

Mentoring and Coping Self-Efficacy as Predictors of Affective Occupational Commitment for Women in STEM

Abstract

Purpose: Despite an evident increase in the number of women joining Science Technology Engineering and Mathematics (STEM) majors at universities, the recruitment and retainment of women in STEM occupations continues to be a substantial challenge. The aim of this research is to investigate several individual and contextual factors that could increase the representation of women in STEM fields.

Design/Methodology/Approach: We report the results of a questionnaire survey of women (n= 375) working in STEM industries in the Middle East and North Africa region who have or had a mentor during their careers. Structural equation modeling is used to examine the proposed hypotheses.

Findings: The results indicate that both mentoring and coping self-efficacy positively influence affective occupational commitment. Coping self-efficacy is also found to partially mediate the relationship between mentoring and affective occupational commitment.

Originality: In our study we investigate individual and contextual factors that have potential to enhance women's occupational commitment in STEM industries based on the Career Self-Management Model.

Practical Implications: We recommend that researchers and practitioners give more attention to the contextual factors such as mentoring and its contribution to the coping self-efficacy and affective occupational commitment of employees in STEM occupations.

KEYWORDS Coping self-efficacy, mentoring, affective occupational commitment, women in STEM, Career Self-Management Model.

Introduction

The high rate of employee attrition of women in STEM industries is a major concern. Women comprise 29% and 24% respectively of the STEM workforce in the USA and the UK (NSF, 2019; Davis, 2021). Similar under-representation has been reported in several other countries worldwide (Catalyst, 2018; Hunt, 2016; Van Veelen, Derks, and Endedijk, 2019). Twenty-five years after joining STEM occupations in increasing numbers, the retention rate of women is half that of men (Frehill, 2010) and according to other sources such as the Society of Women Engineers (SWE, 2007), women's turnover rate is four times greater than men. Half the number of women who work in STEM industries opt out whereas less women (20%) working in non-STEM careers such as in nursing, law, and finance quit (Glass *et al.*, 2013; Singh *et al.*, 2018). In the Middle East and North Africa (MENA) region women's educational enrolment including STEM majors is growing due to significant increase in funds allocated towards education (UNESCO, 2019). The region contains 22 countries and represents 5% of the world's population with over 400 million people (Lord, 2016). Women comprise 25% of the workforce (World Bank, 2019) and most MENA region countries have endorsed the Convention on the Elimination of all Forms of Discrimination against Women (CEDAW). At the current time, technology and innovation are viewed as major catalysts for the MENA region, and so STEM jobs are on the increase offering significant career opportunities for part of the workforce (Islam, 2019). In spite of substantial demand for skilled labour, women are still under-represented in STEM fields as they are in other parts of the world (UNESCO, 2019). In the Kingdom of Saudi Arabia (KSA) and United Arab Emirates (UAE), for example, while a large proportion of women graduate with STEM majors, 45% and 65%

respectively, only 15% to 18% become employed in STEM fields (UNESCO, 2019; World Bank, 2019).

We therefore argue it is crucial to investigate the factors influencing women's decisions to choose and remain in STEM occupations in order to identify effective methods of management that could improve women's employment and retention in these fields. Our research focus is on women's occupational commitment which is central to the development of work abilities because it contributes to individual persistence in developing complex technical skills (Savickas and Porfeli, 2012).

The leaky pipeline is a metaphor used to describe the continuous loss of girls and women in STEM fields starting from high school until they enter the job market (Forget, 2021). The metaphor has been criticized for presenting an over-simplistic view of the problem of women's under-representation (Branch, 2016), however, it is still considered a beneficial way of understanding the challenges faced by women and attempting to construe possible solutions (Buckles, 2019).

Therefore, we argue that loss of a potential talent in the supply pipeline is a loss of future competence within the world of STEM and thus, clear under-representation of women in STEM occupations ought to be recognized and comprehended in order to reach successful measures for addressing the problem (Resmini, 2016).

Previous studies on STEM have focused on high school students, comparing female with male capabilities in Mathematics and Science subjects finding little evidence for differences in cognitive abilities as an explanation for the under-representation of females in STEM fields. Most findings do not identify any compelling biological differences between the sexes in abilities in Mathematics and Sciences (Ito and McPherson, 2018). Various education studies have analysed campus and

classroom climates for discrimination and sexism and concluded that the perceived fit of women and men with their academic environment has a distinct effect on their behaviours and choices. However, recommendations from these previous studies have not led to substantial improvements in the recruitment and retainment of women in STEM occupations (Singh *et al.*, 2018; UNESCO 2019).

Researchers have identified groups of factors that contribute to the “leaky pipeline” of women working in STEM fields, such as the existence of an unfriendly work environment which can include problems of condescension, poor accommodation of family obligations, sexual harassment, disparities in pay, biased job duties and appointments, and varying approaches to evaluating work (Hill *et al.*, 2010). Women’s under-representation in the workplace has also been attributed to biased selection processes favouring men in certain job roles and positions in this way creating subjective and arbitrary advancement opportunities (Betz, 2005; Hart, 2016). Despite the fact that the findings and recommendations of studies on equal opportunities and unfair discrimination have been taken into consideration and improvements made in many organizations, women’s working representation in the field has not encountered any significant advance for over ten years (Fouad *et al.*, 2011, 2016; Fouad and Santana, 2017).

Consequently, for all of the reasons stated above it is important that more is done to understand how to improve the occupational commitment of women employed in STEM fields (Singh *et al.*, 2013; Singh *et al.*, 2018). One way of doing more would be by focusing more concertedly on contextual supports for these women (Cross *et al.*, 2017; Lent *et al.*, 2000).

Therefore, this study directly contributes to the literature by investigating the antecedents of women’s occupational commitment in STEM fields within the MENA region. This study analyses

important groups of contextual and cognitive variables affecting occupational commitment based on the Career Self-Management (CSM) model (Lent *et al.*, 1994; Lent and Brown, 2013). The CSM model proposes that a person's self-efficacy belief and her outcome expectations influence her decisions and choices. To-date, the majority of research utilizing this theory concentrates on the impact of barriers to career decisions (Albert and Luzzo, 2011; McWhirter, Torres, and Rasheed, 1998; Swanson *et al.*, 1996), and fewer studies have examined the role and impact of contextual supports (McWhirter, Hackett, and Bandalos, 1998; Tang, Fouad, and Smith, 1999). The theory, however, offers ample opportunity for exploring the impact of contextual supports and mandates further investigation of this area (Brown and Lent, 2019). The results also indicate that mentoring enhances affective occupational commitment. Contextual supports have still not received adequate research attention (Cross *et al.*, 2017; Lent *et al.*, 2000; Lapointe and Vandenberghe, 2017; Mendez *et al.*, 2017). Therefore, this empirical study contributes to theory on the role of mentoring as a contextual support to the occupational commitment of women employed in male-dominated occupations.

The findings of this study also show a positive relationship between coping self-efficacy and affective occupational commitment. It also reveals that coping self-efficacy mediates the relationship between mentoring and affective occupational commitment.

While there is still an ongoing need to investigate the unique and complementary role of CSE on career decisions and choices (Bandura, 2006; Falk *et al.*, 2016; Falko and Summers, 2019; Lent *et al.*, 2000), this study also contributes to theory by attempting to explain the mediating effect of CSE. We argue that useful intervention techniques targeting self-efficacy can aid in promoting career-decision making (Bandura, 1986; Lent, 2013).

In addition, the study tests the persistence and commitment of women in STEM, a new range of development tasks and challenges in relation to CSM, as a response to scholars calling for widening the range of applicability of the model (Brown and Lent, 2019; Lent and Brown, 2013). Whereas a large amount of research has sought to understand the reasons behind the under-representation of women in STEM in the West (e.g. Buschor *et al.*, 2014; Fouad *et al.*, 2016), a growing number of scholars call for more research on the problem to be conducted within the MENA region (Marmenout and Lirio, 2014; Tlaiss, 2015; Howe-Walsh *et al.*, 2020).

In the following sections, a review of the literature is presented on occupational commitment, mentoring and coping self-efficacy, then, an explanation of the theoretical framework is provided. Next, we outline the quantitative methodology and methods used, before reporting the results. In the closing sections, we highlight the significant role of coping self-efficacy and mentoring in shaping the occupational commitment of women working in STEM occupations. Theoretical implications on coping self-efficacy and on mentoring as a contextual support are discussed. Practical implications and recommendations are then stated on the importance of enhancing coping self-efficacy and providing contextual support for women employed in STEM careers. Then, the limitations and recommendations for future research are outlined. In order to further understand the antecedents to women's occupational commitment in STEM careers, we propose that researchers should continue to examine potential differences between informal and formal mentoring schemes.

Literature Review

Theoretical Framework:

The theoretical framework for this study is the CSM model. CSM is an extension of social cognitive career theory (SCCT) (Lent and Brown, 2013; Lent *et al.*, 2000). The SCCT seeks to explain how educational and career-related interests, choices, and persistence behaviour are interrelated and developed. The theory is founded on three major concepts, namely self-efficacy, outcome expectations and goals, which are analysed in combination with a range of other factors including contextual supports, individual interests and abilities (Lent, *et al.*, 1994, 2000).

Changes in the environment such as international competition, economic uncertainty, diminishing job security, and technological progress, all invite consideration of new ways of assisting employees in pursuit of their work careers (Blustein, 2006). The new emerging model of career self-management is in part a research approach attempting to understand such changes. The CSM model is distinct from previous SCCT models in so far as it focuses on processes rather than the content features of career development (Lent and Brown, 2013). For instance, CSM concentrates on micro-level mechanisms, such as how individuals handle normal developmental duties and cope with less anticipated incidents. The approach focuses on a broader range of vocational adaptability behaviours compared to previous SCCT models, particularly individuals' reactions to existing career-related challenges. Consistent with other SCCT models, within CSM, individual variables such as gender and contextual factors are predicted to be associated with self-efficacy and outcome actions.

The CSM model is based on the assumption that individuals are able, to some degree, to exert a certain measure of individual control at least over some parts of their career development (Brown and Lent, 2019). Clearly, these personal capabilities do not imply that individuals have full autonomous control over their work and occupations, but then neither are they completely determined by their environment. Human action is a result of complex interactions between

individual, behavioural, and contextual determinants (Bandura, 2006). Thus, CSM considers individuals' actions within a social context, which affords continuous opportunities to be affected by, as well as to affect, others. In short, the purpose of CSM theory is to inform our knowledge and understanding of how cognitive and contextual aspects might influence individual outcomes (Brown and Lent, 2019).

Broadly, CSM can be viewed as consisting of two main groups of variables. The first group relate to personal cognitive aspects of self-efficacy, outcome expectations, and personal goals. The second group analyses the relations between other sets of variables such as personal input, learning experience, and support factors. Given the evident obstacles that women experience in STEM occupations, contextual barriers are an important area of study. However, examination of barriers should be accompanied by analysis of contextual supports (Brown and Lent, 2019). Support factors and mechanisms are important elements of CSM theory, but have been under-researched in comparison to barriers (Brown and Lent, 2019; Lapointe and Vandenberghe, 2017; Mendez *et al.*, 2017). In our study we therefore examine the impact of mentoring as a contextual support to complement the existing literature on barriers to career development (Cross *et al.*, 2017).

Occupational Commitment:

The varied definitions of OCC possess a common interest in the extent to which a person feels keen to work in an occupation (Okurame, 2012). Hall (1971) initially defined OCC as the degree of a person's motivation to work in a chosen career. Blau (1985) subsequently explained that occupational commitment pertains to an individual's attitude towards his or her profession or vocation. According to Van Der Heijden *et al.*, (2009) OCC relates to the extent that a person freely adopts the values of her occupation. Arguably, research on OCC is becoming increasingly

significant due to the changing nature of the workplace, heightened competition and employee mobility which all exert pressure on people to be more committed to their occupation rather than the specific organization they are employed in (Ballout 2009; Gobeski and Beehr, 2009; Lee *et al.*, 2000). More research on OCC is therefore considered both justified and necessary (Blau, 2009; Jones and McIntosh, 2010; Weng and McElroy, 2012).

The terms professional, career, and occupational commitment are usually used synonymously throughout the literature. This study focuses on occupational commitment, which according to Lee *et al.* (2000), contains the correct degree of precision in relation to one's commitment to a line of work. Lee *et al.* (2000) argue that the term professional commitment is too restrictive and career commitment is somewhat too general. Our study is consistent with Lee *et al.*'s (2000) definition of occupational commitment as a psychological bond between an individual and her occupation based on an emotional link to that occupation. Importantly, this definition is also compatible with Meyer *et al.*'s (1993) concept of affective occupational commitment. While fully acknowledging that there are two other dimensions in Meyer's model of occupational commitment, normative and continuance, our empirical study is confined to investigating the effects of mentoring functions and coping self-efficacy on affective occupational commitment (AOC).

According to Meyer *et al.* (1993), AOC occurs when an individual continues with her occupation because she wants to, and identifies favourably with her occupation and feels its psychological accomplishments are desirable. Individuals whose work experiences are consistent with their expectations tend to reveal high levels of satisfaction with their occupation. Satisfied employees compared to unsatisfied employees have been found to possess deeper AOC (Meyer *et al.*, 1993).

As was mentioned in the introduction, a number of factors contribute to the “leaky pipeline” of women in STEM fields by creating an unfriendly environment. In addition to problems such as poor accommodation of family obligations, sexual harassment, disparities in pay, and so on (Hill et al 2010; Walton *et al.*, 2015), some researchers argue that women’s under-representation in the workplace is influenced by biased selection procedures favouring men (Betz 2005; Hart, 2016). Given the fact that women’s working representation in the field has not encountered any significant improvement for over ten years (Fouad *et al.*, 2011, 2016; Fouad and Santana, 2017), the concept of AOC is especially significant, then, for under-represented women working in STEM occupations. These women have to cope with stressful situations which unfortunately can include work harassment, gender bias, unfair treatment and discrimination (Hill *et al.*, 2010; Singh *et al.*, 2018).

Mentoring:

A mentor is defined as a person who provides a mentee (or protégé) with advice, looks out for him or her, and helps by promoting her work achievements bringing these capabilities and strengths to the attention of senior and other influential individuals in the organization (Day and Allen, 2004). This study incorporates Kram’s (1985) two-dimensional functions of mentoring: psychological (role modelling, friendship, acceptance and confirmation, and counselling) and career-related (sponsorship, coaching, protection, exposure, and challenging work).

Various researchers have indicated that mentoring has a positive impact on successful career advancement and development in challenging occupations such as STEM careers and nursing for instance (Griffin *et al.*, 2010; Gwyn, 2011; Roche, 1979). Increased job satisfaction and career success have been found empirically to be related to women who have mentors (e.g. Bell and

Goldsmith, 2013; St-Jean et al., 2018). Studies also show that mentoring plays a role in advancing the quality of organizational life for women and reduces stress by enhancing self-esteem (Lui *et al.*, 2019). Women who have mentors in powerful senior roles in organizations have greater opportunity of obtaining access to beneficial social networks; learning directly about managerial competencies by observing, experiencing and discussing effective senior management practices (Bagilhole and White, 2011; Davidson and Burke, 2011; Dreher and Ash, 1990). Previous research has emphasized the influence of role models on the ambitions and accomplishments of under-represented women and those working in non-traditional careers, because they demonstrate the feasibility of overcoming gender-related challenges to success (Fotaki, 2013; Quimby and Santis, 2006). Consistent with the idea of contextual support, Stout *et al.* (2011) contend that female Engineering students familiar with the biographies and successful accomplishments of female engineers were more likely to pursue an Engineering career. Mentoring functions have been acknowledged to contribute to the development of minorities and female employees and are also a significant factor in fostering women's career progress in STEM fields (Dawson *et al.*, 2015).

Given the fact that only 18% of women are employed in STEM fields within the MENA region (UNESCO, 2019; World Bank, 2019) the leaky pipeline is a major threat to the retainment of women in these industries. A principal argument of this paper consistent with other research on mentoring is that advancing purposive mentoring interventions can be an efficient human resource strategy and should be given more attention by researchers and practitioners (Blaique and Pinnington, 2021; Brown and Lent, 2019; Lent *et al.*, 2000; Lapointe and Vandenberghe, 2017; Mendez *et al.*, 2017). By empirically testing the relationship between mentoring and AOC, in addition to the mediating effect of CSE, this study attempts to answer two critical questions, does mentoring have an effect on AOC and if so, then how?

Mentoring functions have the potential to act as antecedents of an individual's career advancement and commitment (Gravey, 2014; Kidd and Smewing, 2001; Wickramasinghe and Jayaweera, 2010). A mentor, through coaching and exposure, for example, helps the mentee to learn new skills and invest in her own professional development and work behaviour leading to professional success, career advancement, and employee commitment (Elliott *et al.*, 2010). Such mentoring actions and outcomes also strengthen the bond between the mentor and mentee. As a result, the mentee benefits further with the mentoring activities making a significant contribution to her socialization within the organization and her individual development. In turn, this increasing profile and social influence in the organization enhances the mentee's professional advancement and career commitment (Mezias and Scandura, 2005; Okurame, 2012; Wang *et al.*, 2014).

Occupational commitment tends to be low at the early stages of a career, however, favourable work experiences that foster career exploration, goal setting, and enhancement of person-job fit all support an individual's development of AOC (Goulet and Singh, 2002; Meyer *et al.*, 1993). Accordingly, the degree of support, guidance, and coaching that the mentee receives from the mentor are likely to contribute to her skills development, career advancement and affective attachment to her occupation (Lapointe and Vandenberghe, 2017).

Therefore, the following hypothesis is asserted:

H1: Mentoring has a positive effect on affective occupational commitment.

Coping Self-Efficacy:

One propitious way to improve the retainment of females in STEM industries is strengthening their coping self-efficacy. Self-efficacy has been identified as the most crucial aspect of social cognitive theory and is defined as an individual's confidence in her capabilities to perform certain acts or

execute several related behaviours successfully (Bandura, 2001; Brown and Lent, 2019). This aspect of CSM is a high predictor of whether an individual will perform a certain act, persist at it, and eventually succeed (Bandura, 1997). Coping involves both emotion-focused coping (i.e. responses that focus on managing emotional responses to stressful events), and problem-focused coping (i.e. responses that focus on changing problematic aspects of stressful events) (Lazarus and Folkman, 1984). In simple terms, it is defined as a person's confidence or ability to effectively handle stressful or traumatic situations (Bandura, 1997; Chesney *et al.*, 2006).

A group of studies have analysed the challenges of unsupportive organizational climate that women working in STEM fields often have to endure as a proportionally under-represented group (Hill *et al.*, 2010; Sang *et al.*, 2014; Fouad and Santana, 2017; Byars-Winston *et al.*, 2015). The mentoring functions discussed earlier, both career-related and psychological, can contribute to strengthening women's coping self-efficacy in these industries. Among the career-related functions of mentoring, the mentor provides the mentee with job duties and assignments that enrich her skillset and knowledge resulting in the mentee's increased self-esteem and confidence that ultimately could lead to job promotions and career success (Kram, 1986; Yip and Kram, 2017). Through the protection function, the mentor plays the role of a buffer granting help during adversity and sharing responsibility for the mentee's mistakes. Through the exposure activity, the mentor facilitates opportunities for the mentee to promote her proficiency to the attention of influential executives and managers in the organization (Elliott *et al.*, 2010).

The psychological mentoring functions include activities of friendship (Kram, 1986) which have also been found to aid in strengthening a person's self-efficacy (Day and Allen, 2004; Jones, 2017). Acceptance and confirmation functions occur when the mentor offers continuous help, appreciation, and respect resulting in stronger self-efficacy and self-image for the mentee (Kram,

1986). Being exposed to other similar individuals who achieve success when facing adverse environmental circumstances heightens her belief that she can master such experiences and succeed (Bandura, 2001; DeFreitas and Bravo, 2012; Garcia et al., 2019; Herrmann et al., 2016 Lankau and Scandura, 2002). Therefore, the following hypothesis is formulated:

H2: Mentoring has a positive effect on coping self-efficacy.

Several studies have examined the effect of self-efficacy on occupational commitment. In a study conducted in Singapore, Chan et al. (2008) found a positive relationship between self-efficacy and occupational commitment among 2,130 primary school teachers and 1,587 secondary school teachers. Research also indicates that perceived self-efficacy directs how individuals deal with work-related stress and maintain interest in their occupations (Klassen and Chiu, 2010). Women who are sufficiently confident in their skills and capacity to achieve work objectives and cope with stressful situations show higher levels of occupational commitment (Park and Jung, 2015; Tschannen-Moran and Woolfolk Hoy, 2001). Individuals with high self-efficacy tend to persist when facing obstacles by drawing on positive past experiences and believing that they have the skills and capabilities to perform the job (Bandura, 2006). In order to commit to their occupations, women need to believe that they can cope with stressful situations, such as long working hours, demanding deadlines, the challenge of balancing life and work responsibilities, and in some technical and professional contexts the unfriendly work environment they might be operating in ([Fagan and Teasdale, 2021](#); Glass, 2004; Pinnington and Sandberg, 2013; Seron *et al.*, 2018; Suseno *et al.*, 2007; Whittington, 2011).

Therefore, hypothesis three states that:

H3: Coping self-efficacy enhances affective occupational commitment.

The Mediating Role of CSE:

Mentoring can enhance self-efficacy through social persuasion, which is one of the sources of self-efficacy (Bandura, 2006). A mentor attends to supporting the mentee's career through varied functions such as sponsoring, protecting, coaching, and providing challenging work assignments (Yip and Kram, 2017; Yarger and Kasten, 2001). Mentors can influence mentees' beliefs that they have the skills and competencies to perform effectively. Women who feel more motivated towards achieving work tasks are likely to be more successful than when they continually experience significant doubts about their competencies or concentrate solely on their deficiencies. People who facilitate efficacy tend to make constructive evaluations and seek to create situations that prompt individuals' success (Bandura, 2001). Mentors who provide coaching functions to their mentees facilitate the latter's skill development, professional success, career advancement, and employee commitment (Okurame, 2012). Coaching activity in the career-related functions of mentoring requires the mentor to act as a teacher and advisor delivering worthwhile guidance (Scandura and Castro, 2004) and constructive feedback (Kram, 1986) that can further strengthen a mentee's self-efficacy.

Self-efficacy plays a role in building AOC through social persuasion and according to Meyer and Allen (1997), AOC is also refined through retroactive rationale. Self-efficacy is further strengthened by enhancing and updating one's skillset and knowledge and achieving certain career goals (Lent *et al.*, 2013) leading to increased job satisfaction and occupational commitment (Darden *et al.*, 1989; Thomas, 2000). Therefore, we assert:

H4: CSE mediates the relation between mentoring and AOC

‘FIGURE 1 here’

Methodology:

Sample and Procedure:

The data were collected using an online survey. The survey targeted females who had been working in STEM industries for more than two years. Twelve universities were contacted for approval to administer the online survey among their female STEM alumni in the UAE and Lebanon. The faculty and disciplines contacted were engineering and architecture, mathematics, computer science, and biology. After obtaining approval, the survey was administered to alumni from two private universities in the UAE and Lebanon. The remaining 10 universities declined our invitation. The survey was also shared on several professional platforms for empowering women in STEM and organizations that offer mentoring for women in STEM in the Middle East. The sample size is 410, where 375 respondents indicated affirmatively that they possessed a mentor and were able to answer the final section of the survey that asked questions about the mentoring functions. Table 1 presents the demographic characteristics of the respondents to the survey. The majority of respondents worked in the Engineering field (n=230, 61.33%). The professional level indicates the professional seniority of the respondents, where the administrative level is the lowest entry level, followed by coordinator, manager, director, and finally C-level which is the highest level. Most respondents selected the coordinator level (n=148, 39.47%). The majority of the female respondents were single (n= 260, 69.33%).

‘TABLE 1 here’

Measures:

The survey contains six items measuring AOC, 26 items measuring CSE, and nine items measuring the mentoring function.

Occupational Commitment Scale:

The occupational commitment scale developed by Meyer et al. (1993) is used to measure affective occupational commitment. The six items for assessing AOC are used in this study. They are measured on a 7-point Likert scale with 1 being “strongly disagree” to 7 “strongly agree”. The sub-scale’s Cronbach’s alpha was 0.82 (Meyer *et al.*, 1993).

Coping Self-Efficacy Scale:

To measure this construct, we adopted the coping self-efficacy questionnaire developed by Chesney *et al.* (2006). The questionnaire contained three subscales, measures on perceived capability and confidence to cope with difficult life circumstances. The three subscales are: stopping unpleasant thoughts or feelings, problem focused coping, and getting support from friends and family. Respondents were requested to rate 26 items on a Likert scale (0= Cannot do at all, 10= Certain can do). The instrument aims to measure one’s confidence in coping efficiently with a stressor rather than coping styles. The scale was originally adopted from the Lazarus stress and coping theory (Lazarus and Folkman, 1984) and also draws from the ways of coping questionnaire (Folkman and Lazarus, 1988). The Cronbach’s alpha for the subscales ranged between 0.79 and 0.92 (Chesney *et al.* 2006).

The Mentoring Scale:

The Mentoring Functions Questionnaire (MFQ-9) designed by Scandura and Castro (2004) was used to measure the mentoring experiences of the respondents. Initially derived from her definition of mentoring as having two functions, Kram (1985) developed the MFQ-9 to assess the career-related and psychological functions of mentoring. The first type measures the mentor's behaviour as a coach, protector, or sponsor. The second type assesses the mentor's sense of competence in offering social support and assisting with defining the mentee's identity. Some of the items on the scale are: 'My mentor helps me coordinate professional goals', 'I consider my mentor my friend', and 'I admire my mentor's ability to motivate others'. The questionnaire was developed further by Scandura and Castro (2004) to measure three aspects of support received by individuals who have or had a mentor, namely career-related, psychological, and role modelling. The MFQ-9 contains nine items intended to measure the three subscales in a Likert format where 1= "Strongly disagree" and 5= "Strongly agree". The Cronbach's alpha measuring the subscales ranged between 0.70 and 0.89 (Kao et al., 2014).

Reliability Testing-Cronbach's Alpha:

The assessment of a scale includes testing its reliability (Tavakol and Dennick, 2011). Reliability refers to the extent of measurement consistency (Tavakol *et al.*, 2008). Cronbach's alpha has been the most commonly used technique for assessing reliability due to the ease of conducting the test in comparison to other methods of testing reliability (Tavakol and Dennick, 2011; Cohen and Swerdlik, 2010). Cronbach's alpha gives an estimate of the internal consistency of a specific scale and is presented in a number ranging between zero to one with an acceptable threshold of 0.7 and

above (Cortina, 1993). Testing reliability also gives the measurement error. In general, the value of Cronbach's alpha increases when the items of a measure are correlated with one another. The coefficient of alpha is dependent on the size of the test (Nunnally and Bernstein, 1994). Given the fact that alpha is based on the scores of a test in a particular sample, scholars explain that researchers using any available test should administer Cronbach's alpha and not depend on previously published alpha coefficient of the scales used (Streiner, 2003).

The coefficients of Cronbach's alpha for each of the scales used are as follows: 0.925 for CSE, 0.732 for AOC, and 0.887 for mentoring functions as indicated in Table 2.

Results

Descriptive Statistics

Means, Standard Deviation (S.D), Cronbach's Alpha, correlations between the variables, and Skewness and Kurtosis are reported in Table 2. Cronbach's Alpha indicated satisfactory internal consistencies ($.732 \leq \alpha \leq .925$) for the three scales. The highest correlation was CSE with AOC (0.276), significant at 1%, followed by mentoring functions (MEF) with CSE (0.219) significant at 1%. Furthermore, MEF was significantly correlated at 1% with AOC (0.188).

'TABLE 2 here'

Assessment of Common Method Bias

Common method variance (CMV) is defined as the variance related to the method of measurement rather than due to the constructs being measured (Fiske, 1982). CMV is a potential concern in behavioural research (Kline *et al.*, 2000, Conway, 1998). Method biases are considered an obstacle to data analysis because they represent a source of measurement error. Measurement errors impede the validity of the findings concerning the relations between the constructs and are commonly known to have arbitrary and organized aspects to them (Bagozzi and Yi, 1991). Therefore, in addition to Cronbach's alpha test results which were higher than cutoff 0.7, CMB was administered using Harman's single factor test. Harman's single factor test is considered one of the most common methods to assess CMV (Podsakoff *et. al*, 2003). The variables are all loaded into an exploratory factor analysis (EFA) to test the unrotated factor solution in order to identify the number of factors that account for the variance in these variables. This technique rests on the assumption that in case CMV exists then either a single factor will result from the analysis or one common factor will be responsible for the bulk of the covariance (Aulakh and Gencturk, 2000). The total variance indicated a loading of 25.272% which is substantially below the 50% cutoff. Thus, CMB does not affect the data.

Confirmatory Factor Analysis

We proceeded with confirmatory factor analysis (CFA) in order to use a path analysis test for the variables (Yong and Pearce, 2013). CFA obtained the following results: $X^2 [736] = 1337.354, p < 0.000$, CFI=0.920; TLI=0.911; SRMR=0.059; RMSEA=0.047. The Comparative Fit Index (CFI) = .920 was greater than .90 which indicated good model fit. The closer the CFI to 1, the more it reflects a perfect fit which is rare in research (Cheung and Rensvold, 2002). The Tucker-Lewis index (TLI) =.911; where a cutoff close to .95 is considered a good result, according to Hu and

Bentler (1999). The standardized root mean square (SRMR) in the study was 0.059 and can be considered a good fit. Hu and Bentler (1999) proposed a cutoff result of SRMR close to 0.08. The root mean square error of approximation (RMSEA) = 0.047 lower than 0.08, thus it indicated acceptable fit (Chen *et al.*, 2018). Therefore, all of the indicators showed acceptable levels of fit.

Structural Equation Modeling

Structural equation modeling (SEM) was used to test the hypotheses of this study. SEM is often adopted to analyze relationships between exogenous variables (e.g., mentoring functions) and endogenous variables (e.g., affective occupational commitment). To investigate the effect of mentoring functions on the two other variables, we tested all constructs together: mentoring functions → affective occupational commitment, mentoring functions → coping self-efficacy and coping self-efficacy → affective occupational commitment. We found that the direct relationship between MEF and AOC (20%) was positive and significant at 1% which supports H1. The relationship between MEF and CSE (24%) was also positive and significant at .01% which supports H2. Finally, the relationship between CSE and AOC (25%) was positive and significant at .01% which supports H3.

To test our mediator (H4), which is considered as a simple mediation model that occurs when one variable mediates the effect of the independent variable on the dependent variable (Preacher and Hayes, 2004), we followed the three steps recommended by Baron and Kenny (1986). The first step was to determine whether a significant relationship exists between the independent variable (MEF) and the mediator (CSE). Then, we tested if the mediator (CSE) was significantly related to the dependent variable (AOC). Finally, we examined whether the independent variable (mentoring functions) is significantly related to the dependent variable (AOC). Based on these results we found that the relationship (paths) between our constructs were positive and significant, hence, we

conclude that CSE was partially mediating the relationship between MEF and AOC. Thus (H4) is accepted (See Figure 2). Furthermore, the possibility of indirect effects is important when assessing mediation (Hayes and Scharkow, 2013). The results indicate that the indirect relationship between MEF and AOC (4%) was positive and significant at 1% through the mediator (CSE).

‘FIGURE 2 here’

Discussion

Contribution to Theory and Research:

The severe under-representation of women in STEM occupations is a worldwide challenge. STEM jobs and especially engineering are expected to grow at a faster rate compared to other jobs due to developments in workplace digitalisation (Corbett and Hill, 2015). This change is compounded by problems of global labour supply and demand along with the insufficient employee retainment of women (Frehill, 2010; Hewlett *et al.*, 2008; Singh *et al.*, 2018). Therefore, attaining and retaining talented employees, especially women in growing STEM work domains requires urgent attention by government policy makers, professional groups, employing organisations and their managers. Mentoring programmes are one valuable means of increasing the retention of women. Therefore, this study contributes to the literature and the debates on work and employment by assessing whether having a mentor is related to women’s occupational commitment in STEM fields in the MENA region. A second contribution of this study is to understand how mentoring can enhance women’s occupational commitment in STEM, which we pursued through quantitatively testing CSE as a mediator.

This study also offers several theoretical contributions. First, we identify the important role that mentoring as a contextual support plays in enhancing career outcomes. Contextual supports are considered within the SCCT as environmental factors that may enable career decisions and choices (Brown and Lent, 2019; Lent *et al.*, 2000). Despite the fact that such supports have been identified in the career development literature for several decades (e.g. Tinsley and Faunce, 1980), they still have not received adequate research attention (Cross *et al.*, 2017; Lent *et al.*, 2000; Lapointe and Vandenberghe, 2017; Mendez *et al.*, 2017). The findings of this study extend prior knowledge relating to the positive impact of mentoring as a contextual support on CSE and AOC (Fisher and Stafford, 1999, Richie *et al.*, 1997).

The second main theoretical contribution of this study relates to coping self-efficacy. Previous research indicates the important role that self-efficacy plays in shaping individual choices and careers (Falk *et al.*, 2016; Inda *et al.*, 2013; Moakler and Kim, 2014). CSE is viewed as different from the concept of task or content-specific self-efficacy. CSE, as defined earlier, indicates a person's perceived ability to cope in certain stressful or complicated situations. Content-specific self-efficacy, on the other hand, is defined as perceived ability to perform a certain action to succeed within normal, optimal, or undesignated conditions (Bandura, 1997). When compared to content-specific self-efficacy, CSE has added value by shaping individual performance and commitment in difficult and challenging situations. Previous findings indicate that content-specific self-efficacy is a suitable predictor of academic commitment (e.g., Multon *et al.*, 1991), however, there is an ongoing need to investigate the unique and complementary role of CSE on career decisions and choices (Bandura, 1997; Falk *et al.*, 2016; Falko and Summers, 2019; Lent *et al.*, 2000). Thirdly, the study contributes to theory by utilizing and testing CSM in a non-Western context where additional research is required (Brown and Lent, 2019). Fourthly, emergent

evidence indicates that useful intervention techniques targeting self-efficacy can aid in promoting career-decision making (Bandura, 1997; Lent, 2013). The results of the study indicate a positive impact of mentoring on CSE which ultimately strengthens AOC. These findings contribute to theory on the importance of utilizing intervention strategies that assist women with their career-decision making. Finally, scholars call for testing new ranges of development tasks and challenges with respect to CSM (Brown and Lent, 2019; Lent and Brown, 2013). This study increases academic understanding of CSM by empirically testing the persistence and commitment of women in STEM in the MENA region, thus widening the range of applicability of the model.

Practical Implications and Recommendations

By empirically examining the impact of mentoring on the CSE and AOC of women working in STEM industries, this research contributes to answering questions such as what are the factors that contribute to the occupational commitment of women as an under-represented group and despite the barriers present in these industries? Answers to such questions offer practical implications for career advisors, HR managers, and organizations. The results of this study show that mentoring positively enhances AOC. Therefore, it could be beneficial for companies to offer mentoring programmes on a short-term basis for employees. Such programmes would aim to ease the socialization processes among new recruits and support women to learn more about their organizations' cultures and work practices (Greenhaus *et al.*, 2010). These programmes can assist by explaining job tasks and roles to minimise job ambiguity and provide knowledge about the skills required to perform these tasks successfully (William *et al.*, 2014). Mentees who might form constructive and beneficial relationships with some of the mentors in formal programmes could choose to continue subsequently through informal mentoring relationships, after the programme is closed. The principal aim of both parties would be on enhancing knowledge related to work

performance and successful organizational and business practices. Thus, some mentors may continue to motivate past mentees towards continuous learning and development enhancing their career success and commitment over the longer term.

The results of the current study also indicate a positive relationship between mentoring and CSE. Mentoring is a valuable employee development strategy that can positively improve career outcomes for women through strengthening self-efficacy, since self-efficacy instils confidence to succeed through coping strategies and ability to overcome difficult situations within the occupation (Bandura, 2001). Mentors may discuss with female mentees past experiences and particularly focus on successful experiences that help them to formulate clear goals, engage in career exploration, and reflect on particular task performances to increase their work accomplishments. Mentors should also expose their mentees to challenging work and assignments that broaden their knowledge, advance their expertise, and ultimately strengthen their self-efficacy. From a policy perspective, mentors along with other managers can identify work activities that will aid in achieving organizational goals while simultaneously providing value for women's career development and occupational commitment.

In terms of mentoring in the MENA region, some studies indicate that the role of mentoring is not perceived to be a major career facilitator. Thus, formal mentoring programmes have not been fully embraced by Arab corporations (Abdalla, 2015). Clearly, not all formal mentoring activities and relationships will be successful. However, alongside formal schemes other management initiatives encouraging informal mentoring also have potential to deliver positive outcomes for participants (Ragins and Cotton, 1999). Based on the findings of this research, we advise organizations within the MENA region to include policies that facilitate formal mentoring specifically for women working in STEM.

Finally, the findings of this study indicate that self-efficacy is a major factor in shaping the occupational commitment of women working in STEM fields. Organizations can facilitate vicarious learning by connecting their female employees with role models or inspirational people. This is especially important given the fact that the lack of role models for women working in STEM industries is a pressing concern that, not only affects their occupational commitment, but also their likelihood of attaining senior job positions in organizations (Sealy and Singh, 2010).

This research study was designed to examine mentoring and coping-self efficacy as independent variables and AOC as the dependent variable. These relationships are central to the assumptions and predictions of CSM theory and have been discussed in our literature review. Notably, a meta-analysis conducted by Ghosh and Reio (2013) on the provision of career, psychosocial and role modelling mentoring support identified five types of subjective career outcomes for mentees: job satisfaction, organisational commitment, turnover intent, job performance, and career success. Our study design is based on the argument that occupational commitment will have similar outcomes. We indicated that AOC might become more influential in work circumstances where long-term organisational tenure is unlikely. Such contexts might include project contract work with different organisations, job insecurity with the present employer or other work and family contexts where continuing employment with the current organisation is impracticable. As well as examining the role of mentoring in AOC, empirically there might be potential for a reverse relationship whereby women who demonstrate high and low AOC respond differently to mentoring processes and experience differing outcomes. Based on our dataset we found inconclusive results for a reverse relationship, which may or may not be a design problem related to the measurement items used in the study. For mentoring and AOC, we therefore recommend that researchers analyse the

possibility that women with higher affective occupational commitment are more likely to seek out or maintain relationships with their mentors.

Context of the Study: MENA Region

In this research, we applied the CSM model to test how mentoring affects both CSE and AOC. We studied the impact of CSE on AOC, and finally we tested the mediating effect of CSE on the relationship between mentoring and AOC. Since the data collection for this study was conducted in Lebanon and UAE, specific contributions and recommendations relating to women working in STEM industries in the MENA region can be identified.

Arab women's recruitment and commitment to STEM occupations is influenced by socio-cultural factors (Al-Mughni and Tetreault, 2000; Kandiyoti, 1991; Elamin and Omair, 2010; UNESCO, 2017), however, the representation of Arab women working in STEM occupations shows similar under-representation as reported in other countries worldwide (Hill *et al.* 2010; UNESCO, 2017). One frequently expressed interpretation is that the Arab context considers family and childcare responsibilities a woman's duty. In Arab societal contexts, single Arab women maintain a higher rate of work participation than women with family and dependent care responsibilities (Fargues, 2005). In our study 69% of the respondents were single and 27% married. Many barriers faced by these respondents are not unique to Arab cultural, social and legislative contexts, although it is argued that they continue to show a more enduring impact on women's employment in the MENA region (Hewlett and Rashid, 2011; Jalbout, 2015; Momani, 2016). Therefore, it is reasonable to anticipate that these barriers will negatively affect women in Arab countries working in male-dominated industries more so than in some other regions (Koeing *et al.*, 2011; Sidani, 2016).

The contextual barriers are changing, including the centrality of the family unit in Arab societies with the consequence that over time an increasing proportion of married women continue to be

employed in paid work (Haj-Yahia, 2000). Therefore, future research should further examine approaches to contextual supports and barriers in Arab contexts that increase the number of women employed in STEM. The contribution of this study in terms of predictors of AOC for women in STEM fields should be studied further in other countries and regions to assess the extent that these findings can be generalized to multiple contexts.

Limitations and Future Research

One limitation of this study is that the survey did not request data on the characteristics and the nature of the mentorship, for instance, the number of mentorships that each respondent had, the gender of the mentor and whether the mentoring relationship was formal or informal. Future research should focus on personal characteristics of the mentee and mentor and the nature of the relationship, which will enable further investigation of the identification process (Humberd and Rouse, 2016). Future research could also examine how the identification process between the mentee and mentor affects the quality of the mentoring relationship.

Another limitation is that data collection from universities targeted only private organisations. To give an example from the UAE, Dubai's higher education industry has around 47, 871 students enrolled in private universities and 8,996 students enrolled in public ones (Jeffery, Hancock and Marie, 2019). The UAE population including expatriates is 9.99 million as of 2021. Expatriates constitute around 89% of the population while Emiratis are 11% or 1.15 million (Macrotrends, 2021). One possible explanation behind the fact that private provision in Dubai's higher education institutions makes up a much larger proportion of student places compared to public ones might be that UAE citizens can attend government institutions free of charge. Another reason is the impact of Dubai's academic free zones which contain a large number of private universities and

international branch campuses that tend to attract more expatriate students seeking quality international education. Therefore, one possible variation that may be expected in samples of women who attended private vs non-private institutions in the UAE is that Emirati nationality might be more prevalent in public universities.

It is also important to note that public higher education institutions have more diversity among their graduating students' specializations than private ones. Graduates from Engineering, IT and environment and health sciences amounted to 30% in 2015. Private universities focus more on offering profitable programmes that attract large enrolment numbers or have low running costs such as Business, for example, and refrain in some cases from offering majors such as Medicine. Therefore, another possible variation that may be expected in samples of women who attended private vs non-private institutions is more diversified specializations in STEM of their alumni. Future research could collect data from both private and non-private universities and investigate whether the proposed relationships might differ in specific ways between women who attended private versus those who attended state institutions. The findings of this cross-sectional research study were nested in a single point dimension. A longitudinal study investigating the influence of contextual supports and social, emotional, and cognitive aspects of women working in STEM industries might add to knowledge about the factors influencing OCC. Alternative research designs such as qualitative, mixed and longitudinal methods could also be used to provide deeper insight into the under-representation of women in STEM occupations.

The results of this study reaffirm the importance of mentoring for women in STEM fields. Scholars also call for additional research to explore the organizational context of mentoring and noted the necessity to investigate mentoring effects beyond the mentor-mentee dyad (Dougherty *et al.*, 2010; Chandler *et al.*, 2011). One of the main issues discussed on women in STEM is the unfriendly

organizational climate that may intimidate women from joining and committing to STEM occupations. Thus, future research could investigate organizational context related to mentoring like job scope and actual development opportunities (Lapointe and Vandenberghe, 2017). Despite the fact that in previous research gender has not necessarily affected the outcomes of mentoring (Young *et al.*, 2006), it would also be interesting for future research to explore mentors' and mentees' gender role orientation where individuals' perceptions of themselves as having primarily feminine (vs. masculine) attributes may motivate them to respond differently to the mentoring functions, which in turn could influence the effect of mentoring on work outcomes (Ortiz-Walters *et al.*, 2010). Further understanding of when and among whom mentoring is more effective could offer more insight into how mentoring would aid women's occupational commitment in STEM (Pan *et al.*, 2011; Ortiz-Walters *et al.*, 2010).

Meyer *et al.* (1993) have identified three dimensions of occupational commitment namely, normative (perceived obligation to stay in the occupation), continuance (perceived costs resulting from leaving the occupation) and affective which is the focus of this study. Future research could analyse the relationship between self-efficacy and a range of these OCC dimensions while examining the contribution of various organizational support practices and programmes such as family friendly or well-being programmes that aid in attachment to the field. In addition, due to the fact that the nature of employment relationship is changing (Savickas, 1997), future research could explore what role career adaptability plays in occupational commitment.

Conclusion

This study finds that the positive influence of mentoring on AOC is mediated by CSE. The findings also show that both mentoring and CSE positively impact AOC. We offer a solution to the comparatively high rates of attrition by demonstrating that in the presence of contextual support

such as mentoring along with development of a strong sense of coping efficacy, women employed in STEM may be more able to persist and commit to their occupation.

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Figure 1: Relationship between mentoring functions & Affective occupational commitment mediated by coping self-efficacy.

Conceptual framework

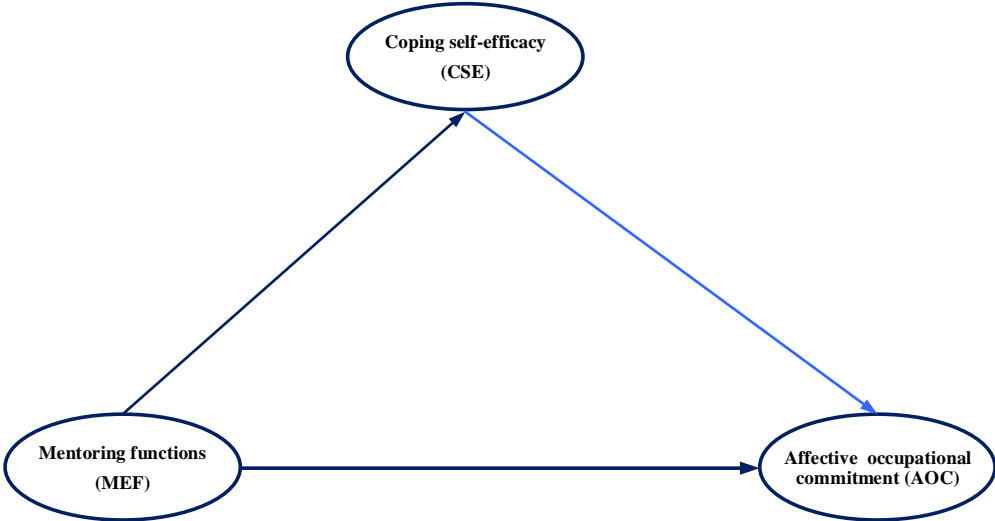


Fig. 1. Relationship between mentoring functions & affective occupational commitment mediated by coping self-efficacy

Table 1: Demographic information

Variables	Frequency	Percentage
Field		
Engineering	230	61.33%
Technology	109	29.07%
Science	32	8.53%
Mathematics	4	1.07%
Marital Status		
Single	260	69.33%
Other	11	2.93%
Married	104	27.73%
Position in firm		
Coordinator	148	39.47%
Director	17	4.53%
Manager	87	23.20%
C Level	65	17.33%
Administrative	58	15.47%
Gender		
Female	375	100%

Table 2: Means, Standard Deviations, Cronbach's Alpha, Correlations, Skewness and Kurtosis

Constructs	Mean	S.D.	MEF	CSE	AOC	Skewness	Kurtosis
Mentoring functions (MEF) (5-point Likert scale)	3.663	0.837	(.887)			-.577	.145
Coping self-efficacy (CSE) (11-point Likert scale)	7.315	1.280	.219**	(.925)		-.218	-.352
Affective occupational commitment (AOC) (7-point Likert scale)	6.146	0.738	.188**	.276**	(.732)	-.983	.561

** Correlation is significant at the 0.01 level (2-tailed). Cronbach's alpha in parentheses.

Figure 2: Statistical Results

