www.ijte.net

Computational Thinking Skills and Computational Self-Efficacy as Predictors of Academic Well-Being

Ehab Gouda Tolba
Mansoura University, Egypt

To cite this article:

Tolba, E.G. (2025). Computational thinking skills and computational self-efficacy as predictors of academic well-being. *International Journal of Technology in Education (IJTE), 8*(3), 761-788. https://doi.org/10.46328/ijte.1180

IJTE International Journal of Technology in Education
2025, Vol. 8, No. 3, 761-788 https://doi.org/10.46328/ijte.1180

Computational Thinking Skills and Computational Self-Efficacy as Predictors of Academic Well-Being

Ehab Gouda Tolba

Article Info

Article History

Received:
7 January 2025
Accepted:
4 May 2025

Keywords

Computational thinking skills
Computational self-efficacy
Academic well-being
Students

Abstract

This study aimed to identify the levels of computational thinking skills, computational self-efficacy, and academic well-being among students, identify the potential relationships among them, and determine the predictive effects of computational thinking skills and computational self-efficacy on academic well-being. The study used the following tools: the Computational Thinking Skills Scale, the Self-Efficacy Scale, and the Academic Well-Being Scale. The study adopted a quantitative correlational predictive approach. The sample consisted of 280 students at the Faculty of Specific Education - Mansoura University. The study revealed that there is an average level of computational thinking skills, computational self-efficacy, and academic well-being. There is also a statistically significant relationship between computational thinking skills, computational self-efficacy, and academic well-being among students. In addition, computational thinking skills and computational self-efficacy are good predictors of academic well-being. Finally, the study presented a set of recommendations and suggestions.

Introduction

The insertion of digital technologies into the educational field is a cultural process, and it forms part of an individual's culture (Grover & Pea, 2013; Yen et al., 2012). Accepting learners as digital citizens requires them to acquire different patterns of thinking, such as innovative and critical thinking, complex problem solving, and computational thinking (Richado et al., 2023; Rich et al., 2021; Moore et al., 2020; Hou et al., 2020; Kukul & Karatas, 2019; Ching et al., 2018; Yen et al., 2012), which represents a new pattern for understanding human behavior (Bundy, 2007; Wing, 2008). Computational thinking is a skill that shapes future professions (Avcu & Ayverdi, 2020; Weese & Feldhausen, 2017; Yadav et al., 2017; Bers et al., 2014).

Computational thinking skills can be developed by enhancing computational self-efficacy, which positively affects students' learning (Ross et al., 2001; Cassidy & Eachus, 2002; Thoonen et al., 2010) and represents a strong motivation for learning and practicing computational thinking skills (Malone & Lepper, 2021; Murnieks et al., 2020). Talsma et al. (2018) and Özmen and Altun (2014) indicate that one of the reasons for students' difficulties in learning and practicing computational thinking skills is low self-efficacy; therefore, studies have focused mainly on variables such as self-efficacy and its relationship with computational performance (Yildiz-Durak & Saritepeci, 2018; Kong et al., 2018; Yang & Cheng, 2009; Cassidy & Eachus, 2002).

Korhonen (2018) and Huppert and So (2013) also noted that students' subject-related self-efficacy is an indicator of academic well-being. Self-efficacy represents an individual's positive evaluation of his life and is a positive indicator of life satisfaction, which has implications for academic well-being (Shek and Chai, 2020; Chen et al., 2017; Howell et al., 2013; Rey et al., 2011; Proctor et al., 2009; Huebner et al., 2004). Moreover, computational thinking involves complex patterns of thinking that require a degree of mental health in students (DeRosier et al., 2013) and a change in the learning culture from a culture of stress to a culture of well-being and flourishing (Gesun, 2021; Jensen, 2021), as academic well-being affects the learner's thinking, attention, and information interpretation processes, which are essential requirements for computational thinking (Lambert et al., 2015).Therefore, it is important to know the levels of computational thinking skills, computational self-efficacy, and academic well-being; to study the potential relationships among computational self-efficacy, computational thinking skills, and academic well-being; and to verify the role of computational thinking skills and computational self-efficacy in predicting academic well-being among university students..

Conceptual Framework

Computational Thinking Skills

Computational thinking (CT) is defined as the mental activity of deriving problems and formulating solutions (de Jesusi et al., 2022; Yadav et al., 2014) and represents a combination of other thinking styles, such as abstract thinking, modeling thinking, and procedural thinking (Román-González et al., 2017). Computational thinking skills are defined in algorithmic thinking; abstraction; problem decomposition; data collection, representation, and analysis; parallelization; control flow; incremental and iterative; testing and debugging; and questioning (Weese & Feldhausen, 2017; Barr et al., 2011).

These skills enable students to acquire new strategies for solving problems and finding new solutions for the real and virtual worlds (Wing, 2008), enhance creative thinking, provide new ways to view social and physical phenomena (Miller et al., 2013; Settle et al., 2012), improve students' attitudes toward practicing computational thinking (Sun et al., 2022; Gulbahar et al., 2019; Dickerson, 2019; Brennan & Resnick, 2012), enhance academic achievement (Lei et al., 2020), and understand many academic fields, such as mathematics, when mathematical algorithms are applied (Grover & Pea, 2013). Therefore, it becomes important to include computational thinking skills in the curriculum (Pewkam & Chamrat, 2022; Nordén et al., 2017) and for the student to possess a high level of these skills by planning activities that allow for the effective application of computational thinking skills (Huda & Rohaeti, 2024).

Studies have shown that students have a below-average level of computational thinking skills (Wardani et al., 2022; Rosali & Suryadi, 2021), and Korkmaz et al. (2015) reported that students have an average level of perceptions of computational thinking skills. Prabawa et al. (2024) reported that students have an average level of computational thinking ability, problem-solving and innovation skills are the most dominant skills, and algorithmic thinking skills are the least dominant skills. Katai et al. (2021) reported that computational thinking skills increase with students' cognitive development and maturity. Chongo et al. (2020) reported that students have a high level of computational thinking skills and that there is a relationship between computational thinking skills and achievement. Although studies have reported mixed results concerning the association between computational thinking and academic achievement, some have indicated a significant positive association between them (Lei et al., 2020; Mindetbay et al., 2019; Lishinski et al., 2016; Yildiz-Durak & Saritepeci, 2018; Gülmez and Özdener, 2015; Haddad & Kalaani, 2015), indicating that there is no significant association between them (Doleck et al., 2017; Miller et al., 2013).

Computational Self-Efficacy

Bandura (1995; 1977) indicated that self-efficacy is related to an individual's beliefs and motivations and expresses an individual's confidence in his ability to achieve a specific goal or solve a problem, control his level of performance (Bandura, 1993), persistence when facing difficult tasks, and resilience in the face of difficulty or failure (Nordén et al., 2017; Schunk et al., 2014). Computational self-efficacy is defined as the effort made by an individual to practice computational thinking, solve programming-based computer problems, and achieve an attitude toward computational thinking skills (Yagci, 2016; Trevelyan, 2011; Compeau and Higgins, 1995). It expresses an individual's judgments about using digital tools creatively (Espinosa et al., 2021; Marakas et al., 1998).

Self-efficacy is associated with concepts such as academic success, motivation, competence building, self-regulation, self-knowledge, autonomy, and happiness (Espinosa et al., 2021; Yahyanezhad & Moharer, 2020; Zee et al., 2016; Thoonen et al., 2010; Zimmerman, 2000), is positively associated with a high level of educational technology use (Buchanan et al., 2013), is associated with computer literacy (Gudek, 2019), is one of the most influential factors in behavior (Anastasiadou & Karakos, 2011), represents the emotional aspect of computational thinking skills (Avcu & Ayverdi, 2020; Safari et al., 2020; Türker & Pala, 2020), works to develop computational thinking skills such as analysis, problem solving, and error correction (Yildiz-Durak et al., 2019; Shell et al., 2014), increases interest in the learning process and development of academic self-concept (Pellas & Kazanidis, 2014), increases individuals' intention to use technology and digital tools (Afari et al., 2023; Gudek, 2019), and reduces computer anxiety (Gudek, 2019; Durndell & Haag, 2002), Self-efficacy is an important variable in predicting computational thinking (Dickerson, 2019; Tsai et al., 2018) and influences the practice of computational thinking skills (Malone & Lepper, 2021; Murnieks et al., 2020; Kong et al., 2018; Yildiz-Durak & Saritepeci, 2018; Nordén et al., 2017; Özmen and Altun, 2014; Thoonen et al., 2010; Yang & Cheng, 2009). Therefore, education in modern societies aims to increase students' self-efficacy to improve their computational thinking skills and use technology (Korucu et al., 2017).

A person with high computational self-efficacy has good perceptions of his ability to use a computer (Turel, 2014), uses digital tools efficiently (Dumbauld et al., 2014), tries to maintain motivation and develop computer skills (Schunk, 1991), develops effective strategies for dealing with complex problems (Odaci, 2013), and expands the scope of his personal goals, which generates better psychological health (Safari et al., 2020). A person with lower computational self-efficacy exerts less effort in performing a task and fails to complete the task (Nordén et al., 2017). Thus, studies indicate the importance of having a high level of computational self-efficacy as a strong predictor of continuing performance and learning computational thinking skills (Espinosa et al., 2021; Krejčová et al., 2019; Yildiz-Durak et al., 2019; Valencia-Vallejo et al., 2016; Shell et al., 2014; Thoonen et al., 2010; Ramalingam & Wiedenbeck, 1998).

Studies have shown that students have low levels of self-efficacy in using computer skills and multimedia programs (Sarfo et al., 2016; 2017) and using technology in the classroom (Singh et al., 2018) and that this low level leads to difficulty in learning and practicing computational thinking skills (Schwarzhaupt et al., 2021; Espinosa et al., 2021; Talsma et al., 2018). Low perceptions of students about themselves in the field of computing (self-efficacy) and a perceived lack of self-confidence and ability to succeed were found to be inhibitors that hinder their entry into the fields of computational thinking (Ahadi et al., 2017; Stout and Tamer, 2016).

However, studies have shown mixed results. There is a strong relationship between self-efficacy and programming (Davidson et al., 2010), a relationship between self-efficacy and information and communication technology (Hatlevik et al., 2018), a relationship between the level of computational self-efficacy and general and specific computer knowledge and the attitude toward digital technology (Gudek, 2019), and a direct and significant relationship between computational self-efficacy and information skills (Espinosa et al., 2021), whereas there is a positive and medium-level relationship between self-efficacy and both computer programming and computational thinking skills (Avcu & Ayverdi, 2020; Wing, 2014; Roman-Gonzalez et al., 2018; Ciftci et al., 2018; Yildiz-Durak et al., 2019) and between computational thinking, reflective thinking and problem solving (Durak & Yilmaz, 2019; Bocconi et al., 2016; International Society for Technology in Education “ISTE”, 2016; Wing, 2014).

Academic Well-Being

The concept of well-being has been associated with positive psychology (Lambert et al., 2015; Biglan et al., 2012) and consists of a set of cognitive, emotional, and behavioral elements that enhance learner self-satisfaction (Akmal, et al., 2021; Renshaw and Bolognino, 2016). It expresses an individual’s happiness and satisfaction with life and awareness of his positive behaviors, such as positive feelings and thoughts (Yahyanezhad & Moharer, 2020; Renshaw, 2018), self-acceptance, personal growth, positive relationships with others, social acceptance, and freedom from physical and psychological diseases (Youssef –Morgan & Luthans, 2015), expresses the learner’s mental health (World Health Organization “WHO”, 2021), and achieves future results (Reynolds et al., 2024).

Academic well-being is the investment of the concept of well-being in the academic field, is related to academic achievement, academic stress, and academic satisfaction (Shek and Chai, 2020; Widlund et al., 2020; Govorova et al., 2020; Fiorilli et al., 2017), is related to school-related engagement and the creation of a positive, fulfilling study-related state of mind characterized by energy, dedication, and absorption (Salmela-Aro & Upadyaya, 2012), and is also associated with happiness (Yahyanezhad & Moharer, 2020; Diener et al., 1985; Andrews & Withey, 1976) because, according to the hedonic model, academic well-being and happiness depend primarily on experiencing pleasurable moments (Diener et al., 1985). Therefore, academic well-being plays a role in students’ academic achievement (Korhonen, 2018).

Researchers have conceptualized academic well-being as a multidimensional concept (Korhonen et al., 2016) consisting of cognitive and affective components of well-being (Chávez-Castillo, et al., 2023; Asghar et al., 2022) and shaped by a wide variety of variables, such as academic efficiency (an individual's belief in their ability to perform or complete academic tasks), academic satisfaction (an individual's assessment of the quality of their academic life), and college connection (an individual's perceptions of pleasant and supportive relationships at school) (Renshaw, 2018; Renshaw & Bolognino, 2016).

Many studies have also examined the relationship between academic well-being and students' academic achievement. It has become clear that the relationship between well-being and actual academic achievement is complex and that there is some contradiction in the results. Some studies show a positive relationship between cognitive academic well-being, mental health, and academic achievement (Klapp et al., 2024; Chávez-Castillo et al., 2023; Kansky et al., 2016; Luhmann et al., 2012; Ansari et al., 2011), some studies show low and weak positive relationships between academic achievement and subjective well-being in students (Amholt et al., 2020; Roeser et al., 1999; Watt, 2004; Eccles & Roeser, 2009; Lv et al., 2016; Cheng & Furnham, 2001; Huebner, 1991), while others fail to find such a relationship (Heller-Sahlgren, 2018; Reisberg, 2000).

There is also a relationship between cognitive well-being and self-efficacy (Robinson and Snipes, 2009), student satisfaction and life within the learning environment (Carter & Yeo, 2018), between academic self-efficacy and subjective well-being (Serinci et al., 2023), and between a learner with a high level of self-efficacy and high levels of subjective well-being (Santos et al., 2014; Mohtasham et al., 2024), as a learner with higher academic self-efficacy exerts more effort and perseverance to solve problems and overcome obstacles and challenges during learning and has a positive attitude and greater ability to adapt, which leads to increased academic well-being (Khodapanah & Tamannaeifar, 2023).

Datu and Mateo (2020) reported that there is an association between well-being (positive emotions and happiness) and self-efficacy. Callaghan et al. (2020), Khodapanah, & Tamannaeifar (2023), and Mohtasham et al. (2024) reported that there is a relationship among academic well-being, academic self-efficacy, and academic achievement among students. Serinci et al. (2023) reported that there is an effect of self-efficacy on psychological well-being among students, that there is a relationship between them, and that academic self-efficacy is a good predictor of psychological well-being. Khodapanah & Tamannaeifar (2023) reported that academic self-efficacy predicts academic well-being and that academic self-efficacy plays a stronger role in explaining the variance in academic well-being. Sahrai et al. (2017) suggested that academic well-being can be partially explained by academic self-efficacy. Therefore, McGeown et al. (2014) reported that academic self-efficacy is an important factor that predicts academic well-being.

Although studies have revealed a decline in students' well-being (Ye et al., 2012) and a deterioration in students' levels of well-being and mental health (Alkureishi et al., 2022; Chen et al., 2022) and that academic well-being ranks lower than does spiritual well-being, psychological, physical, subjective and social well-being among students (Ling et al., 2022), and students in higher education have low levels of well-being (Rynke et al., 2023) and that some students suffer from poor or very poor well-being (Szepe & Meszaros, 2024), academic well-being is among the most important indicators that affect the quality of their academic life (Durlak et al., 2011), plays a fundamental role in individual performance, enhances their thinking and problem-solving abilities (Faqih & Nasab, 2023), and contributes to good performance in school, academic satisfaction, stress reduction, and lower dropout rates (Shek & Chai, 2020; Korhonen et al., 2014), and develops a sense of life satisfaction and positive feelings toward the present and the future (Wu et al., 2020).

On the basis of the above, the following questions can be addressed:

Q1. What are the students' levels of computational thinking skills, computational self-efficacy, and academic well-being?

Q2. Is there a relationship between computational thinking skills, computational self-efficacy, and academic well-being?

Q3. Can academic well-being be predicted by computational thinking skills and computational self-efficacy among university students?

Method

The study used the quantitative correlational predictive approach, as it focuses on determining the levels of computational self-efficacy, computational thinking skills, and academic well-being among students, determining the relationships among computational self-efficacy, computational thinking skills, and academic well-being. In addition, academic well-being may be predicted through computational thinking skills and computational self-efficacy among university students.

The Sample

The targeted research sample consisted of 320 students at the Faculty of Specific Education, Mansoura University, whose ages ranged from 19--21 years, with an average age of 20.6 years and a standard deviation of 6.3 years. The age skewness coefficient was 0.432, meaning that there was moderation in the distribution of sample members on the research variables, and students who did not complete the response to the measurement were excluded; thus, the sample on which the analyses were conducted in its final form consisted of 280 male and female students, with 105 males at a rate of 37.5% and 175 females at a rate of 62.5%.

Data Collection Tools

Computational Thinking Scale

The scale aims to measure students' computational thinking skills. To construct the scale's items, previous literature and studies dealing with computational thinking were reviewed (Pewkam & Chamrat, 2022; de Jesusi et al., 2022; Román-González et al., 2017; Korkmaz et al., 2015; Bocconi et al., 2016; Grover & Pea, 2013; Wing, 2008). Accordingly, the tool consists of (20) items distributed into five dimensions of computational thinking:

creative thinking, algorithmic thinking, collaborative thinking, critical thinking, and problem solving. The items were formulated on a five-point Likert scale (1 = "I completely disagree", 2 = "I disagree", 3 = "Neutral", 4 = "I agree", 5 = "I completely agree"). Thus, the maximum score of the scale becomes 100, and the minimum score becomes 20. The reliability of the computational thinking skills scale was verified via Cronbach's alpha in a sample of 32 university students. Table 1 shows the stability coefficients for the scale dimensions.

Table 1. Reliability Coefficients Related to the Computational Thinking Scale

Dimension	Number of Items	Cronbach's Alpha Coefficient	Sig.	Reliability Level
Creative Thinking	4	0. 78	0.01	high
Algorithmic Thinking	4	0.83	0.01	high
Collaborative Thinking	4	0.87	0.01	high
Critical Thinking	4	0.76	0.01	high
Problem-Solving	4	0.81	0.01	high
Computational Thinking Skills Scale	20	0.84	0.01	high

The validity of the scale was also determined via the internal consistency method by calculating the correlation coefficient between the dimensions of the Computational Thinking Skills Scale, which ranged between 0.78 and 0.85 and was significant at the 0.01 level. The correlation coefficients between the dimensions of the Computational Thinking Skills Scale and the scale as a whole ranged between 0.81 and 0.89 and were significant at the 0.01 level. This indicates that the scale has high scores of validity, stability and internal consistency.

Computational Self-Efficacy Scale

The scale aims to measure students' computational self-efficacy. To construct the scale's items, the literature and previous studies that dealt with self-efficacy in general, computational self-efficacy, and digital self-efficacy were reviewed (Espinosa et al., 2021; Kukul and Karatas, 2019; Dickerson, 2019; Tsai et al., 2018; Nordén et al., 2017; Yang & Cheng, 2009; Cassidy & Eachus, 2002). Accordingly, the tool consists of 27 items distributed in nine dimensions of computational thinking: algorithms, abstraction, problem, decomposition, parallelization, data collection, control flow, incremental and iterative, testing and debugging, and questioning. The items were formulated on a five-point Likert scale (1 = "I completely disagree", 2 = "I disagree", 3 = "Neutral", 4 = "I agree", 5 = "I completely agree"). Thus, the maximum score of the scale becomes 135, and the minimum score becomes 27. The stability of the computational self-efficacy scale was verified via the alpha–Cronbach method on a sample of 32 university students.

Table 2 shows the stability coefficients for the scale dimensions. The validity of the scale was also calculated via the internal consistency method by calculating the correlation coefficient between the dimensions of the computational self-efficacy scale and the correlation coefficients between the dimensions of the computational self-efficacy scale and the scale as a whole, which ranged between 0.79 and 0.88 and was significant at the 0.01

level. This indicates that the scale has high scores of validity, stability and internal consistency.

Table 2. Reliability Coefficients Relating to the Computational Self-Efficacy Scale

Dimension	Number of Items	Cronbach's Alpha Coefficient	Sig.	Reliability Level
Algorithms	3	0.81	0.01	high
Abstraction	3	0.87	0.01	high
Problem Decomposition	3	0.80	0.01	high
Parallelization	3	0.86	0.01	high
Data Collection	3	0.85	0.01	high
Control Flow	3	0.88	0.01	high
Incremental and Iterative	3	0.81	0.01	high
Testing and Debugging	3	0.82	0.01	high
Questioning	3	0.86	0.01	high
Computational Thinking Self-Efficacy Scale	27	0.85	0.01	high

Academic Well-Being Scale

The scale aims to measure students' academic well-being. To build the scale's vocabulary, the literature and previous studies that dealt with academic well-being were reviewed (Chávez-Castillo et al., 2023; Moliner et al., 2021; Renshaw, 2018; Nainian et al., 2017; Li et al., 2015; Renshaw & Arslan, 2016; Renshaw & Bolognino, 2016). Accordingly, the tool consists of 15 items distributed across three dimensions: academic satisfaction, academic efficacy and enjoying learning. The items were sent to 3 experts in the field of education and psychology, and in light of the experts' comments, the required modifications were made. The instrument, in its final form, consists of 15 items distributed across three dimensions: academic satisfaction, academic efficacy, and enjoying learning. The items were formulated on a five-point Likert scale (1 = "I completely disagree", 2 = "I disagree", 3 = "Neutral", 4 = "I agree", 5 = "I completely agree"). Thus, the maximum score of the scale becomes 75, and the minimum score is 15. The reliability of the academic well-being scale was verified via the alpha–Cronbach method on a sample of 32 university students. Table 3 shows the reliability coefficients for the scale dimensions.

Table 3. Reliability Coefficients Relating to the Academic Well-Being Scale

Dimension	Number of Items	Cronbach's Alpha Coefficient	Sig.	Reliability Level
Academic satisfaction	5	0. 79	0.01	high
Academic efficacy	6	0.86	0.01	high
Enjoy learning	7	0.82	0.01	high
Academic Well-Being Scale	18	0.83	0.01	high

The validity of the scale was also calculated via the internal consistency method by calculating the correlation coefficient between the dimensions of the academic well-being scale, which ranged between 0.76 and 0.84 and was significant at the 0.01 level. The correlation coefficients between the dimensions of the academic well-being scale and the scale as a whole ranged between 0.77 and 0.86 and were significant at the 0.01 level. This indicates that the scale has high scores of validity, stability and internal consistency.

Data Analysis

To classify university students into high, medium, and low levels of computational thinking skills, computational self-efficacy, and academic well-being, respectively, and since the three scales follow a five-point scale in response to them, the scores used in each scale (the five-point scale) were divided into three levels of equal range by using the following equation: Category length = (highest value - lowest value) ÷ 3 = (5-1) ÷ 3 = 1.33. Table 4 shows this classification.

Table 4. The Actual Limits of the Response Level Scores (Relative Weights) on the Scales according to the Five-Point Likert Scale

Arithmetic mean value	Percentage	
3.67- 5.00	73.4% –100%	High
2.34 – 3.66	46.8 % – %73.2	Medium
1- 2.33	20% – 46.6%	Low

The data were analyzed via descriptive statistics, specifically arithmetic means, relative means, standard deviations, percentages, and the hypothetical mean (highest theoretical score + lowest theoretical score/2) for each dimension of the scale and at the scale level as a whole. Pearson's correlation coefficient was used to calculate the relationships among the three variables (computational thinking skills, computational self-efficacy, and academic well-being). Regression coefficients were also used to study the effect of the independent variables on the dependent variable with the aim of predicting the scores of the dependent variable from the scores of the independent variables. In addition, inferential statistics, such as t tests, were used to determine the differences between the students' score means and the hypothetical means at the three scales. (Relative mean = arithmetic mean/number of scale items. The range of scores for the item (5 - 1 = 4) was divided into equal segments, so that the low level ranged from 1--2.32, the medium level ranged from 2.33--3.66, and the high level ranged from 3.67--5.

Results and Discussion

Q1. What are the students' levels of computational thinking skills, computational self-efficacy, and academic well-being?

To answer this question, the relative mean was calculated, and a t test was used to compare the mean scores of the research sample and the hypothetical means of the three scales. Table 5 shows these results.

Table 5. t Test to Compare the Mean of the Sample's Scores on the Computational Thinking Skills, Computational Self-Efficacy, and Academic Well-Being and the Hypothesized Mean

	Mean	Hypothetical mean	Std. Deviation	t- test	Sign.	Relative mean	The Level
Computational Thinking Skills	54.75	60	6.22	14.18	0.01	2.74	Medium
Computational Self-Efficacy	66.99	81	12.43	19.09	0.01	2.48	Medium
Academic Well-Being	37.00	45	11.81	11.34	0.01	2.47	Medium

As shown in Table 5, there are statistically significant differences between the students' mean scores (54.75, 66.99, 37.00) and the hypothesized means (60, 81, 45) in computational thinking skills, computational self-efficacy, and academic well-being at a significance level of 0.01 in favor of the hypothesized mean. This means that the students' level is average in computational thinking skills with a relative mean (2.74), in computational self-efficacy with a relative mean (2.48), and in academic well-being with a relative mean (2.47).

This result contrasts with studies that have shown that students have a below-average level of computational thinking skills (Wardani et al., 2022; Rosali & Suryadi, 2021). This finding is also consistent with a study by Chongo et al. (2020), who reported that students had a high level of computational thinking skills, and with a study by Katai et al. (2021), who reported that students' possession of computational thinking skills increased with their cognitive development and maturity, while it was consistent with studies that reported that students had an average level of perceptions of computational thinking skills (Prabawa et al., 2024; Korkmaz et al., 2015). This result contrasts with studies that reported low levels of self-efficacy in the use of computer skills, multimedia software, and database application software (Sarfo et al., 2016; 2017) and in the use of technology in the classroom (Singh et al., 2018).

This result is also in contrast to studies that reported low levels of academic well-being (Szepe and Meszaros, 2024; Rynke et al., 2023; Ye et al., 2012) and that there is a deterioration in well-being levels (Alkureishi et al., 2022; Chen et al., 2022) and that it ranks lower than students' spiritual, psychological, physical, subjective, and social well-being (Ling et al., 2022).On the basis of this result, it becomes necessary to pay attention to and develop computational thinking skills among students (Prabawa et al., 2024), include them in curricula (Pewkam & Chamrat, 2022; Nordén et al., 2017), and plan purposeful activities that allow for the effective application of these skills (Huda & Rohaeti, 2024; Katai et al., 2021).

This result highlights the importance of developing learners' computational self-efficacy and having good perceptions of computational thinking skills (Turel, 2014), using digital tools efficiently (Dumbauld et al., 2014), and developing effective strategies for dealing with complex problems (Odaci, 2013) because the availability of a high level of computational self-efficacy represents a strong indicator of continuing performance and learning computational thinking skills (Espinosa et al., 2021; Krejčová et al., 2019; Yildiz-Durak et al., 2019; Shell et al., 2014; Thoonen et al., 2010; Ramalingam & Wiedenbeck, 1998).This result also indicates that the high level of academic well-being and its enhancement is a critical element in the learning process, as it is a good indicator of mental health and academic performance (Chávez-Castillo et al., 2023; Kansky et al., 2016; Luhmann et al., 2012), life satisfaction and positive feelings toward the present and the future (Wu et al., 2020; Carter and Yeo, 2018), affects the quality of academic life (Durlak et al., 2011), enhances thinking and problem-solving abilities (Faqih & Nasab, 2023), reduces stress and dropout rates among learners (Shek and Chai, 2020; Korhonen et al., 2014), and expands the scope of their personal goals to generate better mental health (Safari et al., 2020).

Q2: Is there a relationship between computational thinking self-efficacy, computational thinking skills, and academic well-being?

Pearson's correlation coefficient was used to explore this question, and the results are shown in Table 6.

Table 6. Correlation Coefficients between Computational Thinking Skills, Computational Self-Efficacy, and Academic Well-Being

Variables	Computational Thinking Skills	Computational Self-Efficacy
Computational Self-Efficacy	0.870**	-
Academic Well-Being	0.855*	0.959**
**The correlation coefficients are significant at 0.01.		

Table 6 shows a statistically significant positive correlation at the 0.01 level between academic well-being and computational thinking skills; the correlation coefficient was 0.855. Given that studies have shown a link between computational thinking and academic achievement (Lishinski et al., 2016, Doleck et al., 2017; Yildiz-Durak & Saritepeci, 2018; Gülmez and Özdener (2015 Haddad and Kalaani, 2015) and that cognitive well-being is positively related to academic achievement Klapp et al. (2024; Ansari et al., 2011) and mental health and academic performance (Chávez-Castillo et al., 2023; Kansky et al., 2016; Luhmann et al., 2012), a positive correlation between academic well-being and computational thinking skills is expected. Therefore, Faqih & Nasab (2023) indicated that academic well-being plays a fundamental role in an individual's performance and enhances thinking. This result differs from studies that have indicated that there is no significant association between computational thinking and academic achievement (Doleck et al., 2017, Miller et al., 2013), that there is no correlation between academic well-being and students' academic achievement (Reisberg, 2000), and that the relationship between them is weak (Heller-Sahlgren, 2018) and not strong (Lv et al., 2016; Cheng & Furnham, 2001; Huebner, 1991), which indicates the expectation of no relationship between academic well-being and computational thinking skills.

This finding suggests that academic well-being is one of the most important indicators that affects the quality of one's academic life, academic satisfaction, and stress reduction and enhances one's ability to engage in "computational thinking" (Durlak et al., 2011; Shek and Chai, 2020 Korhonen et al., 2014; Faqih & Nasab, 2023) and opportunities to practice thinking (Asghar et al., 2022).Table 6 also shows that there is a statistically significant positive correlation at the 0.01 level between academic well-being and computer self-efficacy. The correlation coefficient is 0.959, and this result is consistent with the findings of (Robinson & Snipes, 2009), who confirmed the existence of a relationship between cognitive well-being and self-efficacy, and with studies that indicated a relationship between academic well-being and academic self-concept (Huebner & Gilman, 2006), which differs from studies that indicated a weak positive relationship between well-being and motivation among students (Amholt et al., 2020; Roeser et al., 1999; Watt, 2004; Eccles and Roeser, 2009). Despite this contradiction, these results support the relationship between academic well-being and other variables, such as life satisfaction and positive feelings toward the present and future (Wu et al., 2020), academic success, and positive psychological experiences and feelings in academic contexts (Reynolds et al., 2024), which in turn are associated with the learner's self-efficacy.

These results are consistent with studies that have indicated positive relationships between self-efficacy and several variables, such as subjective well-being (Serinci et al., 2023; Santos et al., 2014), well-being (i.e., positive emotions and happiness) (Callaghan et al., 2020; Datu and Mateo 2020), academic well-being (Khodapanah & Tamannaeifar, 2023), and psychological well-being (Mohtasham et al., 2024). These results support that a learner with high levels of self-efficacy has high levels of subjective well-being (Santos et al., 2014) and exerts more effort and perseverance to solve problems and overcome obstacles and challenges that he faces during learning, which leads to increased academic well-being. Additionally, a positive psychological state enhances academic self-efficacy (Mohtasham et al., 2024). A learner with high computer self-efficacy expands the scope of his personal goals, which results in better psychological health (Safari et al., 2020), whereas a person with lower computer self-efficacy exerts less effort regarding the task and fails to complete the task (Nordén et al., 2017).

In addition, Table 6 shows a statistically significant positive correlation at the 0.01 level between computational thinking skills and computational self-efficacy; the correlation coefficient reached 0.870. These results are consistent with studies that have indicated a close relationship between computational self-efficacy and programming (Davidson et al., 2010), information and communication technology (Hatlevik et al., 2018), computer literacy (Gudek, 2020), and information skills (Espinosa et al., 2021), whereas they differ from studies that have indicated a positive and medium-level relationship between self-efficacy and both computer programming and computational thinking skills (Avcu & Ayverdi, 2020), computational thinking skills (Roman-Gonzalez et al., 2018; Ciftci et al., 2018; Yildiz-Durak et al., 2019), and computational thinking and problem solving (Yildiz-Durak et al., 2019; Bocconi et al., 2016; ISTE, 2016; Wing, 2014).

This finding supports studies that indicate that the practice of computational thinking skills is influenced by self-efficacy (Malone & Lepper, 2021; Murnieks et al., 2020; Yildiz-Durak & Saritepeci, 2018; Kong et al., 2018; Nordén et al., 2017; Özmen and Altun, 2014; Thoonen et al., 2010) and that a learner with high computational self-efficacy has good perceptions of his or her ability to use a computer (Turel, 2014), strong motivation to use computational thinking skills to solve problems (Richado et al., 2023; Kong et al., 2018), efficient use of digital tools (Dumbauld et al., 2014), and computer skills (Schunk, 1991), and develop effective strategies for dealing with complex problems (Odaci, 2013). This result also supports the perspective that students' perceptions of themselves in the field of computing (self-efficacy) and lack of self-confidence are inhibitory factors that hinder their entry into the field of computational thinking (Ahadi et al., 2017; Stout and Tamer, 2016) and that low self-efficacy leads to difficulty in learning and practicing computational thinking skills (Schwarzhaupt et al., 2021; Espinosa et al., 2021; Talsma et al., 2018). Therefore, a high level of self-efficacy in computational thinking becomes important as a strong predictor of learning computational thinking skills (Espinosa et al., 2021; Krejčová et al., 2019; Yildiz-Durak et al., 2019; Shell et al., 2014; Thoonen et al., 2010; Ramalingam & Wiedenbeck, 1998).In general, in light of these results, self-efficacy is an indicator of successful performance in computer environments that require the practice of computational thinking skills (Espinosa et al., 2021; Krejčová et al., 2019; Yildiz-Durak et al., 2019; Valencia-Vallejo et al., 2016).

.

Q3. Can academic well-being be predicted by computational thinking skills and computational self-efficacy among university students?

Multiple regressions were used to explore the effects of the independent variables (computational thinking skills and computational self-efficacy) on the dependent variable (academic well-being), and the results are shown in Tables 7 and 8.

Table 7. Analysis of Variance for Academic Well-being by Digital Resilience, Digital Stress and Social Support

Variable	Source of difference	Sum of Squares	df	Mean Square	F	t	Sig.
Computational Thinking Skills	Regression	28420.70	1	28420.70	755.039	27.478	0.001
	Residual	10464.296	278	37.641			
	Total	38884.996	279				
Computational Self-Efficacy	Regression	35770.343	1	35770.343	3192.7	56.504	0.001
	Residual	3114.653	278	11.204			
	Total	38884.996	279				

Table 7 shows a regression relationship between computational thinking skills as an independent variable and academic well-being as a dependent variable, with the value of “F” reaching 755.039, which is significant at the 0.001 level. Table 7 also shows a regression relationship between computational self-efficacy as an independent variable and academic well-being as a dependent variable, with the value of “F” reaching 3192.7, which is significant at the 0.001 level. Table 7 shows that the regression coefficients are significant at the (0.001) level. The T value (27.478, 56.504) is also significant at the (0.001) level.

Table 8. Predicting Academic Well-being through Computational Thinking Skills and Computational Self-Efficacy

	Variable	R	R Square	Adjusted R Square	B	Std. Error	Contribution %	Sig.
1	Constant	-	-	-	52.099	3.263	-	0.001
	Computational Thinking Skills	0.855	0.731	0.730	0.855	0.059	73.1%	0.001
2	Constant	-	-	-	27.439	1.158	-	0.001
	Computational Self-Efficacy	0.959	0.920	0.920	0.962	0.017	92%	0.001

Table 8 shows that the B values of the regression coefficients of computational thinking skills and computational self-efficacy are statistically significant at the 0.001 level. This result indicates that academic well-being can be predicted on the basis of the independent variables of computational thinking skills and computational self-efficacy.The results also revealed that computational thinking skills and computational self-efficacy contribute 73.1% and 92%, respectively, to the prediction of academic well-being. Therefore, the predictive equation for academic well-being from the computational thinking skills score can be processed as follows: the predictive equation for academic well-being is 52.099 + 0.855 (computational thinking skills), and the predictive equation for academic well-being from the computational self-efficacy score can be processed as follows: the predictive equation for academic well-being is 27.439 + 0.962 (computational self-efficacy). These two equations indicate that the higher a student's scores on computational thinking skills and computational self-efficacy are, the higher his or her academic well-being scores are, and vice versa.This result can be attributed to studies indicating that the increase in computational thinking skills is associated with learners’ tendencies and attitudes toward computational thinking, which affect their self-confidence to achieve goals, accomplish complex tasks and make decisions, demonstrate tolerance for uncertainty, and exert mental effort and perseverance in solving complex problems (Brennan & Resnick, 2012; Roman-Gonzalez et al., 2019; Avcu & Ayverdi, 2020), which are important elements for enhancing their psychological state, mental health and academic well-being (Mohtasham et al., 2024; Khodapanah & Tamannaeifar, 2023; Yahyanezhad & Moharer, 2020; Wu et al., 2020).

What confirms that computational thinking skills can be a good predictor of academic well-being is the statistically significant correlation at 0.01 between computational thinking skills and academic well-being (Table 6), and studies have indicated a positive relationship between both computational thinking skills and academic well-being and academic achievement (Klapp et al., 2024; Chávez-Castillo et al., 2023; Lei et al., 2020; Chongo et al., 2020; Mindetbay et al., 2019; Lishinski et al., 2016, Doleck et al., 2017; Yildiz-Durak & Saritepeci, 2018; Gülmez & Özdener, 2015; Haddad & Kalaani, 2015; Kansky et al.,2016; Ansari et al., 2011).

This result is consistent with the study of McGeown et al. (2014), who reported that academic self-efficacy is an important factor that predicts academic well-being; the study of Sahrai et al. (2017), who reported that academic self-efficacy can be explained by academic self-efficacy; the study of Serinci et al. (2023), who reported that academic self-efficacy significantly predicts subjective well-being; and the study of Khodapanah & Tamannaeifar (2023), who reported that academic self-efficacy predicts academic well-being and that it plays a strong role in explaining the variance of academic well-being. What confirms that computational self-efficacy can be a good predictor of academic well-being is the presence of a statistically significant correlation at 0.01 between computational self-efficacy and academic well-being (Table 6), and studies have indicated the presence of a positive relationship between self-efficacy and academic well-being and that the learner’s display of high levels of academic self-efficacy is accompanied by high levels of academic well-being (Mohtasham et al., 2024; Serinci et al., 2023; Khodapanah & Tamannaeifar, 2023Callaghan et al., 2020; Datu and Mateo, 2020; Santos et al., 2014).

Conclusion

The current study concluded that there is a medium level of computational thinking skills, computational self-efficacy, and academic well-being. There is also a statistically significant relationship between computational thinking skills, computational self-efficacy, and academic well-being among students. In addition, computational thinking skills and computational self-efficacy are good predictors of academic well-being. The results obtained support the importance of computational thinking skills and computational self-efficacy in influencing and predicting academic well-being.

Recommendations

In light of these results, the current study suggests the following:

- Different educational interventions can enhance students' computational thinking skills, computational self-efficacy, and academic well-being.
- Studies that address the cognitive and noncognitive variables that predict computational thinking skills, computational self-efficacy, and academic well-being among students should be conducted.
- Designing and implementing educational programs and interventions that aim to enhance computational thinking skills and computational self-efficacy and maintain academic well-being for all students.
- Computational thinking skills and computer self-efficacy are incorporated as part of the curriculum offered in student preparation programs.
- Multiple regression models are developed by considering cognitive and noncognitive (affective) variables that predict academic well-being.
- A structural equation modeling approach was used to explore the hypothesized relationships between the study variables computational thinking skills, computational self-efficacy, and academic well-being.
- The proposed research is expanded to include the influence of student-related mediating and moderating factors that influence the relationships among computational thinking skills, computational self-efficacy, and students' academic well-being.

Limitations

There are several limitations to the study results, including the use of scales as tools to estimate the study variables. Evaluating computational thinking skills, computational self-efficacy, and academic well-being using only a Likert-type measurement tool can be considered a limitation Avcu & Ayverdi (2020) because other assessment tools should be used in addition to the scales used in this study, such as observations or interviews. The use of self-report measures is also subject to measurement error, as students may overestimate or underestimate their computational thinking skills, computational self-efficacy, and academic well-being. Another limitation is the descriptive correlational approach, as it cannot explain the relationships among computational thinking skills, computational self-efficacy, and academic well-being. Qualitative research can be suggested to learn more about these variables, explore students' levels of these variables, and gain insight into the nature of the relationships among them. In addition, students' gender, experience in using technology and computer programming, emotional intensity, innovative styles, and interest in the future are other limitations, as these variables affect computational thinking skills, computational self-efficacy, and academic well-being (Sarfo et al., 2016).

Notes

Conflict of Interests

The author acknowledges and declares that there is no potential conflict of interest regarding the authorship and publication of the current study.

Funding

This study did not receive research funding from public or private organizations.

The Data Availability Statement

Data cannot be shared openly but are available on request from the author.

Ethical Considerations

All respondents understood that participating in this study was voluntary, and they could decide to withdraw at any time. Furthermore, Sample were informed that their responses would only be used for a research study and that their identities would not be revealed.

Acknowledgements

The author would like to acknowledge the students and teachers who voluntarily contributed to the success of this study.

References

Afari E, Eksail FAA, Khine MS, & Alaam SA. (2023). Computer self-efficacy and ICT integration in education: Structural relationship and mediating effects. Educ Inf Technol (Dordr). 2023 Mar 3:1-17. https://doi.org/10.1007/s10639-023-11679-8

Ahadi, A., Lister, R., Lal, S., Leinonen, J., & Hellas, A. (2017). Performance and Consistency in Learning to Program. *Proceedings of the Nineteenth Australasian Computing Education Conference* (pp. 11–16). ACM. https://doi.org/10.1145/3013499.3013503

Akmal, S., Kumalasari, D., & Grasiaswaty, N. (2021). Indonesian adaptation of the Revised College Student Subjective Wellbeing Questionnaire. *Humanitas Indonesian Psychological Journal, 18* (2),75-86. http://dx.doi.org/10.26555/humanitas.v18i2.19040

Alkureishi, M. L., Jaishankar, D., Dave, S., Tatineni, S., Zhu, M., Chretien, K. C., Woodruff, J. N., Pincavage, A., & Lee, W. W. (2022). Impact of the early phase of the COVID-19 pandemic on medical student well-being: A multisite survey. *Journal of General Internal Medicine, 37*(9), 2156–2164.

https://doi.org/10.1007/s11606-022-07497-2

Amholt, T. T., Jesper, D., Rhonwyn, C., & Janni, N. (2020). Psychological well-being and academic achievement among school-aged children: A systematic review. *Child Indicators Research, 13*(5), 1523–1548. https://doi.org/10.1007/s12187-020-09725-9

Anastasiadou, S.D., & Karakos, A.S. (2011). The beliefs of electrical and computer engineering students regarding computer programming. *The International Journal of Technology, Knowledge and Society*, 7(1), 37–51. https://doi.org/10.18848/1832-3669/CGP/v07i01/56170

Andrews FM, Withey SB. (1976). *Social Indicators of Well-Being.* Boston, MA: Springer US. https://doi.org/10.1007/978-1-4684-2253-5

Ansari, W., Stock, C., Snelgrove, T., Hu, X., Parke, S., Davies, S., et al. (2011). Feeling healthy? A survey of physical and psychological wellbeing of students from seven universities in the UK. *International Journal of Environmental Research and Public Health, 8*(5):1308-1323. https://doi.org/10.3390/ijerph8051308

Asghar, M.; Minichiello, A.; & Iqbal, A.(2022). Perceived Factors Contributing to the Subjective Wellbeing of Undergraduate Engineering Students: An Exploratory Study. *Int. J. Environ. Res. Public Health, 19*, 16284. https://doi.org/10.3390/ijerph192316284

Avcu, Y. E., & Ayverdi, L. (2020). Examination of the computer programming self-efficacy's prediction towards the computational thinking skills of the gifted and talented students. *International Journal of Educational Methodology, 6*(2), 259-270. https://doi.org/10.12973/ijem.6.2.259

Bandura, A. (1977). *Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review*, 84, 191–215, http://dx.doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1993). Perceived Self-Efficacy in Cognitive Development and Functioning. Educational Psychologist, 28(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (Ed.). (1995). *Self-efficacy in Changing Societies*. Cambridge university press. https://doi.org/10.1017/CBO9780511527692

Barr, V., & Stephenson, C. (2011). Bringing computational thinking to K-12: What is involved and what is the role of the computer science education community?. *ACM Inroads 2* (1), 48–54. https://doi.org/10.1145/1929887.1929905

Bers, M. U., Flannery, L., Kazakoff, E. R., & Sullivan, A. (2014). Computational thinking and tinkering: Exploration of an early childhood robotics curriculum. *Computers & Education, 72*, 145–157. https://doi.org/10.1016/j.compedu.2013.10.020

Biglan, A., Flay, B. R., Embry, D. D., & Sandler, I. N. (2012). The critical role of nurturing environments for promoting human well-being. *The American Psychologist*, *67*(4), 257–271. https://doi.org/10.1037/a0026796

Bocconi, S., Chioccariello, A., Dettori, G., Ferrari, A., Engelhardt, K., Kampylis, P., & Punie, Y. (2016). *Developing computational thinking in compulsory education - Implications for policy and practice*, EUR 28295 EN, Publications Office of the European Union, Luxembourg, https://doi.org/10.2791/792158

Brennan, K., & Resnick, M. (2012). New Frameworks for Studying and Assessing the Development of Computational Thinking. Proceedings of the 2012 Annual Meeting of the American Educational Research Association, Vol. 1, Vancouver, 13-17 April 2012, 25 p.

http://scratched.gse.harvard.edu/ct/files/AERA2012.pdf

Buchanan, T., Sainter, P. & Saunders, G. (2013). Factors affecting faculty use of learning technologies: implications for models of technology adoption. *Journal of Computing in Higher Education. 25*, 1–11 (2013). https://doi.org/10.1007/s12528-013-9066-6

Bundy, A. (2007). Computational thinking is pervasive. *Journal of Scientific and Practical Computing*, 1(2), 67-69. http://www.spclab.com/publisher/journals/Vol1No2/N1.pdf

Callaghan, S., & Maureen, D. (2020). Academic Self-efficacy, Subjective Well-being, and Academic Achievement of Students Who "Believe" They Are Gifted. *The International Journal of Learning: Annual Review,* 27 (1), 17-35. https://doi.org/10.18848/1447-9494/CGP/v27i01/17-35

Carter, S., & Yeo, A. C. M. (2018). Internet-enabled collective intelligence as a precursor and predictor of consumer behaviour. *Economics, Management and Financial Markets, 13*(4), 11. https://doi.org/10.22381/EMFM13420181

Cassidy, S., & Eachus, P. (2002). Developing the Computer User Self-Efficacy (CUSE) Scale: Investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research, 26*(2), 133–153. https://doi.org/10.2190/JGJR-0KVL-HRF7-GCNV

Chávez-Castillo, Y.; Zapata-Lamana, R.; Diaz-Vargas, C.; Antileo-Miño, L.; Castro-Durán, L.; Vásquez-Gómez, J.; Parra-Rizo, M.A.; & Cigarroa, I. (2023). Mental Health, Subjective Well-Being, and Academic Performance in Chilean Schoolchildren Who Are Part and Are Not Part of the School Inclusion Program. *Educ. Sci., 13,* 1065. https://doi.org/10.3390/educsci13101065

Chen, T., Lucock, M., Mittal, P., & Mittal, P. (2022). The mental health of university students during the COVID-19 pandemic: An online survey in the UK. *PLoS One, 17*(1), e0262562. https://doi.org/10.1371/journal.pone.0262562

Chen, W., Zhang, D., Pan, Y., Hu, T., Liu, G., & Luo, S. (2017). Perceived social support and self-esteem as mediators of the relationship between parental attachment and life satisfaction among Chinese adolescents. Pers. *Indiv. Differ. 108,* 98–102. http://dx.doi.org/10.1016/j.paid.2016.12.009

Cheng, H., & Furnham, A. (2002).Personality, peer relations, and self-confidence as predictors of happiness and loneliness. *Journal of Adolescence. 25* (3):327-339. https://doi.org/10.1006/jado.2002.0475

Ching, YH., Hsu, YC. & Baldwin, S.. (2018). Developing computational thinking with educational technologies for young learners. *TechTrends*, *62*(6), 563-573. https://doi.org/10.1007/s11528-018-0292-7

Chongo, S., Osman, K., & Nayan, N. (2020). Level of Computational Thinking Skills among Secondary Science Student: Variation across Gender and Mathematics Achievement. *Science Education International, 31*(2), 159- 163. https://doi.org/10.33828/sei.v31.i2.4

Ciftci, S., Cengel, M., & Paf, M. (2018). Reflective thinking skills on computational thinking and problem solving as a predictor of self-efficacy of informatics teacher candidates on programming. *Ahi Evran University Journal of the Faculty of Education*, *19*(1), 321-334. https://doi.org/10.29299/kefad.2018.19.009

Compeau, R. & Higgins, A. (1995) 'Computer self-efficacy: development of a measure and initial test', *MIS Quart*, Vol. 19, No. 192, pp. 189–211. https://doi.org/10.2307/249688

Datu, J. A. D., & Mateo, N. J. (2020). Character strengths, academic self-efficacy, and well-being outcomes in the Philippines: A longitudinal study. *Children and Youth Services Review, 119,* Article 105649. https://doi.org/10.1016/j.childyouth.2020.105649

Davidson, K., Larzon, L., & Ljunggren, K. (2010). *Self-Efficacy in Programming among STS* Students. Upssala University. https://www.it.uu.se/edu/course/homepage/datadidaktik/ht10/reports/Self-Efficacy.pdf

de Jesusi, A. & Silveira, I. (2022). A Collaborative Learning Framework for Computational Thinking Development through Game Programming. *Informatics in Education, 21* (2), 253–281. https://doi.org/10.15388/infedu.2022.14

DeRosier, M. E., Frank, E., Schwartz, V., & Leary, K. A. (2013). The potential role of resilience education for preventing mental health problems for college students. *Psychiatric Annals, 43*(12), 538–544. https://doi.org/10.3928/00485713-20131206-05

Dickerson, J. (2019). *Computational Thinking Self-Efficacy in High School Latin Language Learning.* Electronic Theses and Dissertations. 2515. https://digitalcommons.memphis.edu/etd/2515

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71-75. https://doi.org/10.1207/s15327752jpa4901_13

Doleck, T., Bazelais, P., Lemay, D. J., Saxena, A., & Basnet, R. B. (2017). Algorithmic thinking, cooperativity, creativity, critical thinking, and problem solving: exploring the relationship between computational thinking skills and academic performance. *Journal of Computers in Education, 4*(4), 355–369. https://doi.org/10.1007/s40692-017-0090-9

Douwes, R., Metselaar, J., Pijnenborg, G. H. M., & Boonstra, N. (2023). Well-being of students in higher education: The importance of a student perspective. *Cogent Education, 10*(1). https://doi.org/10.1080/2331186X.2023.2190697

Dumbauld, J., Black, M., Depp, C., Daly, R. Curran, M., Winegarden, B. & Jeste, D. (2014) ‘Association of Learning Styles with Research Self-Efficacy: Study of Short-Term Research Training Program for Medical Students’, *Clinical and Translational Science*, 7 (6), 489–492. https://doi.org/10.1111/cts.12197

Durlak, J. A.,. Weissberg, R. P., Dymnicki, A. B.,Taylor, R. D.& Schellinger, K. B. (2011). The impact of enhancing students’ social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*, 405–432. https://doi.org/10.1111/j.1467-8624.2010.01564.x.

Durndell, A. & Haag, Z. (2002) ‘Computer self-efficacy, computer anxiety, attitudes towards the Internet and reported experience with the Internet, by gender, in an Eat European simple’, *Computers in Human Behavior*, Vol. 18, No. 5, pp. 521–535. https://doi.org/10.1016/S0747-5632(02)00006-7

Eccles, J. S., & Roeser, R. W. (2009). Schools, academic motivation, and stage-environment fit,” in Handbook of Adolescent Psychology: Individual Bases of Adolescent Development, eds., R. M. Lerner and L. Steinberg (Hoboken, NJ: John Wiley & Sons Inc.), 404–434. https://doi.org/10.1002/9780470479193.adlpsy001013

Espinosa, E., Cortés Ruiz, J., & Mercado, M. (2021). Computational Self-Efficacy and Information Skills in Postgraduate Students in Administration at the Times of Covid-19. *Journal on Efficiency and Responsibility in Education and Science, 14* (2), 118-129. http://dx.doi.org/10.7160/eriesj.2021.140205

Faqih, M., & Nasab, L. (2023). Psychometric properties of the college student subjective wellbeing questionnaire (CSSWQ) in a sample of Iranian students. *Journal of Biological Studies, 6* (1), 162-168. https://doi.org/10.62400/jbs.v6i1.7775

Fiorilli, C., De Stasio, S., Di Chiacchio, C., Pepe, A., & Salmela-Aro, K. (2017). School burnout, depressive symptoms and engagement: their combined effect on student achievement. *Int. J. Educ. Res. 84*, 1–12.

https://doi.org/10.1016/j.ijer.2017.04.001

Gesun, J. (2021). *Beyond Surviving: Developing and Testing a Model of Thriving for Engineering Students.* Ph.D. Thesis, Purdue University Graduate School, West Lafayette, IN, USA.

Govorova, E., Benítez, I., and Muñiz, J. (2020). How schools affect student well-being: A cross-cultural approach in 35 OECD countries. *Front. Psychol.* 11:431. https://doi.org/10.3389/fpsyg.2020.00431

Grover, S., & Pea, R. (2013). Computational Thinking in K–12: A Review of the State of the Field. *Educational Researcher*, *42*(1), 38-43. https://doi.org/10.3102/0013189X12463051

Gudek, B. (2019). Computer self-efficacy perceptions of music teacher candidates and their attitudes towards digital technology. *European Journal of Educational Research, 8*(3), 683-696. https://doi.org/10.12973/eu-jer.8.3.683

Gulbahar, Y. Kert, S. B., & Kalelioglu F. (2019). The self-efficacy perception scale for computational thinking skill: Validity and reliability study. *The Self-Efficacy Perception Scale for Computational Thinking Skill: Validity and Reliability Study. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 10(1), 01–29. Retrieved from https://turcomat.org/index.php/turkbilmat/article/view/194*

Gülmez, I., & Özdener, N. (2015). Academic achievement in computer programming instruction and effects of the use of visualization tools; at the elementary school level. *British Journal of Education, Society & Behavioural Science, 11*(1), 1–18. https://doi.org/10.9734/BJESBS/2015/18316

Haddad, R. J., & Kalaani, Y. (2015). "Can computational thinking predict academic performance?," *2015 IEEE Integrated STEM Education Conference*, Princeton, NJ, USA, pp. 225-229, https://doi.org/10.1109/ISECon.2015.7119929

Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers & Education*, *118*, 107-119. https://doi.org/10.1016/j.compedu.2017.11.011

Heller-Sahlgren, G. (2018). Smart but unhappy: Independent-school competition and the wellbeing-efficiency trade-off in education. *Economics of Education Review, 62*, 66–81. https://doi.org/10.1016/j.econedurev.2017.10.005

Hou, H. Y., Agrawal, S., & Lee, C. F. (2020). Computational thinking training with technology for non-information undergraduates. *Thinking Skills and Creativity*, *38*, 100720. https://doi.org/10.1016/j.tsc.2020.100720

Howell, A., Passmore, H., & Buro, K. (2013). Meaning in nature: meaning in life as a mediator of the relationship between nature connectedness and wellbeing. *J. Happiness Stud. 14*, 1681–1696. http://dx.doi.org/10.1007/s10902-012-9403-x

Huda, N. & Rohaeti, E. (2024). Computational Thinking Skill Level of Senior High School Students Majoring in Natural Science. *International Journal of Learning, Teaching and Educational Research, 23* (1), 339-359. https://doi.org/10.26803/ijlter.23.1.17

Huebner, E. S. (1991). Correlates of life satisfaction in children. *School Psychology Quarterly, 6*(2):103-111. https://doi.org/10.1037/h0088805

Huebner, E. S., Suldo, S. M., Smith, L. C., & McKnight, C. G. (2004). Life satisfaction in children and youth: empirical foundations and implications for school psychologists. Psychol. Sch. 41, 81–93.

http://dx.doi.org/10.1002/pits.10140

Huebner, E.S., & Gilman, R. (2006).Students who like and dislike school. *Applied Research in Quality of Life, 1*(2):139-150. https://doi.org/10.1007/s11482-006-9001-3

Huppert, F. A., & So, T. T. (2013). Flourishing across Europe: application of a new conceptual framework for defining well-being. *Soc. Indic. Res. 110*, 837–861. http://dx.doi.org/10.1007/s11205-011-9966-7

International Society for Technology in Education (2016). *ISTE standards for students.* ISTE. https://www.iste.org/standards/for-students

Kansky J, Allen JP, &Diener E. (2016). Early adolescent affect predicts later life outcomes. Applied Psychology. *Health and Well-Being, 8* (2):192-212. https://doi.org/10.1111/aphw.12068

Khodapanah, F., & Tamannaeifar, M. (2023). Academic Well-Being of Adolescent Girls: The Role of Academic Self-Efficacy and Happiness. *International Journal of Medical Investigation, 12* (2), 108-120. http://intjmi.com/

Klapp, T., Klapp, A. & Gustafsson, J. (2024). Relations between students' well-being and academic achievement: evidence from Swedish compulsory school. *European Journal of Psychology of Education, 39*:275–296. https://doi.org/10.1007/s10212-023-00690-9

Kong, S. C., Chiu, M. M., & Lai, M. (2018). A study of primary school students' interest, collaboration attitude, and programming empowerment in computational thinking education. *Computers & Education*, *127*(12), 178-189. https://doi.org/10.1016/j.compedu.2018.08.026

Korhonen J (2018) Academic Well-Being, Mathematics Performance, and Educational Aspirations in Lower Secondary Education: Changes Within a School Year. *Front. Psychol. 9*:297. http://dx.doi.org/10.3389/fpsyg.2018.00297

Korhonen, J., Linnanmäki, K., & Aunio, P. (2014). Learning difficulties, academic well-being and educational dropout: A person-centred approach. *Learn. Individ. Differ. 31*, 1–10. https://doi.org/10.1016/j.lindif.2013.12.011

Korhonen, J., Tapola, A., Linnanmäki, K., & Aunio, P. (2016). Gendered pathways to educational aspirations: the role of academic self-concept, school burnout, achievement and interest in mathematics and reading. *Learn. Instr. 46*, 21–33. https://doi.org/10.1016/j.learninstruc.2016.08.006

Korkmaz, Ö., Çakır, R., Özden, M. Y., Oluk, A., & Sarıoğlu, S. (2015). Examining Individuals' Computational Thinking Skills in Terms of Different Variables. *Ondokuz Mayis University Journal of Faculty of Education, 34*(2), 68-87. https://doi.org/10.7822/omuefd.215276

Korucu, A., Gencturk, A., & Gundogdu, M. (2017). Examination of the Computational Thinking Skills of Students. *Journal of Learning and Teaching in Digital Age, 2*(1), 11-19.

Krejčová, K., Chýlová, H. & Michálek, P. (2019) 'A Role of Siblings in Perception of Academic Self-Efficacy and Social Support'. *Journal on Efficiency and Responsibility in Education and Science*, 12, (4), 126–134. https://doi.org/10.7160/eriesj.2019.120403

Kukul, V. & KARATAŞ, S. (2019). Computational Thinking Self-Efficacy Scale: Development, Validity and Reliability. *Informatics in Education, 18* (1), 151–164, https://doi.org/10.15388/infedu.2019.07

Lambert, L., Passmore, H.-A., & Holder, M. D. (2015). Foundational frameworks of positive psychology: Mapping well-being orientations. *Canadian Psychology / Psychologie canadienne, 56*(3), 311–321. https://doi.org/10.1037/cap0000033.

Lei, H., Chiu, M., Li, F., Wang, X. & Geng, Y. (2020). Computational thinking and academic achievement: A meta-analysis among students. Children and Youth Services Review, 118, 105439. https://doi.org/10.1016/j.childyouth.2020.105439

Li, M., Yang, D., Ding, C., & Kong, F. (2015). Validation of the Social Well-being Scale in a Chinese sample and invariance across gender. *Social Indicators Research*, *121*(2), 607–618. https://doi.org/10.1007/s11205-014-0639-1

Ling, X., Chen, J., Chow, D., Xu, W. & Li, Y. (2022). *The "Trade-Off" of Student Well-Being and Academic Achievement: A Perspective of Multidimensional Student Well-Being*. *Front. Psychol. 13*:772653. https://doi.org/10.3389/fpsyg.2022.772653

Lishinski, A., Yadav, A., Enbody, R., & Good, J. (2016). The influence of problem solving abilities on students' performance on different assessment tasks in CS1. *SIGCSE '16: Proceedings of the 47th ACM Technical Symposium on Computing Science Education* (pp. 329–334). https://doi.org/10.1145/2839509.2844596

Luhmann, M., Lucas, R.E., Eid, M., & Diener, E. (2012). The prospective effect of life satisfaction on life events. *Social Psychological and Personality Science, 4* (1):39-45. https://doi.org/10.1177/1948550612440105

Lv, B., Zhou, H., Guo, X., Liu, C., Liu, Z., & Luo, L. (2016). The relationship between academic achievement and the emotional well-being of elementary school children in China: The moderating role of parent school communication. *Frontiers in Psychology,7,* 1-10. https://doi.org/10.3389/fpsyg.2016.00948

Malone, T., & Lepper, M. R. (2021). Making learning fun: A taxonomy of intrinsic motivations for learning. In *Aptitude, learning, and instruction* (pp. 223-254), Routledge: London. https://doi.org/10.4324/9781003163244

Marakas, G. M., Yi, M. Y. & Johnson, R. D. (1998) 'The multilevel and multifaceted character of computer self-efficacy: toward a clarification of the construct and an integrative framework for research', *Information Systems Research*, Vol. 9, No. 2, pp. 126–163. https://doi.org/10.1287/isre.9.2.126

McGeown, S. P., Putwain, D., Geijer Simpson, E., Boffey, E., Markham, J., & Vince, A. (2014). Predictors of adolescents' academic motivation: Personality, self-efficacy and adolescents' characteristics. *Learning and Individual Differences, 32*, 278–286. https://doi.org/10.1016/j.lindif.2014.03.022

Miller, L. D., Soh, L. K., Chiriacescu, V., Ingraham, E., Shell, D. F., Ramsay, S., & Hazley, M. P. (2013). Improving learning of computational thinking using creative thinking exercises in CS-1 computer science courses. *IEEE Frontiers in Education Conference (FIE),* Oklahoma City, OK, USA, 2013, (pp. 1426-1432). https://doi.org/10.1109/FIE.2013.6685067

Mindetbay, Y., Bokhove, C., & Woollard, J. (2019). What is the Relationship between Students' Computational Thinking Performance and School Achievement?. *International Journal of Computer Science Education in Schools*, *2* (5), 3–19. https://doi.org/10.21585/ijcses.v0i0.45

Mohtasham, S., Hatami Rad, S. S., Hormozi, A., Moodi Ghalibaf, A., & Mohammadi, Y. (2024). Academic Self-Efficacy and Psychological Well-Being in Medical Students: A cross-sectional study. *Canon Journal of Medicine*, *4*(3), 87-90. https://doi.org/10.30477/cjm.2024.418330.1065

Moliner, L., Alegre, F., Cabedo-Mas, A. & Chiva-Bartoll, O. (2021). Social Well-Being at School: Development and Validation of a Scale for Primary Education Students. *Front. Educ. 6*:800248. https://doi.org/10.3389/feduc.2021.800248

Moore, T. J., Brophy, S. P., Tank, K. M., Lopez, R. D., Johnston, A. C., Hynes, M. M., & Gajdzik, E. (2020).

Multiple representations in computational thinking tasks: a clinical study of second-grade students. *Journal of Science Education and Technology*, *29*(1), 19-34. https://doi.org/10.1007/s10956-020-09812-0

Murnieks, C. Y., Klotz, A. C., & Shepherd, D. A. (2020). Entrepreneurial motivation: A review of the literature and an agenda for future research. *Journal of Organizational Behavior, 41*(2), 115-143. https://doi.org/10.1002/job.2374

Nainian, M., Nik Azin, A., Shairi, M., & Rajabi, M. (2017). Reliability and Validity of Adults Personal Wellbeing Index. *Biannual Journal of Clinical Psychology & Personality, 15*(1), 189-199. https://20.1001.1.23452188.1396.15.1.18.2

Nordén, L-Å., Mannila, L., & Pears, A. (2017). Development of a self-efficacy scale for digital competences in schools. In: In: *2017 IEEE Frontiers in Education Conference (FIE): Proc. 47th ASEE/IEEE Frontiers in Education Conference*, IEEE Press, 2017. https://doi.org/10.1109/FIE.2017.8190673

Odaci, H. (2013). Risk-Taking Behavior and Academic Self-Efficacy as Variables Accounting for Problematic Internet Use in Adolescent University Students. *Children and Youth Services Review, 35,* 183-187. https:/doi.org/10.1016/j.childyouth.2012.09.011

Özmen, B., & Altun, A. (2014). Undergraduate Students' Experiences in Programming: Difficulties and Obstacles. *Turkish Online Journal of Qualitative Inquiry, 5* (3), 1-27. https://doi.org/10.17569/tojqi.20328

Pellas, N. & Kazanidis I. (2014) 'The impact of computer self-efficacy, situational interest and academic self-concept in virtual communities of inquiry during the distance learning procedures through second life', *World Wide Web*, Vol. 17, pp. 695–722. https://doi.org/10.1007/s11280-013-0266-9

Pewkam, W., & Chamrat, S. (2022). Pre-Service Teacher Training Program of STEM-based Activities in Computing Science to Develop Computational Thinking. *Informatics in Education, 21* (2), 311–329. https://doi.org/10.15388/infedu.2022.09

Prabawa, H., Rosjanuardi, R. , & Nurlaelah, E. (2024). Computational Thinking Level of Student in Statistics Using Computational Thinking Scale. In; F. Khoerunnisa et al. (eds.), *Proceedings of the 9th Mathematics, Science, and Computer Science Education International Seminar (MSCEIS 2023)*, Advances in Social Science, Education and Humanities Research 860. https://doi.org/10.2991/978-2-38476-283-5_9

Proctor, C. L., Linley, P. A., & Maltby, J. (2009). Youth life satisfaction: a review of the literature. J. Happiness. Stud. 10, 583–630. http://dx.doi.org/10.1007/s10902-008-9110-9

Ramalingam, V., & Wiedenbeck, S. (1998). Development and Validation of Scores on a Computer Programming Self-Efficacy Scale and Group Analyses of Novice Programmer Self-Efficacy. *Journal of Educational Computing Research*, *19*(4), 367-381. https://doi.org/10.2190/C670-Y3C8-LTJ1-CT3P

Reisberg L. (2000).Student stress is rising, especially among women. *The Chronicle of Higher Education, 46*(21):49-50

Renshaw, T. L. (2018). Psychometrics of the Revised College Student Subjective Wellbeing Questionnaire. *Journal of School Psychology*, *33*(2), 136–149. https://doi.org/10.1177/0829573516678704

Renshaw, T. L., & Arslan, G. (2016). Psychometric properties of the Student Subjective Wellbeing Questionnaire with Turkish adolescents: A generalizability study. *Canadian Journal of School Psychology*, *31*(2), 139–

151. https://doi.org/10.1177/0829573516634644

Renshaw, T. L., & Bolognino, S. J. (2016). The College Student Subjective Wellbeing Questionnaire: A brief, multidimensional measure of undergraduate's covitality. *Journal of Happiness Studies*, *17*(2), 463-484. https://doi.org/10.1007/s10902-014-9606-4

Rey, L., Extremera, N., & Pena, M. (2011). Perceived emotional intelligence, self-esteem and life satisfaction in adolescents. Interv. Psicosoc. 20, 227–234. http://dx.doi.org/10.5093/in2011v20n2a10

Reynolds, K.A., Komakhidze, M., Fishbein, B., & von Davier, M. (2024). *Aspects of Student Well-Being and Reading Achievement in PIRLS 2021* (PIRLS Insights). Boston College, TIMSS & PIRLS International Study Center. https://doi.org/10.6017/lse.tpisc.tr2103.kb1236

Rich, P. J., Mason, S. L., & O'Leary, J. (2021). Measuring the effect of continuous professional development on elementary teachers' self-efficacy to teach coding and computational thinking. *Computers & Education*, *168*, 104196. https://doi.org/10.1016/j.compedu.2021.104196

Richado, R., Dwiningrum, S., & Wijaya, A. (2023). Computational Thinking Skill for Mathematics and Attitudes Based on Gender: Comparative and Relationship Analysis. *Pegem Journal of Education and Instruction, 13* (2), 2023, 345-353. https://doi.org/10.47750/pegegog.13.02.38

Robinson, C., & Snipes, K. (2009). Hope, optimism and self-efficacy: A system of competence and control enhancing African American college students academic well-being. *Multiple Lin. Reg. Viewpoints* 35, 16–26.

Roeser, R. W., Eccles, J. S., & Freedman-Doan, C. (1999). Academic functioning and mental health in adolescence: Patterns, progressions, and routes from childhood. *Journal of Adolescent Research, 14,* 135–174. https://doi.org/10.1177/0743558499142002

Román-González, M., Pérez-González, J. C., & Jiménez-Fernández, C. (2017). Which cognitive abilities underlie computational thinking? Criterion validity of the Computational Thinking Test. *Computers in human behavior*, *72*, 678-691. https://doi.org/10.1016/j.chb.2016.08.047

Roman-Gonzalez, M., Perez-Gonzalez, J. C., Moreno-Leon, J., & Robles, G. (2018). Extending the nomological network of computational thinking with non-cognitive factors. *Computers in Human Behavior*, *80* (3), 441-459. https://doi.org/10.1016/j.chb.2017.09.030

Rosali, D. F., & Suryadi, D. (2021). An Analysis of Students' Computational Thinking Skills on The Number Patterns Lesson during The Covid-19 Pandemic. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *11*(2), 216–232. https://doi.org/10.30998/formatif.v11i2.9905

Ross, J. A., Hogaboam-Gray, A., & Hannay, L. (2001). Effects of Teacher Efficacy on Computer Skills and Computer Cognitions of Canadian Students in Grades K-3. *The Elementary School Journal, 102*(2), 141–156. http://www.jstor.org/stable/1002205

Safari, I., Davaribina, M. & Khoshnevis, I. (2020) 'The Influence of EFL Teachers' Self-Efficacy, Job Satisfaction and Reflective Thinking on their Professional Development: A Structural Equation Modeling', *Journal on Efficiency and Responsibility in Education and Science, 13*(1), 27–40. https://doi.org/10.7160/eriesj.2020.130103

Sahrai, S., Sugar, H., Khanbani, M., Hakimi, & Rad, E. (2017). The relationship between academic self-efficacy beliefs and academic wellbeing: the mediating role of perceived academic stress and achievement emotions. *Educational Psychology Quarterly, 14* (49):53-84.

Salmela-Aro, K., & Upadyaya, K. (2012). The schoolwork engagement inventory: energy, dedication, and absorption (EDA). Eur. J. Psychol. Assess. 28, 60–67. https://doi.org/10.1027/1015-5759/a000091

Santos, M. C. J., Magramo, J. C. S., Oguan, J. F., & Paat, J. J. (2014). Establishing the relationship between general self-efficacy and subjective well-being among college students. *Asian Journal of Management Sciences & Education*, *3*(1), 1–12

Sarfo, F. K., Amankwah, S., Oti-Agyen P., & Yidana, I (2016). Information and communication technology access and use and competency level among second-cycle school teachers in Ghana. *Journal of Medial and Communication Studies. 8* (5), 43 -51. https://doi.org/10.5897/JMCS2016.0495

Sarfo, F., Amankwah, F., & Konin, D. (2017). Computer Self-Efficacy among Senior High School Teachers in Ghana and the Functionality of Demographic Variables on Their Computer Self-Efficacy**.** *Turkish Online Journal of Educational Technology - TOJET, 16* (1), 19-31.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational psychologist*, *26* (3-4), 207-231. https://doi.org/10.1207/s15326985ep2603&4_2

Schunk, D.H., Meece, J.R., & Pintrich, P.R. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Boston, MA: Pearson.

Schwarzhaupt, R., Liu, F., Wilson, J., Lee, F. & Rasberry, M. (2021). Teachers' Engagement and Self-Efficacy in a PK–12 Computer Science Teacher Virtual Community of Practice', *Journal of Computer Science Integration, 4*(1), p. 1. https://doi.org/10.26716/jcsi.2021.10.8.34.

Serinci, S., Çıkrıkçı, Ö., & Sarıkaya, Y. (2023). Investigation of relationships between academic self-efficacy, life goals and subjective well-being of middle school students. *British Journal of Guidance & Counselling, 52*(5), 955–969. https://doi.org/10.1080/03069885.2023.2285326

Settle, A., Franke, B., Hansen, R., Spaltro, F., Jurisson, C., Rennert-May, C., & Wildeman, B. (2012). Infusing computational thinking into the middle-and high-school curriculum. In *ITiCSE '12: Proceedings of the 17th ACM annual conference on Innovation and technology in computer science education* (pp. 22-27). ACM. https://doi.org/10.1145/2325296.232530

Shek. D. & Chai, W. (2020) The Impact of Positive Youth Development Attributes and Life Satisfaction on Academic Well-Being: A Longitudinal Mediation Study. *Front. Psychol. 11*:2126. http://dx.doi.org/10.3389/fpsyg.2020.02126

Shell, D. F., Hazley, M. P., Soh, L. K., Miller, L. D., Chiriacescu, V., & Ingraham, E. (2014). Improving learning of computational thinking using computational creativity exercises in a college CSI computer science course for engineers. In *Frontiers in Education Conference (FIE), 2014 IEEE* (pp. 1-7).

Singh, K.; Yamt, H. & Wahi, W. (2018). Teachers' Beliefs on Technological Fusion in Teaching ESL Students. *Creative Education, 9*(14), 2125- 2136. https://doi.org/10.4236/ce.2018.914154

Stout, J., & Tamer, B. (2016). Collaborative learning eliminates the negative impact of gender stereotypes on women's self-concept. *Proceedings of the 47th ACM Technical Symposium on Computing Science Education* (pp. 496–496). ACM. https://doi.org/10.1145/2839509.2850515

Sun, L.; Hu, L.; & Zhou, D. (2022). Programming attitudes predict computational thinking: Analysis of differences in gender and programming experience. *Computers & Education, 181,* May 2022, 104457. https://doi.org/10.1016/j.compedu.2022.104457

Szepe, O., & Meszaros, A. (2024). Assessing well-being of university students and evaluation of its determinants. *BMC Public Health, 24,* 2862. https://doi.org/10.1186/s12889-024-20287-1

Talsma, K., Schüz, B., Schwarzer, R., & Norris, K. (2018). I believe, therefore I achieve (and vice versa): A meta-analytic cross-lagged panel analysis of self-efficacy and academic performance. *Learning and Individual Differences, 61,* 136–150. https://doi.org/10.1016/j.lindif.2017.11.015

Thoonen, E. E. J., Sleegers, P. J. C., Peetsma, T. T. D., & Oort, F. J. (2010). Can teachers motivate students to learn?. *Educational Studies*, *37*(3), 345–360. https://doi.org/10.1080/03055698.2010.507008

Trevelyan, R. (2011). Self-efficacy and effort in new venture development. *Journal of Management & Organization*, *17*(1), 2-16. https://doi.org/10.5172/jmo.2011.17.1.2

Tsai, M.-J., Wang, C.-Y., & Hsu, P.-F. (2019). Developing the Computer Programming Self-Efficacy Scale for Computer Literacy Education. *Journal of Educational Computing Research, 56*(8), 1345-1360. https://doi.org/10.1177/0735633117746747

Turel, V. (2014). Teachers' Computer Self-Efficacy And Their Use Of Educational Technology. *Turkish Online Journal of Distance Education-TOJDE, 15* (4) Article 7, 130-149. http://dx.doi.org/10.17718/tojde.81990

Türker, P. & Pala, F. (2020). The Effect of Algorithm Education on Students' Computer Programming Self-Efficacy Perceptions and Computational Thinking Skills. *International Journal of Computer Science Education in Schools,3* (3), 19–32. https://doi.org/10.21585/ijcses.v3i3.69

Valencia-Vallejo, N., López-Vargas, O., & Sanabria-Rodríguez, L. (2016). Self-Efficacy in Computer-Based Learning Environments: A Bibliometric Analysis. *Psychology, 7*, 1839-1857. http://dx.doi.org/10.4236/psych.2016.714170

Wardani, R., Zakaria, M., Priyanto, P., Luthfi, M. I., Rochmah, I. N., Rahman, A. F., & Putra, M. T. M. (2022). An Authentic Learning Approach to Assist the Computational Thinking in Mathematics Learning for Elementary School. *Elinvo (Electronics, Informatics, and Vocational Education), 6*(2), 139–148. https://doi.org/10.21831/elinvo.v6i2.47251

Watt, H. M. (2004). Development of adolescents' self-perceptions, values, and task perceptions according to gender and domain in 7th- through 11th-grade Australian students. *Child Dev. 75,* 1556–1574. https://doi.org/10.1111/j.1467-8624.2004.00757.x

Weese, J. L., & Feldhausen, R. (2017). *STEM Outreach: Assessing computational thinking and problem solving.* Paper presented at the 2017 ASEE Annual Conference & Exposition, Columbus, Ohio.

Widlund, A., Tuominen, H., Tapola, A., & Korhonen, J. (2020). Gendered pathways from academic performance, motivational beliefs, and school burnout to adolescents' educational and occupational aspirations. *Learning and Instruction, 66*. https://doi.org/10.1016/j.learninstruc.2019.101299

Wing, J. (2014). Computational thinking benefits society. *40th Anniversary Blog of Social Issues in Computing*. New York: Academic Press.

Wing, J. M. (2008). Computational Thinking and Thinking about Computing. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 366* (1881), 3717-3725. https://doi.org/10.1098/rsta.2008.0118

World Health Organization (2021). Mental Health of Adolescents. 2021. Available online: https://www.who.int/news-room/factsheets/detail/adolescent-mental-health

Wu, H., Li, S., Zheng, J., & Guo, J. (2020). Medical students' motivation and academic performance: the mediating roles of self-efficacy and learning engagement. *Medical Education Online, 25* (1). https://doi.org/10.1080/10872981.2020.1742964

Yadav, A., Gretter, S., Good, J., & McLean, T. (2017). Computational thinking in teacher education. In *Emerging research, practice, and policy on computational thinking*. 205-220. https://doi.org/10.1007/978-3-319-52691-1_13

Yadav, A., Mayfield, C., Zhou, N., Hambrusch, S., & Korb, J. T. (2014). Computational thinking in elementary and secondary teacher education. *ACM Trans. Comput. Educ.* 14, 1, Article 5 (March 2014), 16 pages. http://dx.doi.org/10.1145/2576872

Yadav, A., Mayfield, C., Zhou, N., Hambrusch, S., & Korb, J. T. (2014). Computational thinking in elementary and secondary teacher education. *ACM* Trans*. Comput. Educ.* 14, 1, Article 5 (March 2014), 16 pages. https://doi.org/10.1145/2576872

Yagci, M. (2016). Effect of attitudes of information technologies (IT) preservice teachers and computer programming (CP) students toward programming on their perception regarding their self-sufficiency for programming. *International Journal of Human Sciences*, *13*(1), 1418–1432. https://www.j-humansciences.com/ojs/index.php/IJHS/article/view/3502

Yahyanezhad, F., & Moharer, A. (2020). Self –efficacy, academic achievement and happiness. *International Journal of Education and Cognitive Sciences*, *1* (3), 16-23. https://iase-ijeas.com

Yang, H.-L., & Cheng, H.-H. (2009). Creative self-efficacy and its factors: An empirical study of information system analysts and programmers. *Computers in Human Behavior, 25*(2), 429–438. https://doi.org/10.1016/j.chb.2008.10.005

Ye, Y., Mei, W., Liu, Y., & Li, X. (2012). Effect of academic comparisons on the subjective well-being of Chinese secondary school students. *Social Behaviour and Personality: an international journal, 40*(8), 1233-1238. https://doi.org/10.2224/sbp.2012.40.8.1233

Yen, CZ., Wu, PH., & Lin, CF. (2012). Analysis of Experts' and Novices' Thinking Process in Program Debugging. In: Li, K.C., Wang, F.L., Yuen, K.S., Cheung, S.K.S., Kwan, R. (eds) Engaging Learners Through Emerging Technologies. ICT 2012. *Communications in Computer and Information Science, vol. 302*, 122-134. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-31398-1_12

Yildiz-Durak, H. Y., Yilmaz, F. G. K., & Yilmaz, R. (2019). Computational Thinking, Programming Self-Efficacy, Problem Solving and Experiences in the Programming Process Conducted with Robotic Activities. Contemporary Educational Technology, 10(2), 173-197. https://doi.org/10.30935/cet.554493

Yildiz-Durak, H., & Saritepeci, M. (2018). Analysis of the relation between computational thinking skills and various variables with the structural equation model. *Computers & Education, 116*(1), 191-202. https://doi.org/10.1016/j.compedu.2017.09.004

Youssef-Morgan, C. M., & Luthans, F. (2015). Psychological capital and well-being. *Stress health, 31*(3), 180–188. https://doi.org/10.1002/smi.2623 . PMID: 26250352.

Zee, M., & Koomen, H. M. Y. (2016). Teacher Self-Efficacy and Its Effects on Classroom Processes, Student Academic Adjustment, and Teacher Well-Being: A Synthesis of 40 Years of Research. *Review of Educational Research, 86* (4), 981-1015. https://doi.org/10.3102/0034654315626801

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary educational psychology*, *25*(1), 82-91. https://doi.org/10.1006/ceps.1999.1016

Author Information

Ehab Gouda Tolba

https://orcid.org/0000-0002-7766-5807

Mansoura University

Faculty of Specific Education

Dep. of Educational and Psychological Sciences

Egypt

Contact e-mail: *ehabtolba@mans.edu.eg*