AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.3, May-August, 2021https://ajemates.org

SECONDARY SCHOOL STUDENTS' LEARNING STRATEGIES AND SELF-DIRECTED LEARNING AS CORRELATES OF CRITICAL THINKING IN ANAMBRA STATE

Dr. Anyanwu, Adeline Nne & Emesi, Kingsley Ekene
Department of Educational Foundations Faculty of Education,
Nnamdi Azikiwe University Awka Anambra State
an.anyanwu@unizik.edu.ng; kingsleyemesi@gmail.com

ABSTRACT
Students' metacognitive learning processes had experienced some challenges that caused the students' critical thinking, learning strategies and self-directed learning to become a debating issue in the academic field. The study aimed to explore how the students' critical thinking correlates with learning strategies and self-directed learning in Anambra State. Four research questions and six null hypotheses guided the study. The study adopted a correlational approach. The population of the study comprised of 21, 204 from which a sample of 609 was drawn. Multi-stage procedure was used to select the sample. Three standardized research instruments namely; Critical Thinking Ability Scale (CTAS), Metacognitive Ability Scale (MAS) and Self-directed Rating Scale (SRS) were used. Cronbach's alpha was used to determine the reliability of the items in the instruments. A reliability index of 0.81, 0.76, 0.67, 0 .70, 0 .73, 0.81, 0.72, 0.74, 0.84, 0 .87, and 0 .68, were obtained for elaboration, organization, rehearsal, monitoring, planning, self-regulation, self-awareness, learning activities, interpersonal skills and evaluation. The overall reliability coefficient was .76. The Pearson Product Moment Correlation was used to answer research questions 1-3 and test hy potheses 1-3 while the research question four and hypotheses four, five and six were answered and tested with multiple regression. Findings showed that students' critical thinking and learning strategies recorded a very low positive relationship. Findings also revealed that these variables statistically predicted students' critical thinking. Based on these findings, it was recommended that school management and teachers should adopt more teaching techniques to enhance students' critical thinking, learning strategies, self-directed learning so that their metacognitive abilities will be strengthened.

Keywords: Critical Thinking, Learning Strategies, and Self-directed Learning

Introduction

Human beings are essential needs for human nature and learning is an indispensable phenomenon for people to maintain their life and adapt to changing circumstances. This adaptation through learning may be facilitated through self-directed learning strategies and critical thinking respectively.

Interestingly, Meijuan and Cheng (2020), opined that individuals can succeed in learning, if they become aware of their cognitive processes. Those who become aware of their own learning can also be successful in academic and daily life. On the other hand, one of the goals of education is raising individuals who constantly think, put their ideas into practice and thus achieve personal and societal development. Possessing such skills require conscious effort and organization that will facilitate the cognitive dialectic processes in learning. In this respect critical thinking is necessary and important for all individuals in academic and daily life. According to Mansoor, Rafat and Fatemeh (2014), critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and or evaluating information gathered from, or generated by observation, experience, relative reasoning or communication as a guide to belief and action. Sternberg, in Mansoor et al (2014) interpreted it broadly as

comprising the mutual process, strategies and representative people use to solve problems, make decisions and learn new concepts. According to Teimourtash and Fahim (2012) critical thinking (CT) is the ability to analyze facts, generate and organize ideas, define opinions, make comparisons, draw inferences, evaluate arguments and solve problems.

Therefore, failures can be reduced through investment in CT as part of the analyses process. According to Paul and Elder (2011), it is a deliberate meta-cognitive and cognitive act whereby a person reflects on the quality of the reasoning process simultaneously while reasoning to a conclusion. This shows that CT helps to motivate the effects of mindsets and biases by involving skillful examination of evidence both for and against an issue, as well as consideration of obvious and less obvious alternatives explanations (More, 2017). As thinking is a complex internal process in which the individual detaches from the external world to engage in an inner dialogue and contemplation of ideas and abstract concepts, Paul and Elder (2011) believed that the idea of CT is to learn to think for oneself, to gain command over one's thought processes as it entails a commitment to analyzing and evaluating beliefs on the bases of reason and evidence, to question when it is rational to question, to believe when it rational to believe and to confirm when it is rational to confirm. However it is the responsibility of educational institutions to teach students to improve and to achieve higher level skills and habits involved in CT and its relationship to self-directed learning and learning strategies has become a central issues and it is time to explore the term in connection with the predictive strength each has in predicting one another respectively.

In the understanding of learning strategies, Lennia, Willy and Maarten (2017) defined them as useful skills for storage and retrieval of information. These involve actions and operations used by the students in order to optimize the process of obtaining and storing information, extracting it from memory and its use. Printrich, Conley and Kempler (2013) described learning strategies as skills students use to understand different tasks, choose and effectively employ the appropriate techniques to accomplish task or meet goals. These are tactics students use to assist themselves in the leaning process. They involve using self-generated actions, feelings, or thoughts towards the attendant of personal goals or academic goals. They are also the techniques and processes selected by the learners by which to achieve a specific learning objective (Lennia et al, 2017). They are specific techniques which are usually employed by learners in order to make learning easier, faster and more effective. These techniques can be in the form of cognitive, compensation, social, effective, meta-cognitive and mnemonic as they can be very useful for critical thinking and self-directed learning. According to Dowson and Mclnerny as cited by Lennia et al (2017), learning strategies consist of six subscales such as: elaboration, organization, rehearsal, monitoring, planning, and regulation. Elaboration strategies are used for storage of information in long-term memory, creating connections between the aspects needed to be learned and also help to integrate new information with the knowledge that the student already has. These are useful to have a deep understanding of what students are studying. Organization strategies are used to select information and build association between the aspects which need to be learned. They help to connect information with prior knowledge. Rehearsal strategies are used in basic memory activities, for example reciting or naming items to be learned. They are used for simple tasks and to activate information in working memory. Monitoring strategies involve self checking for understanding self-testing and organizing reviews of learned materials. These imply systematic attempts to evaluate the assimilation and organization of learned materials. Planning strategies involves prioritizing, time management, scheduling, setting realistic goals, and arranging work environment appropriately. These imply thoughtful preparation for completing work. Then self-regulation is a strategy put in place to rectify deficits identified while monitoring. The specific strategies includes, attempting different ways to learn

material, and identifying mistakes in reasoning. It is on this ground that the researchers sought to examine how critical thinking correlates with students' learning strategies and self-directed learning.

In the academic domain, Haba and Reda(2018), defined self-directed learning (SDL) as a process where the adult students take the initiative to specify their own learning needs, aims, the appropriate learning sources and strategies, as well as evaluating their learning results. This process can be established by students independently or with others' support including educators, tutors, and even classmates. Adding to that, it can be developed at different settings as the academic continuing education settings or at clinical practices level. Self-directed learning has four stages; the first stage is accessing the surrounding environment, one's own readiness for SDL, learning needs and required learning resources. The second stage is planning to promote SDL. The third stage is implementing the learning activity using the most active learning strategies and finally, evaluating learning outcomes and discovering the future learning needs.

However, Haba and Reda (2018), opined that the success of SDL process depends on readiness of students to learn, this readiness can be viewed as owning the required personal trait, attitudes and talents for SDL. Learners with high SDL readiness are aware of their leaning responsibility and act independently. They have the curiosity and self-confidence in their abilities to organize their times and plan their learning tasks and solve problems effectively. Likewise, SDL is a learning construct that deals with the enhancement of students' enthusiasm, self-confidence, autonomy, and refine their clinical skills for continuing education. During the SDL process students are encouraged to build up the ability to appraise the gaps in their knowledge and skills afterwards and look for relevant resources to assist them in overcoming these gaps (Mehmet & Kenan, 2018).

Haba and Reda (2018), believed that self-directed students tend to think about different aspects of new ideas, and rely on independent different resources to gather data rather than being limited to one source. Also, they are able to recall their earlier knowledge and experiences, interpret their points of view and deal with uncertainty. Additionally, they are eager for their learning achievements; apply hypothesis-based approach to learning; take advantage of feedback obtained in other situations; and be autonomous in their learning processes. This autonomy strengthens students' learning passion and allows them to continue their life-long learning on the same basis. On the other hand, Willey as cited by Mechment and Kenan (2018), opined that SDL has personal, social and political dimension and contexts. They emphasized that the balance between them is of importance to self-directed readiness to learning.

Individuals can succeed in learning if they become aware of their connective processes. Those who become aware of their own learning can also be successful in academic and daily life. It is considered that having SDL depends on acquiring certain preliminary information, skills and attitudes. Individuals should acquire cognitive and emotional characteristics required by SDL to have life-long learning. Self-directed learning process should be constructed considering the individual's intellectual characteristics, critical thinking and learning strategies. It could be suggested that those leaning constructs could be significant variables for self-directed learning. In this present study, four dimensions of SDL such as self-awareness, learning activities, self-evaluation and interpersonal skills will be examined in relation with critical thinking and learning strategies components. Self-awareness deals with learners understanding of the factors contributing to becoming self-directed learners. Learning activities deal with the requisite learning activities learners should actively engage in order to become self-directed in their learning process. Interpersonal skills describe learners' interpersonal relationships, which are pre-requisites to their becoming self-directed learners. Then self- evaluation is the component of SDL that reveals learners' specific attributes in other to help monitor their learning activities.

Sequel to these researches, critical thinking, learning-strategies and self-directed learning are representing the ability to clarify understanding of a problem to produce logical decisions. Examining the current classroom situations through students' participation in the learning process, one can discover signs of academic apathy among the students.

Moreover, global composition in the digital age requires more than mastering of knowledge. It also involves the acquisition of a variety of skills including critical thinking skills, learning-strategies, and self-directed learning towards the global issues. The 21st century requires a generation of critical thinker, strategies learners, and self-directed learners who can solve problems and participate actively in making decisions on local and global issues that are formed through the thought process. Again, the ability to think critically, strategically, and be self-directed can be acquired through learning that prioritizes the thought process in the classroom learning contexts or situations.

It will be interesting to state that many studies have examined the interactions and associations that existed among these variables at different levels with different results being recorded. For example, the study of Meijuan, and Cheng (2020), recorded a positive and significant relationship between the students' learning strategies and self-directed learning ability . Also, the study of Haba and Reda (2018) had recorded a significant positive correlation between students' self-directed learning and critical thinking. The study of Mehmet and Kenan (2018) had recorded a positive relationship between self-directed learning and critical thinking. Then, the study of Mansoor, Rafat and Fatemah (2014) also recorded a positive significant relationship between students' critical thinking and their self-directed learning. In their findings, Carolina et al (2014), revealed that learning style and deep processing learning strategies had positive correlation with self-directed learning. The major problem with these studies is that they failed to establish the level of positive relationship that has existed between the variables in their study. The findings from the reviewed studies did not examine the variables such as self-directed learning and learning strategies into component parts to ascertain the sub-component that has the highest predictive strength in predicting critical thinking and this is one of the gaps in knowledge which the present study will cover. Therefore, the authenticity of this study aims to explore the students' learning-strategies and self-directed learning as correlate of critical thinking among the secondary school students in Anambra state.

Research Questions

1. What is the relationship between students' critical thinking and their learning strategies?
2. What is the relationship between students' critical thinking and their self-directed learning?
3. What is the relationship between learning strategies and self-directed learning?
4. What is the proportion of variance in critical thinking that is explained by students' self-directed learning and learning strategies?

Hypotheses

1. There is no significant relationship between students' critical thinking and their learning strategies.
2. There is no significant relationship between students' critical thinking and their self-directed learning.
3. There is no significant relationship between students' learning strategies and their self-directed learning.
4. The proportion of variance in critical thinking that is explained by students' self-directed learning and learning strategies is not significant.
5. There is no significant difference between students' learning activities and their learning strategies.
6. There is no significant relationship between students' interpersonal skills and their learning strategies.

Research Method

The researchers used a correlation research design for the study. The population consisted of 21,204 which represented all the senior secondary 11 (SS11) students in Anambra State. A sample size of 630 was used and questionnaires were administered to all respondents, 609 of them were found useful during data analysis. Multi-stage sampling procedure was used to select the respondents. The procedures for the selection were as follows: In stage one, three education zones were selected from the six education zones in the state by simple random sampling. Then in stage two, from each sampled education zone, one local government area (L.G.A) was selected through simple random sampling given a total of three (3) L.G.As. In stage three, from each sampled L.G.A, 10 schools were randomly selected giving a total of 30 schools. Then, from each of the schools, 21 SSII students were selected for the study using a table of simple random sampling. This gave a total number of 630 students used in the study.

The study adapted three standardized research questionnaires namely, Peng, et al (2004) Critical Thinking Ability Scale (CTAS), Keng and Zang (2005) Metacognitive Ability Scale (MAS) and Shen and Hu(2011) Self-directed Rating Scale (SRS). The methods used for validating the instruments were face and content validity by three experts from the Faculty of Education, Nnamdi Azikiwe University Awka. Cronbach's alpha reliability method was used to determine the internal consistency of the items in the research questions such as critical thinking, 0.81, elaboration, 0.76,organization, .67, rehearsal, .70, monitoring, .73, planning, .81, self-regulation, .72, self-awareness, .74, learning activities, .84, interpersonal skills, .87, and evaluation, .68. The overall reliability coefficient was .76 which shows that the instrument was reliable and good for the study. According to guide lines by Sekaran (2018), a coefficient of 0.6 is considered to be poor, 0.7 is acceptable while over 0.8 is good. The Pearson Product Moment Correlation Coefficient was used in answering research questions one to three and testing of hypotheses one to three. Multiple regression was used to answer research question four and to test hypotheses four, five and six at 0.05 level of significance. The decision rule: for null hypotheses with P-value higher than 0.05, was not rejected, while the hypotheses with P-value lower than 0.05 was rejected. The guide for interpretation of correlation results was done in accordance with Okoye (2015). Rough guide for interpreting correlation coefficient values when a large number of pairs of scores have been correlated. The decision rules to interpret the research questions were presented as follows: r = ± .00, no relationship; r = ± 0.0 to ± 0.2, very low relationship; r = ± 0.2 to ± 0.4, low relationship; r = ± 0.4 to ± 0.6, medium relationship; r = ± 0.6 to ± 0.8, high relationship; and r = ± 0.8 to ± 1.0, very high relationship.

Table 1: ***Relationship between students' critical thinking and their learning strategies.*** (N= 609)

Variables	Critical thinking (r)	Remarks
Elaboration	.083	Very low + relationship
Organization	.192	Very low + relationship
Rehearsal	.108	Very low + relationship
Monitoring	.095	Very low + relationship
Planning	.108	Very low + relationship
Self-regulation	.164	Very low + relationship

The results in Table 1 reveal a very low positive relationship between students' critical thinking and their learning strategies

Table 2: ***Relationship between students' critical thinking and their self-directed learning.***(N= 609)

Variables	Critical thinking (r)	Remarks
Self-evaluation	.120	Very low + relationship
Self-awareness	.142	Very low + relationship
Learning activities	.163	Very low + relationship
Interpersonal skills	-.052	Very low – relationship

The results in Table 2 reveal a very low positive relationship with students' critical thinking and some components of self-directed learning such as; self-regulation, self-awareness, and learning activities while interpersonal skills recorded a very low negative relationship with critical thinking.

Table 3: ***Relationship between students' learning strategies and their self-directed learning.*** (N= 609)

Variables	Self-evaluation	Self-awareness	Learning activities	Interpersonal skills	Remarks
Elaboration	.065	.019	-.012	.014	Very low + and –relationship
Organization	.028	.122	.123	-.080	Very low + and –relationship
Rehearsal	.024	.124	.065	.012	Very low +relationship
Monitoring	.112	.087	.057	-.016	Very low + and – relationship
Planning	.223	.089	.098	-.003	Very low + and –relationship
Self-regulation	.027	.039	.073	-.045	Very low + and – relationship

The results in Table 3 reveal self-regulation and self-awareness recorded a very low positive relationship with students' elaboration, organization, rehearsal, monitoring, planning, and evaluation. Learning activities recorded a very low positive relationship with students' organization, rehearsal, monitoring, planning, and evaluation, and also, recorded a very low negative relationship with students' elaboration. Then, interpersonal skills recorded a very low positive relationship with students' elaboration and rehearsal, while a very low negative relationship was recorded with students' organization, monitoring, planning, and evaluation.

Table 4: ***The proportion of variance in critical thinking explained by students' learning strategies and their self-directed learning.***(N= 609)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.286a	.082	.067	10.00678

Table 4 reveals that the proportion of variance in critical thinking that is explained by students' learning strategies and their self-directed learning is 8.7%.While R adjusted is .082 with standard error of 10.00678.

Table 5: The test for Significant Relationship between Students' Critical thinking and their Learning strategies.

Variables	Critical thinking (r)	P-values	Remarks
Elaboration	.083	.040	Significant
Organization	.192	.000	Significant
Rehearsal	.108	.008	Significant

Monitoring	.095	.019	Significant
Planning	.108	.008	Significant
Self-regulation	.164	.000	Significant

Significant correlation at 0.05 level of significance.

The results in Table 5 reveal that there is a significant relationship between students' critical thinking and their learning strategies. (r =.083> 0.05), (r = .192 > 0.05), (r = .108 > 0.05), (r = .095 > 0.05), (r = .108 > 0. 05), and (r = .164 > 0.0

Table 6: The test for Significant Relationship between Students' Critical thinking and their Self-directed Learning.

Variables	Critical thinking (r)	P-values	Remarks
Self-evaluation	.120	.003	Significant
Self-awareness	.142	.000	Significant
Learning activities	.163	.000	Significant
Interpersonal skills	.148	.000	Significant

Significant correlation at 0.05 level of significance.

The results in Table 6 reveal that there is a significant relationship between students' critical thinking and their self-directed learning. (r = .120 > 0.05), (r = .142 > 0.05), (r = .163 > 0.05), and (r = .148 > 0.05).

Table 7: The test for Significant Relationship between Students' Self-evaluation and their Learning Strategies.

Variables	Self-evaluation (r)	P-values	Remarks
Elaboration	.065	.110	Not Significant
Organization	.028	.485	Not Significant
Rehearsal	.024	.553	Not Significant
Monitoring	.112	.006	Significant
Planning	.223	.000	Significant
Self-regulation	.224	.000	Significant

Significant correlation at 0.05 level of significance. Not Significant correlation at 0.05 level of significance.

The results in the Table 7 reveal that the relationship between students' self-evaluation and some components of learning strategies such as monitoring, planning, and self-regulation is significant (r = .112 > 0.05), (r = .223 > 0.05), and (r = .224 > 0.05), while the relationship with elaboration, organization, and rehearsal is non significant with self-evaluation, (r = .065 > 0.05), (r = .028 > 0.05), and (r = .024 >

Table 8: The test for Significant Relationship between Students' Self-awareness and their Learning Strategies.

Variables	Self-awareness (r)	P-values	Remarks
Elaboration	.019	.635	Not Significant
Organization	.122	.003	Significant
Rehearsal	.124	.002	Significant
Monitoring	.087	.031	Significant
Planning	.089	.28	Not Significant
Self-regulation	.261	.000	Significant

Significant correlation at 0.05 level of significance. Not Significant correlation at 0.05 level of significance.

The results in the table 8 reveal that the relationship between students' self-awareness and some components of learning strategies such as organization, rehearsal, monitoring, and self-regulation is significant, (r = .122 > 0.05), (r = .124 > 0.05), (r = 0.87 > 0.05), (r = 0.89 > 0.05), and (r =.216 >0.05). While the relationship between self-awareness with elaboration and planning is not significant, (r = .019 > 0.05).

Table 9: The test for Significant Relationship between Students' Learning activities and their Learning Strategies.

Variables	Learning activities (r)	P-values	Remarks
Elaboration	-.012	.766	Not Significant
Organization	.123	.002	Significant
Rehearsal	.065	.109	Not Significant
Monitoring	.057	.157	Not Significant
Planning	.098	.016	Significant
Self-regulation	.224	.000	Significant

Significant correlation at 0.05 level of significance. Not Significant correlation at 0.05 level of significance.

The results in the Table 9 reveal that the relationship between students' learning activities and some components of learning strategies such as, elaboration, rehearsal, and monitoring is non significant (r = -.012 > 0.05), (r = .065 > 0.05), (r = .057 > 0.05). While there is a significant relationship between students' learning activities with organization, planning, and self-regulation (r = .123 > 0.05), (r = .098 > 0.05), and (r = .224 > 0.05).

Table 10: The test for Significant Relationship between Students' Interpersonal skills and their Learning Strategies.

Variables	Interpersonal skills (r)	P-values	Remarks
Elaboration	-.016	.687	Not Significant
Organization	.129	.001	Significant
Rehearsal	.080	.047	Significant
Monitoring	.046	.262	Not Significant
Planning	.065	.111	Not Significant
Self-regulation	.244	.000	Significant

Significant correlation at 0.05 level of significance. Not Significant correlation at 0.05 level of significance.

AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.3, May-August, 2021https://ajemates.org

The results in the Table 10 reveal that the relationship between students' interpersonal skills and some components of learning strategies such as, elaboration, monitoring, and planning is not significant (r = -. 016 > 0.05), (r = .046 > 0.05), (r = .244 > 0.05). While there is a significant relationship between students' interpersonal skills with organization, rehearsal, and self-regulation (r = .129 > 0.05), (r = .080 > 0.05), and (r = .129 > 0.05).

Table 11: Multiple Regression of Students' Learning Strategies and Self-directed Learning on Critical Thinking. (N =609)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.286[a]	.082	.067	10.00678

Model	Change Statistics				Sig F Change
	R Square Change	F Change	df1	df2	.000
1	.082	5.345	10	598	

Model		Sum of Squares	Df	Mean Square	F	Sign
1	Regression	5352.296	10	633.272	5.345	.000[b]
	Residual	59881.083	598	99.389		
	Total	65233.379	608			

Model	Unstandardized Coefficients B	Standardized Coefficients Std. Error	Beta	T	Sig.
1 (Constant)	36.91	4.295		8.595	.000
Elaboration	.099	.059	.066	1.673	.095
Organization	.324	.097	.139	3.328	.001
Rehearsal	.097	.101	.040	.961	.337
Monitoring	.075	.096	.032	.788	.431
Planning	.103	.089	.048	1.161	.246
Self-regulation	.104	.065	.067	1.619	.246
Self-awareness	.143	.083	.071	1.719	.086
Learning activities	.238	.087	.112	2.753	.006
Interpersonal skills	-.012	.029	-.017	-.427	.669
Evaluation	-.014	.110	-.005	-.128	.898

The table shows a multiple regression run to predict students' critical thinking from learning strategies and self-directed learning. These variables statistically predicted critical thinking of the students, F (10,598) = 5.345, with R2 of .082. Students' learning strategies and self-directed learning statistically predicted critical thinking, P > .05. The results in the table also revealed the relative contribution of each variable, however it revealed that organization is the most potent predictor of students' critical thinking among other variables (β = .068, t = 1.673, p = .000). This further showed that the other measures of learning strategies and self-directed learning are significant in predicting students' critical thinking. Conclusively, the null hypothesis was rejected, then it was concluded that students' learning strategies and self-directed learning significantly predicted their critical thinking.

Discussion

Findings in table 1 revealed a very low positive and significant relationship between students' critical thinking and their learning strategies. This supported the study of Meijuan and Cheng (2020) that found a positive and significant relationship with students' critical thinking and their learning strategies.

Findings in table 2 revealed a very low positive and significant relationship between students' critical thinking and their self-directed learning. This supported the study of Meijuan and Cheng (2020), that found a low positive and significant relationship between critical thinking and self-directed learning. These also supported the study of Heba and Reda (2018) that recorded a significant and positive relationship between students' critical thinking and self-directed learning. The findings also supported the study of Mansoor, Rafat and Fatemeh (2014) that recorded a positive and significant relationship between students' self-directed and critical thinking. The findings agreed with the study of Mehmet and Kenan (2018) as it had recorded a positive relationship between self-directed learning and critical thinking.

Findings in table 3 revealed a very low positive and a very low negative relationship between students' learning strategies and their self-directed learning. This supported the study of Carolina et al (2014) that recorded a positive relationship between students' self-directed learning with learning strategies.

Conclusion

The outcome of the present study indicated that students' metacognitive learning abilities and processes in different dimensions such as; critical thinking, learning strategies and self-directed learning had a very low positive relationship among the variables. Despite these, students' learning strategies and self-directed learning showed a significant relationship with their critical thinking. This implies that students' critical thinking, learning strategies and self-directed learning are useful instruments that can influence their life-long learning.

Recommendations

Based on the findings, the following recommendations were made.

1. School management and teachers should adopt more teaching techniques to enhance students' critical thinking, learning strategies and self-directed learning so that their metacognitive abilities will be strengthened.
2. Government through the school teachers should provide more access to technological facilities and make internet services available in schools so that students' will use them to enhance their metacognitive abilities.
3. Based on a very low positive relationship among the three variables, teachers should guide and advice students to engage more on studies that involve critical thinking, learning strategies and self-directed learning for them to become relevant to themselves and society in future.
4. Based on the low relationships in the study, government need to redesign students' curricula to enhance their critical thinking, learning strategies and self-directed learning as these will jointly influence their cognitive development on a massive scale.
5. Teachers should stimulate students' critical thinking, learning strategies and self-directed learning through the introduction of interesting and challenging problem scenarios.
6. Teachers should encourage the students to ask questions, challenge them to search for the most relevant facts, and be objective about tracking inquiry to raise their confidence in their reasoning process.
7. As teachers are quite essential in directing students on the development of their critical thinking, learning strategies and self-directed learning as an integral

part of metacognitive learning process, in-service training should be provided to make teachers more efficient

References

Carolina, M.U., Eduardo, F.H., Cristhian, P.V., Javiera, O.B., Paula, P.P., Liliana, O.M., Olga, M.B., & Pilar, I.G. (2014).Relationship between self-directed learning with learning styles and strategies in medical students. Rev Med. Chil. (11), 1422-30.

Dowson, M., & Mclnerney, D.M.(2004). The development and validation of the goal orientation and learning strategies survey (GOALS-S). *Educational and Psychological Measurement, 64,* 290-310.

Haba, K.O, & Reda, A, A.G. (2018). Applying self-directed learning strategies to enhance nursing students' critical thinking skills. *Journal of Nursing and Health Science, 6*(2) 67- 77.

Kang, Z.H., & Zhang, J.S. (2005).*The preliminary construction of the scale for college students' metacognitive ability*.Shanxi University.

Lennia, M., Willy, L., & Maaften, V. (2017). Achievement goals, learning strategies and language achievement among peruvian high school students. *Psycholocia Belgica,47,*(2),51-70.

Mansoor, F., Rafat, B., &Fatemeh, H. (2014).The relationship between self-directed learning and critical thinking ability of Iranian EFL learners. *International Journal of English Language Literature and Humanities, 2*(5)564-565.

Mehmet, B.T.,& Kenan,K.(2018).The impact of self-directed learning readiness on critical thinking and self- efficacy among the students of the school Physical Education and Sports. *International Journal of Higher Education,7*(6) 98.Meijuan, J.& Cheng, J. (2020). The correlation of metacognitive ability, self-directed learning ability and critical thinking in nursing students: A cross-sectional study. *Nursing open, 8*,936-945.

Paul, R., & Elder, L. (2011). The miniature guide to critical thinking: *Concepts and tools (2)*: Foundation critical thinking.

Peng, M.C., Wang, G.C., Cheng, J.L., Cheng, M.H., Bai, H.H., Li, S.G., Li, G.P., Cai, Y., Wang, J.Q., & Yin, L. (2004). Reliability and validity test of critical thinking ability measurement table. *Chinese Journal of Nursing,39*(9), 644-647.

Pintrich, P.R., Conley,A.M., &Kempler, T.M.(2013).Current issues in achievement goal theory and research. *International Journal of Educational Research,39,*319-337.

Shen, W.Q., & Hu, Y. (2011). Reliability and validity of the Chinese version of the self-directed learning rating scale. *Chinese Journal of Nursing, 46*(12),1211-1213.

Sekaran, U. (2018). *The research process for applied and basic research.* Hermitage publishing services, Malloy Lithographing, Inc.

Teimourtash, M. & Fahim, M. (2012).A critical look at the notion of critical thinking from a new personality trait perspective:"Midtrovert". *Advances in Digital Multimedia,1*(3) 143- 152.

Willey K.R. (1982). Effects of a self-directed learning project and preference for structure on self-directed learning readiness. *In proceedings of the 23rd Annual Adult Education Research Conferences* (pp.227-232).

AJEMATES