scholars assume that knowledge agility is merely a simplification and deconstruction of concepts that meets the need to strengthen and learn skills that lead to the adaptation of cognitive structures in interactive reality and in time (Goleman,1998; Calarco, & Gurvis, 2006). Adaptive and flexible at the same time (Al-Fil, 2020), and perhaps the most important single idea in the concepts of the individual and the system of cognitive structures to harmonize the cognitive structure with the structure produced through learning. The study of cognitive agility in different groups recommended the studies of Bedford (2011) and Good (2009). Cognitive Agility comes as an indicator of self-Regulation and self-efficacy, the researcher did not find - to the extent of his knowledge- a study that illustrates the link between cognitive agility, Self-Regulation and Self-efficacy among pre-service Teachers, despite his research in various Arabic and foreign rules. Neither studying the differences - as far as he is aware - which means that there is a research problem that needs a specialized scientific study.The research problem is summarized in the following questions:

1. What is the relationship of cognitive agility, self-Regulation and self-efficacy among pre-service Teachers?

2. What are the differences in each of the gender and cognitive agility, among pre-service teachers, according to self-Regulation and Self-efficacy?

Research purposes

1. Study the relationship between cognitive agility, self-regulation and self-efficacy among pre-service teachers.

2. Examine the differences in both gender and cognitive agility among pre-service teachers according to self-regulation and self-efficacy.

Research Importance

The importance of the research stems from its treatment of contemporary and pivotal variables in personality, learning, and psychology; cognitive and positive. Cognitive agility matches the habits of the mind, adapting knowledge to mental processes that are commensurate with the extent of attention, focus and motivating it for flexible handling and openness to knowledge. Cognitive agility (CA) integrates with Cognitive ability to increase general intelligence and improve an individual's ability to switch between highly focused states to broader external levels of awareness, enable dynamic decision-making.

The cognitive inputs feed the strategic mind, interact with the long-term memory, stores experiences and capabilities to develop creativity and be more in line with the state of the diversity of situations" based on prediction, experience and work analysis based on progressive strategic thinking towards the most creative path, psychological flexibility", its importance stems from being an ideal performance degree of psychological vital energy that facilitates the functions of the mind, facilitates learning and training, and helps the teacher to control his thoughts and enhance his ability to control his reactions and emotions., improves the reception and processing of information, and is a factor - during and after - self-realization at the same time, and increases the ability to deal with uncertainty, and includes the individual's sense of independence, his ability to environmental mastery, and the continuity of his personal development. In addition to the above, this research is considered an important scientific addition and enrichment of specialized human knowledge, as the title of the research did not match any article according to the originality report, the researcher's review of sources,

the web, Google Scholar, and the Psychological Science Network. Which indicates that this title: The cognitive agility and its relationship to self-regulation and self-efficacy among pre-service teachers can be considered an original research.

Literature Review

Self-regulation is an integral part of learning (Park & Kim, 2020; Panadero et al., 2016; Zimmerman, 2008). “Self-regulation (or self-regulated learning) refers to the thoughts, feelings, and actions that are self-generated and systematically planned and adapted as needed to influence learning and motivation” (Schunk & Ertmer, 2000, p. 631). Self-regulation involves the process by which learners engage in behaviors that help them achieve academic goals. While many studies have been conducted to understand self-regulation in greater depth.

Self-regulation is an integral aspect of social cognitive theory. Self-regulated learning can be defined as "an active and constructive process through which learners set goals for their learning and then attempt to monitor, regulate, and control their cognitions, motivations, and behavior, guided and constrained by their goals and contextual features in the environment" (Pintrich, 2005, p. 453). Learners who practice self-regulation believe that learning is a systematic process and that learning outcomes can be controlled. Thus, they take responsibility for their learning by engaging in self-regulatory strategies (Pintrich, 2005; Park & Kim, 2020).

Self-regulation identifies the strategies that individuals consciously adopt to achieve their goals (Schunk and DiBenedetto, 2020). Self-regulation strategies can be broadly classified into three categories: behavioral, which involves self-monitoring; environmental, which involves modifying environmental conditions; and covert, which involves modifying cognitive and emotional states (Zimmerman and Kitsantas, 2005). Some of the key self-regulation strategies are planning and organizing, resisting distractions, making the environment more conducive to learning, self-monitoring behavior, self-reflection, managing resources such as time and effort, paying attention to tasks, and having a self-improvement mindset (Kizilcik et al., 2016; Panadero, 2017). There are many models in the literature to study the concept of self-regulation construct. One of the most popular and comprehensive models used in academic research is the three-stage cyclical model developed by Zimmerman (Panadero and Tapia, 2014; Panadero, 2017). As each stage reinforces the next stage resulting in a self-sustaining cyclical process, there is a spiral effect that leads to more effective outcomes (Zimmerman & Moylan, 2009, p. 304). Each stage in the cyclical self-regulation model is influenced by the environment as detailed in the self-perception theory. The self-regulatory approaches adopted by the individual regulate both skill and volitional behaviors providing a comprehensive learning environment and leading to more effective learning (Schunk, 2012).

The first stage, precontemplation, provides a platform for performance. The second stage, performance, explains how learning influences cognition and affect. The third stage, self-reflection, provides evaluative feedback to learners. Theorists state that self-regulated learners are driven by self-efficacy and that self-efficacy and self-regulation reinforce each other (Bandura, 1977; 2006; Valverde-Berrocoso et al., 2020).

Self-efficacy is defined as "the belief in one's ability to organize and execute the course of action required to produce certain accomplishments" (Bandura, 1977, p. 3). Self-efficacy in cognition can be captured through the four

elements detailed in social cognitive theory (Bandura, 1977). These four elements are personal mastery, which entails developing knowledge, skills, and abilities; vicarious learning, which refers to gaining confidence by observing someone else performing the same task; verbal persuasion, which refers to developing persuasion through listening; and emotional arousal, which refers to gaining power (Bandura, 1977; 1986). Social cognitive theory also explains the importance of domain-specific forms of self-efficacy. Domain-specific self-efficacy, such as academic self-efficacy or online self-efficacy, can have differential effects on learning (Bandura, 2006). This distinction helps emphasize greater specificity in achieving superior learning outcomes.

Academic self-efficacy can be defined as "the belief that one can successfully perform behaviors that can lead to superior academic outcomes" (Bandura, 1977, p. 193). Individuals who demonstrate high academic self-efficacy are able to regulate their learning more effectively (Bandura, 2006), and thus academic self-efficacy has a higher positive association with positive learning outcomes (Schunk, 2012). Empirical studies confirm that academic self-efficacy is positively related to outcomes even when learning occurs in an e-learning environment (Moreno et al., 2017). This hypothesis is also supported by the literature in self-efficacy theory which asserts that "the positive relationship between the strength of an individual's self-efficacy and the likelihood of successful performance is nearly identical for similar and dissimilar tasks at 84% for the individual" (Bandura, 1977; 2006).

Internet self-efficacy refers to "the confidence and comfort an individual has in working online. Internet self-efficacy refers to the level of comfort with computers or digital devices, as well as the ability to navigate the nuances of online communication" (LaRose & Eastin, 2004). Research confirms that prior training and experience in using the Internet increases Internet self-efficacy. Individuals with high levels of Internet self-confidence are more likely to adopt self-regulation, leading to higher positive associations with learning outcomes even in e-learning environments (LaRose & Eastin, 2004; Paraskeva et al., 2009; Landrum, 2020).

Self-efficacy and Self-Regulation

Learning outcomes can be measured statistically to investigate the magnitude of change between constructs. For example, in a pilot study, the correlation between prior grades and subsequent grades was found to be r = .23. However, when self-efficacy mediated this relationship, the actual correlation was r = .56; indicating a 26% increase in the expected correlation (Zimmerman et al., 1992). Clearly, self-efficacy can positively influence

academic learning outcomes. Furthermore, "the positive relationship between the strength of self-efficacy and the likelihood of successful performance is nearly identical for similar and dissimilar threats at 84%" (Bandura, 1977). Thus, we present our case; that self-efficacy can positively influence academic learning outcomes in all learning environments; traditional learning and e-learning (Bandura, 1977; Zimmerman et al., 1992; 2009; Pintrich, 2005).

Existing literature from social cognitive theory also highlights that self-efficacy and self-regulation are mutually reinforcing (Schunk and Ertmer, 2012). Individuals who exhibit these behaviors develop the motivation to achieve superior learning outcomes in both traditional and online learning environments. The behavioral mechanisms inherent in self-efficacy and self-regulation also promote and foster cognitive growth that facilitates learning (Bradley, Brown, & Kelley 2017; Schunk and DiBenedetto, 2020). Self-regulated learners are more motivated, exhibit more proactive behaviors toward goal achievement, and set more challenging goals that enable learning effectiveness in any environment (Yusuf, 2011); Ayllón, Alsina & Colomer, 2019).; Chopra and Madan, 2021).

Cognitive agility is a newly studied complex structure that combines cognitive flexibility, cognitive openness, and attention focus. Good (2009) indicated that it plays a rapid coordinating role to reconcile openness and attention focus to benefit from successive information, especially in a dynamic environment rich in stimuli. Despite the importance of the role of cognitive flexibility, it is not sufficient to follow the cognitive processing of continuous environmental perceptions. The role of cognitive agility is to create integration, coordination, and balance between cognitive processes according to changing circumstances, and leads to adaptation to the requirements of unfamiliar tasks within an appropriate time. Good and Yeganeh (2012) emphasized the role of awareness in the smooth movement between the components of cognitive agility, to create integration between cognitive and conceptual attention, and to control the work of the senses during cognitive openness through cognitive flexibility, to adapt to the changes occurring in the environment and the individual interacts with them through cognitive openness. Therefore, practicing mindfulness contributes to improving its work.)

The concept of cognitive agility and its distinction from organizational flexibility is illustrated by the following:

It deals with dynamic cognitive environments rich in diverse events or circumstances or harsh conditions, so the speed of learning depends on the

ability to learn new competencies in order to perform for the first time and evaluate the individual's ability to learn from experience and performance and learn from experience. Learning goals are set because they are aware of themselves and understand their own goals. Strengths and weaknesses, which they use to determine personal development goals. Taking a proactive stance towards problems and opportunities. Reflecting on their experiences, examining their assumptions and methods. Acting with integrity, having the courage to take a stand and take risks, and being willing to participate in solving problems (Lombardo & Eichinger, 2000; McCauley, 2001)

A concept that has the potential to provide a human performance edge for innovation success is cognitive agility. This thinking capability supports how individuals gain control over their own biases and better prepare themselves to meet their own and other's counterproductive behaviour. Considering the profile challenges presented earlier, cognitive agility can ease individual and collective/collaborative decision making based on various situational factors, whether they present opportunities or constraints. Specifically, cognitive agility can be understood as an individuals' metacognitive strategy proficiency to meet objectives with situational constraints (Hutton et al., 2020). AI presents multiple situational constraints when it is applied in contexts that demand such things as consideration of physical world implications, ethical dilemmas, legal aspects, strategic and operational level business effects, and adversarial interference. Innovations where the task characteristics require effective coordination between multiple agents and asset types (human, technical, tangible and intangible) to build understanding and expedite collaboration will likely benefit from self-governing individuals with openness, flexibility, and adaptability: the psychological characteristics of cognitive agility (Hutton and Turner, 2019)

It is apparent that entrepreneurs and developers need to function with cognitive agility if they are to be effective across multiple thinking spaces. They need to have an understanding about the benefits and opportunities AI has to offer, whilst also understanding how the other

person's personality constellation functions and how this can influence the development process. Metacognition includes the combination of self-awareness, self-regulation and awareness of the role of other actors. Developing metacognition will help decrease time losses due to individual biases, preferences and needs, and avoiding communication failures. In turn this would increase productivity by developing a theory of mind of the other person's approaches based on their personality preferences and cognitive approaches to decisionmaking (Conway et al., 2019)

Self-efficacy is a person's assessment of their ability to complete specific tasks (Bandura, 1997; Mukti, & Tentama, 2020). It influences people's thinking patterns and emotional responses, how much effort they put into an activity, how long they persist when faced with challenges, and how resilient they are in unpleasant situations (Phan, 2012). Highly self-efficacy individuals view difficult tasks as challenges to be overcome rather than threats to be avoided (Peteros, 2021). Mastery experiences shape self-efficacy beliefs by interpreting performance on specific tasks (Cuevas & Berou, 2016). Furthermore, self-efficacy beliefs influence an individual's development and change through life choices and possibilities (Bandura, 2012; Ozcan, & Kültür, 2021).

Self-efficacy has also been associated with the use of deep learning methodologies, high motivation, and a positive attitude toward mathematics. Students with high self-efficacy can perform better because they are capable of high cognitive performance, have extra motivation to face difficulties, have much less anxiety, and are more interested in learning (Watson, 2015). In the classroom, teachers should allow students to learn more successfully through different learning tasks that are completed individually, in pairs, or in groups. These successful experiences improve students' performance and further contribute to the development of beliefs about self-efficacy. In addition, the presence of teachers and classmates in the classroom environment can encourage students to improve their performance in school (Ozcan, & Kültür, 2021).

Research Hypotheses

According to the literature Review, the research questions can be answered with the following hypotheses:

1. There is a statistically significant correlation between cognitive agility, self-regulation, and self-efficacy among pre-service teachers

2. There are statistically significant differences in both gender and cognitive agility among pre-service teachers according to self-regulation and self-efficacy.

Method

Research method

A descriptive research design was used in this study as it attempted to collect data about cognitive agility and their association with self-regulation and self-efficacy. Cognitive agility include; cognitive flexibility, cognitive openness, focused attention, common sense and emotional agility; Self-Regulation

include, planning, monitoring, adjusting, and reflecting. This research design is best suited for studies that aim to describe the nature of situations as they existed at the time of the study and to explore the cause of a particular phenomenon. Among the different types of descriptive research design, four of them have been properly applied: survey, in-depth study, correlation, and comparison.

Participants: The sample of this study consisted of 210 pre-service teachers graduated in the basic education in the Zagazig university. 113 of the teachers were females , while 97 were males. The teachers' ages in both groups ranged from 22 to 23 years. The participants were selected by convenience random sampling.

Data Collection Instruments

1-The cognitive agility scale. The scale in its final form consists of (48) items that measure five dimensions; cognitive flexibility, cognitive openness, focused attention, common sense and emotional agility. Each item is answered by choosing alternatives, which is estimated according to a five-point scale (1-5). The researcher prepared the scale in its initial form, and it was presented to arbitrators by experts with specializations in psychology, psychometric health, and those who examined the paragraph's correlation with the dimension and its suitability to the nature of the sample and the objectives of the research, and the suitability of the paragraphs of the scale to the Arabic language environment, and after verifying the apparent validity and truthfulness of the content, the researcher applied the scale to a reconnaissance sample to extract psychometric characteristics:

2- Self-regulation questionnaire, to assess the respondents' level of self-regulation, which has 22 items categorized into four components: planning, monitoring, adjusting, and reflecting. The respondents were asked to rate the items based on their self-regulation self-assessment using a 5-point Likert scale from 1 (Not Very Like Me) to 5 (Very Like Me) The reliability coefficients of the sub-dimensions of the scale were, planning 0.77 , for monitoring, 0.68 for adjusting, 0.73 for reflecting 0.69 . The results of the fit statistic obtained with CFA were as follows: AGFI = 0.84, RMSEA = 0.064, NNFI= 0.89, RMR = 0.060, and SRMR = 0.060.

3- Self-efficacy scale (SES): The scale was developed by researcher to measure the social, academic, and emotional self-efficacy of pre-service teachers aged 22-23. There are seven items in each sub-dimension of the scale consisting of 21 items. SEC is a 5-point Likert-type scale (1 = none and 5 = very good). Total self-efficacy is calculated by adding the points obtained from the relevant article of each sub-factor. The high score obtained from the

scale indicates that the teachers' self-efficacy level is high, and the low score obtained from the scale indicates that the self-efficacy level of the teachers is low. In the confirmatory factor analysis,

the ft index values were found as RMSEA = 0.04, NFI = 0.95, CFI = 0.96, GFI =0.94 and SRMR = .06. General Self-Efficacy Scale was used to determine the criterion-referenced validity of the scale. Pearson Product Moment Correlation was found to be 0.57 ($p < .01$) between the points obtained by the implementation of two scales. The internal consistency coefficients of SEC were calculated as.86 for the overall scale 0.85 for the sub- dimensions of academic self-efficacy 0,67 for social self-efficacy, and 0.78 for emotional self-efficacy. It was seen that test-retest reliability coefficients of the scale varied between 0.74 and 0.88 the reliability coefficient of SEC was assumed to be sufficiently reliable.

Process

Instruments were administered in the fall term of 2023-2024 academic year. Before implementation, permission was granted from responsible authorities. Afterwards, the researcher went to the specified schools and conducted the study with voluntary pre-service Teachers.

Analysis of Data

The quantitative data collected through a questionnaire survey were analyzed with Two-way Analysis of Variance (ANOVA). Through this statistical analysis, the influence of two different categorical independent variables (gender and levels of Self-regulation, gender and levels of self-efficacy, levels of Self-regulation and levels of self-efficacy) on one continuous dependent variable (Cognitive Agility) were examined. The analysis not only aimed at assessing the main effect of each independent variable but also assessed if there was any interaction between them

Limitations

Several limitations of the study are as follows; firstly, the number of the sample is limited. This situation might restrict the generalization of the results. Secondly, the results about causal relationships, referring a full description of the relationships between variables is difficult. Finally, all the of pre-service teachers' cognitive agility, levels of Self-regulation, and levels of self-efficacy, were measured with a self-report instrument. For the generalization of the results, they should be supported by the studies conducted with various data collection tools.

Results

The relationships between the cognitive agility, self-regulation and self-efficacy were examined through the Pearson product moment correlational, table 1 shows the results of the correlational analyses between the variables analyses.

Table 1, the Relationships between cognitive agility, self-regulation and self-efficacy

Variables	cognitive agility				
	cognitive flexibility	cognitive openness	focused attention	common sense	emotional agility
planning	0.56**	0.57**	0.57**	0.56**	0.57**
monitoring	0.33**	0.51**	0.51**	0.53**	0.51**
adjusting	0.63**	0.62**	0.62**	0.63**	0.62**
reflecting	0.41**	0.47**	0.47**	0.46**	0.47**
self-regulation	0.52**	0.59**	0.59**	0.52**	0.59**
social academic	0.47**	0.51**	0.49**	0.51**	0.49**
emotional	0.56**	0.58**	0.58**	0.56**	0.58**
self-efficacy	0.47**	0.53**	0.52**	0.53**	0.56**
	0.48**	0.52**	0.54**	0.55**	0.55**

Table 1 show that there are statistically significant positive correlations between the dimensions of cognitive agility, self-regulation and self-efficacy, and the total score.

Table 2 shows descriptive statistics and t-test results with regard to gender

Table 2. Results of t-test regarding gender effects for all participants on cognitive agility

Variables	Male (n=97)		Female (n=113)		t	p
	Mean	SD	Mean	SD		
cognitive flexibility	3.75	0.86	3.07	0.87	3.93	.001
cognitive openness	3.81	0.83	3.02	0.83	3.87	.001
focused attention	3.85	0.88	3.01	0.83	3.83	.001
common sense	3.05	0.89	3.64	0.93	3.91	.001
emotional agility	3.09	0.82	3.67	0.91	3.96	.001
cognitive agility	3.51	0.88	3.28	0.83	2.90	.001

According to the Table 2 findings, there are a statistically difference between males and females in terms of common sense and emotional agility in favor of Females, where in terms of cognitive flexibility, cognitive openness, focused

attention and cognitive agility in favor of males.

The effect between gender, levels of self-regulation, levels of self-efficacy and the interaction between them on cognitive agility, was analyzed by Two-way between-groups ANOVA. Tables 3,4, and 5; shows the results of the differences between gender, levels of self-regulation and levels of self-efficacy on cognitive agility, and effect of the interactions between gender, levels of self-regulation and levels of self-efficacy on cognitive agility.

Table 3, the Effect of gender and levels of self-regulation in cognitive agility

Source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
A. gender	4.31	1	4.31	6.37	0.01	0.12
B.self-regulation	20.49	1	20.49	30.32	0.01	0.26
A * B	2.32	1	2.32	3.44	0.04	0.13
Error	156.78	234	0.67			
Total	7791.73	238				

Table 3 shows that there are differences in cognitive agility according to the variables of gender, self-regulation and the interaction between them.

Table 4, the Effect of gender and levels of self-efficacy in cognitive agility

Source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
A. gender	6.52	1	6.52	9.3	0.01	0.14
B. self-efficacy	18.37	1	18.37	26.28	0.01	0.22
A * B	3.29	1	3.29	4.71	0.01	0.09
Error	163.78	234	0.699			
Total	7981.73	238				

Table 4 shows that there are differences in cognitive agility according to the variables of gender, self-efficacy and the interaction between them.

Table 5, the Effect of levels of Self-regulation and levels of self-efficacy in cognitive agility

Source	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
A. self-regulation	7.50	1	7.50	10.36	0.01	0.16
B. self-efficacy	18.79	1	18.79	25.95	0.01	0.23
A * B	4.21	1	4.21	5.81	0.01	0.16
Error	169.38	234	0.724	0.724		
Total	8125.71	238				

Table 5 shows that there are differences in cognitive agility according to the variables of self-regulation, self-efficacy and the interaction between them.

Discussion

Cognitive agility is a formative construct that consists of focused attention, cognitive openness, and cognitive flexibility, as defend by Good (2009). Albeit a good foundation, this is not the sole model that should be used to view cognitive agility in full, since it neglects, at least implicitly, the personal experience which people bring into every situation, while encountering new situations, learning similar or maybe even completely new tasks. Taking into account the importance of experience and expertise, as well as offering a more in-depth description of the construct, Hutton and Turner (2019) have taken a theoretical construct and transposed it in a real-life setting. They have made it applicable and user- and research-friendly, and given a prolonged, detailed definition on what cognitive agility entails. They have also provided some descriptions of aspects of cognitive agility that could be used as tools for future reference when creating material, methods and tasks for cognitive agility and development.

Psychologists have done considerable work in defining cognitive agility in their Feld, for their own use, in the domains of organizational psychology and cognitive psychology. The approach cognitive psychology has taken to explain the construct of cognitive agility has been concerned with individual human factors that could impact the construct, its expression in behavior, as well as its development in practice. However, its complexity, especially in the area of applied human development, requires an interdisciplinary approach. It is self-evident that cognitive agility is a cognitive construct, but it is also socially situated, and it extends into a variety of environments that may determine how it should be examined.

There is a lot of discussion about operationalization of constructs – what are the externalizations of these constructs that can never be directly measured? This is especially challenging when a construct in question is something that has not been researched or measured before, at least not extensively. In their military-personnel-based research and article, Hutton and Turner (2019) discuss cognitive agility not as cognitive performance phenomenon, but rather in the context of cognitive work. While analyzing cognitive work, they focused on the process and the planning that goes into decision-making as a whole, and not just on the output, skills, abilities, and cognitive functions as separate entities. Hutton and Turner (2019).

Self-regulated and Self-efficacy play important roles in Teachers' Cognitive Agility and are perceived as proximal factors that could lead to Professional success (Chandra Shekhar & Rachna Devi, 2012; Cleary, Gubi & Prescott, 2010; Cleary & Platten, 2013 . Early conceptualizations of self-regulation focused on cognitive and in recent years, motivational beliefs have been integrated into self-regulated learning as prerequisites of strategic learning behaviors. Such findings lend further support to both the Expectancy Value Theory and the Social Cognitive Theory, which propose that motivational beliefs are the underlying premise of self-regulated learning (Cosnefroy, 2008; Perry, Phillips & Hutchinson, 2006; Pintrich, 2000). Consistent with past studies, self-efficacy was found to be the most important motivational belief associated with self-regulated learning (Kwon, 2001).

This study also found that Self-Regulation have positive and significant relationships with Self-efficacy, with a moderate strength association. Students who believe that they are in control of the learning outcomes are more prone to use learning strategies. This study also found that gender differences in Self-efficacy were not due to differences in levels of , as revealed by the findings of the two-way ANOVA. This suggests that the effects of Self-efficacy on Cognitive Agility are the same for both male and female students. Students have to believe that they have considerable control over their own learning outcomes, and efforts can make a difference. On the other hand, the positive association between Cognitive Agility andSelf-efficacy indicates that as Cognitive Agility increases, students' Self-efficacy increases .

This is not Self-efficacy are always worried and not confident about their academic performances, thus, it is a lack of motivation to employ self-regulated learning strategies. These findings are relevant for both male and female students, as found by the two-way ANOVA analysis. The results suggest that the anxiety is a debilitating factor of students' learning. Overall,

this study offers insights on the interaction effects between variables. It may help to develop effective instructional strategies to enhance students' self-regulated learning skills in ICT integrated learning environment.

The general academic average has an effect on self-regulated learning strategy was the. The study determined that self-regulated strategies and Self-efficacy averages show parallel changes. The concept of self-regulation may predict Cognitive Agility, and vice versa, academic success may predict the concept of self-regulation. There are numerous studies indicating that the self-regulation strategy is a factor affecting success, there was a positive medium-level relationship between the cognitive agility skill levels and success levels of teacher candidates. The study by Altun (2005) involving university students determined a positive relationship between Cognitive Agility and Self-Regulation based on self-regulation and self-efficacy perception. Tekbıyık et al. (2013) concluded in their study that the self-regulation strategies used in science and technology courses were a significant predictor of the Cognitive Agility. Similarly, the experimental studies determined that self-regulation training increased the success of the students on cognitive Performances. Duru et al. (2014), in their study in which they investigated into the relationships between cognitive Performances, and self-regulation, concluded that academic success was positively related to self-regulation. Supporting this finding, Zimmerman (1990) reported that learners having self-regulation strategies approached educational tasks ardently and with self-reliance, that they searched for and found the ways to be successful even if they encounter barriers such as poor study conditions and complex text books, and that they conducted deep research on a subject in the best way. According to this, it may be said that individuals with high levels of self-regulation skills also have a high level of Cognitive Agility.

Teachers should encourage active participation of students in the learning processes by establishing specific, short-term goals that are challenging yet attainable (Schunk & Pajeres, 2002). Specific self-regulated strategies such as time management strategy can also be taught to students to enable them to complete their learning tasks on time and more efficiently. Successful tasks-completion experiences and effective usage of strategies could enhance male students' self-efficacy and self-regulated learning and in turn narrow the gender gap in performance.

Conclusion

Cognitive agility is one of the effective cognitive variables that provide teachers with an interactive environment that improves self-regulation and self-efficacy. The results of this study show a positive correlation between

cognitive agility and both self-regulation and self-efficacy, and enabling teachers to be cognitively agile anytime and anywhere will enhance self-regulation and self-efficacy. It is logical to conclude that cognitive agility generally indicates a significant positive correlation with self-regulation as well as self-efficacy. These results confirm previous research evidence that teachers who have cognitive agility will have superior self-regulation and self-efficacy.

Recommendations

In line with the results of the study, the following recommendations were developed:

1-The variables that have an effect on the cognitive agility of teachers attending different schools may be determined and comparative studies can be conducted.

2-The cognitive agility of teachers based on courses can be investigated for comparative studies. This way, the analogous and different aspects of cognitive agility in different courses may be revealed.

3- It is maintained that in addition to quantitative data to determine which characteristics of the teachers have an effect on cognitive agility, using composite models involving qualitative and quantitative data, will provide a multi-dimensional assessment.

4- Seminars for the teachers may be organized to ensure that they develop cognitive agility; research projects and homework may be more frequently assigned.

5- The extent of the effect of study programs on the development of cognitive agility in teachers may be studied in more detail.

6- Environments that will develop the cognitive agility of the teachers may be established in study programs. For example, it is maintained that the establishment of environments where the teachers may express and discuss their feelings and ideas freely, where they can interact mutually, where they can be active in the learning process, where they can set targets for themselves and try ways to achieve them, where they can manage their own learning processes and ensure that they undertake responsibilities and make self-assessment will positively contribute the development of the cognitive agility of the teachers.

7- In the present study, to total score of the some scales used was taken into account. It is believed that in subsequent teachers, separate investigations of the sub-dimensions of the scales will be useful.

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الرشاقة المعرفية وعلاقتها بالتنظيم الذاتي والفاعلية الذاتية لدى معلمي ما قبل الخدمة

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ملخص البحث.

تم تصميم هذا البحث لتحليل العلاقة بين الرشاقة المعرفية وكل من التنظيم الذاتي والفعالية الذاتية لدى المعلمين قبل الخدمة. أجريت الدراسة على عينة مكونة من ٢١٠ معلمين قبل الخدمة (٩٧ معلما/ ١١٣ معلمة). تم تطبيق ثلاثة مقاييس: الأول هو مقياس الرشاقة المعرفية (CAS)، ويتكون من خمسة أبعاد؛ المرونة المعرفية، والانفتاح المعرفي، وتركيز الانتباه، والحس العام، والمرونة العاطفية. والثاني هو استبيان التنظيم الذاتي (SRQ) ويتكون من أربعة أبعاد: التخطيط والمراقبة والتعديل والتأمل. والثالث هو استبيان الفعالية الذاتية (SEQ) لقياس الفعالية الذاتية الاجتماعية والأكاديمية والعاطفية للمعلمين قبل الخدمة (أعدهم الباحث) لهذه الدراسة، باستخدام المنهج الوصفي والأساليب الإحصائية المناسبة. أظهرت النتائج أن درجات أبعاد التنظيم الذاتي والفعالية الذاتية للمعلمين قبل الخدمة كانا مرتبطين بشكل إيجابي بدرجات أبعاد الرشاقة المعرفية والدرجة الكلية، توجد فروق دالة إحصائية بين الذكور والإناث في الحس العام والرشاقة العاطفية لصالح الإناث، أما في المرونة المعرفية والانفتاح المعرفي وتركيز الانتباه والرشاقة المعرفية لصالح الذكور، توجد فروق بين المستويات العالية والمنخفضة في تنظيم الذات والفاعلية الذاتية، في الرشاقة المعرفية لصالح المستويات العالية. وتؤثر التفاعلات الثنائية بين: الجنس ومستويات تنظيم الذات، والجنس ومستويات الفاعلية الذاتية ومستويات تنظيم الذات ومستويات الفاعلية الذاتية في الرشاقة المعرفية. تقدم هذه الدراسة رؤى حول التأثيرات التفاعلية للتنظيم الذاتي والفاعلية الذاتية والرشاقة المعرفية. وقد يساعد ذلك في تطوير استراتيجيات تنظيم الذات والفاعلية الذاتية لتعزيز أبعاد الرشاقة المعرفية والدرجة الكلية للمعلمين قبل الخدمة.

الكلمات المفتاحية: الرشاقة المعرفية، تنظيم الذات، الفاعلية الذاتية.