

Metacognition and its relation with academic achievement among college going students of Meghalaya

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Abstract:

Understanding the process of learning has always been area of importance in education. Knowing the way we learn help an individual to learn better as it involves encoding of information, planning, comprehension and evaluation. Baker, 2009 wrote that learning depends, in part, on the effective use of basic cognitive processes such as memory and attention, the activation of relevant background knowledge, and the deployment of cognitive strategies to achieve particular goal. The research was conducted to study the metacognition among college going students of Meghalaya and explored whether metacognition is related to academic achievement, gender, streams of discipline and locale. The approach was quantitative and the survey method was used. The sample of 797 college going students were randomly selected. The study showed that majority of college going students have average metacognition. The ability to think about their own thinking or process of metacognition is affected by locale and streams of study. The relation between metacognition and academic achievement is high in all stream of students, among female as compared to male students and urban students as compared to rural students. The study indicated that increase in metacognition leads to better performance academically.

Keywords: Metacognition, Academic achievement, college students, gender, locale, stream

I. METACOGNITION

American developmental psychologist John Flavell is regarded as a foundation researcher in metacognition. He was influenced by the work of Jean Piaget. Flavell defined metacognition (as cited in Jadav, 2011) knowledge and cognition about cognitive phenomena. The term metacognition literally means cognition about cognition, or more informally, thinking about thinking (Livingston, 1997; Peirce, 2003; & Padma 2013). Metacognition is knowledge about cognition and regulate of cognition. So, metacognition refers to higher order thinking which involves active control over the cognitive processes engaged in learning. Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature (Livingston, 1997). This shows activities such as planning, monitoring, evaluating a task based on the objective and satisfactory completion are included in metacognition.

Metacognition is one's ability to use prior knowledge to plan a strategy for approaching a learning task, take necessary steps to solve a problem, reflect on and evaluate results, and modify one's approach as needed. It helps learners to choose the right cognitive tool for the task and plays a critical role in successful learning (Scanlon, 2012). In this context, metacognition is the higher mental ability to understand one's own understanding which helps the learner to solve problem, evaluate one's own knowledge and task at hand, think critically, which helps an individual achieve a particular goal, it helps a person to ensure that the learning goal is being reached.

Metacognition is a concept that has been used to refer to a variety of epistemological processes. "Metacognition" essentially means cognition about cognition; that is, it refers to second order cognitions: thoughts about thoughts, knowledge about knowledge or reflections about actions. So if cognition involves perceiving, understanding, remembering, and so forth, then metacognition involves thinking about one's own perceiving, understanding, remembering, etc. These various cognitions about cognitions can be labelled "metaperception", "metacomprehension" and "metamemory" with "metacognition" remaining the superordinate term.

Components of Metacognition

1. **Metacognitive Knowledge** (also called metacognitive awareness) refers to what individuals know about themselves and others as cognitive processors. Includes three types of metacognitive awareness:
 - a. **Declarative Knowledge** - knowing about oneself as a learner and about what factors influence one's performance. Example: capacity limitations, rehearsal, and integration of info into LTM.
Effective learners appear to use these aspects.
 - b. **Procedural Knowledge** - Refers to knowledge how to execute procedural skills. Example: heuristics and strategies such as how to "chunk" information. Individuals use knowledge and select skills more automatically

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- c. Conditional Knowledge-** Refers to knowing when and why to apply various cognitive actions. Example: knowing when and what information to rehearse. Allows students to allocate resources and use strategies effectively.
- 2. Metacognitive regulation** is the regulation of cognition and learning experiences through a set of activities that help people control their learning. Three essential skills are included in the process of controlling one's thinking or learning:
- a. Planning** Selection of appropriate strategies and the allocation of resources that effect performance. Example: making predictions before reading, selection of strategies and allocation of resources before beginning a task.
 - b. Monitoring-** Refers to one's on-line awareness of comprehension and task performance. Example: Such as self-testing while learning
 - c. Evaluation-** Refers to appraising the products and regulatory processes of learning.
Example: Such as re-evaluating goals and conclusions
- 3. Metacognitive skills** refer to conscious control processes such as planning, monitoring of the progress of processing, effort allocation, strategy use and regulation of cognition.
- 4. Metacognitive experiences** are those experiences that have something to do with the current, on-going cognitive endeavor.

In order to enhance learning, metacognition could be encourage among students. Learning is affected by number of variables one of which is Metacognition. Metacognition play important role in helping the person to be a better and successful learner in this way the academic achievement of learner could affect positively.

II. RATIONALE OF THE STUDY

Meghalaya has 61 colleges affiliated to North Eastern Hill University, offering general courses as well as professional courses. The college education is the first step towards higher education. The aim of higher education is not to receive graduate degree but beyond it, which is spelled in detail by University Education Commission (1948-49). The commission stated that aims of higher education is the improvement of character and inculcation of values, intellectual adventure, an integrated way of life, wisdom and knowledge, training for leadership, preservation and development of culture and civilization, development of new idea, development of consciousness, aims of social order, love for higher value, discoveries and invention. To achieve such objectives it is imperative to develop metacognition among students. It has been observed that in Meghalaya college going students in general, study only to pass with the grade and certificate. In this way, studying not for understanding and knowledge, will not develop metacognition neither objectives of higher education may be achieved. These youths in Meghalaya should be encourage with awareness on their learning and also encourage believing about themselves. Students should be trained to look at anything consciously and critically, enable them to

decide what is wrong or right this will help to produce an effective person, thinker, leader etc. perhaps when a person is aware of what he/she is thinking this will lead to change for betterment. Thus metacognition plays important role in helping the person to be a better and successful learner in this way the academic achievement of learner could affect positively. In this context the researchers felt the need to investigate the correlation between the metacognition and academic achievement of college students of Meghalaya.

III. OBJECTIVES OF THE STUDY

1. To study the Metacognition of college going students of Meghalaya.
2. To find out the difference in Metacognition between the following groups:
 - i. Arts, science and commerce
 - ii. Male and female students
 - iii. Student from rural and urban colleges
3. To find out the Metacognition in relation to Academic Achievement of the following groups:
 - i. Arts, science and commerce
 - ii. Male and female students
 - iii. Student from rural and urban colleges
4. To explore the relation between Metacognition and Academic Achievement college going students.

IV. HYPOTHESES

1. There is no significant difference in Metacognition of students between
 - a. Arts and Science
 - b. Arts and Commerce
 - c. Science and Commerce
2. There is no significant difference in Metacognition between male and female students.
3. There is no significant difference in Metacognition between urban and rural colleges.
4. There is no significant relationship between Metacognition and Academic Achievement among students of Arts, Science and Commerce.
5. There is no significant relationship between Metacognition and Academic Achievement between male and female students.
6. There is no significant relationship of Metacognition and Academic Achievement between the students of urban and rural colleges.
7. There is no significant relationship between Metacognition and Academic Achievement of college going students.

V. DELIMITATION OF THE STUDY

The present study has been delimited to students of final year of undergraduate courses of arts, science and commerce students (B.A, B.Sc and B.Com).

VI. RESEARCH METHOD

The present study has adopted descriptive survey method as to describe the Metacognition and Academic Achievement of college going students in Meghalaya.

VII. TOOLS

The following two tools was being used for the present study

Metacognition tool. Metacognition Inventory which was constructed by Punita Govil (2003) was adopted for studying the metacognition among the college going students of Meghalaya. The investigator re-adapted the tool to check if it is reliable for the students of Meghalaya.

Academic Achievement of the students. Marks of the students of final year examination of Arts, Science and Commerce was taken as the academic achievement of undergraduate students.

VIII. POPULATION OF THE STUDY

Population of the study constitutes Arts, Science and Commerce final year undergraduate students studying in colleges of Meghalaya. As per the Statistical Cell, NEHU, there are 6644, Arts, Science and Commerce final year college going students for the Academic year 2015-16.

Sample. Sample for the present study consisted of 797 students of final year in colleges of Meghalaya. They will be selected by Stratified random sampling technique.

IX. RESULT

Metacognition of college going students of Meghalaya

The data of Metacognition of college going students of Meghalaya has been analysed using frequency and percentage which is given table below.

Table 1: Metacognition of college going students

Score	Frequency	%	Level
107 and above	44	5.52	Very High
95 – 106	166	20.83	High
82 – 94	363	45.55	Average
70 – 81	179	22.46	Low
69 and below	45	5.65	Very Low

From the above table it is shown that 5.52 percent of the college going students have very high level of Metacognition. 20.83 percent of the students have high level of Metacognition. 45.55 percent of the college going students have an average level of Metacognition. 22.46 percent of college going students have low level of Metacognition. 5.65 percent of college going students have very low level of Metacognition. This showed that majority of college going students have an average level of Metacognition. This indicated majority 45.55 of college going students in Meghalaya have an average level of knowledge of cognition

and regulation of knowledge. Knowledge of cognition deal with all the concepts which are related to thinking processes such as self-concept of knowledge, self-intelligence, self memory, attention, study habits etc., and regulation of cognitive processes include all those mechanisms through which a person regulates thinking process, such as orientation, planning, monitoring, testing, repairing, evaluating, reflecting etc.

Difference in Metacognition between gender

Table 2: Mean, Standard Deviation and t-value of male and female of a students in Metacognition

Variable	Gender	N	Mean	Std. Deviation	df	t-value	P
Metacognition	Male	354	87.47	11.052	795	1.53	Not significant at 0.01
	Female	443	88.69	11.421			

$t(795) = 1.53$ and $p = 0.01$

And independent samples test was performed to find the significant difference between male and female students in Metacognition. The above table shows that t-value is 1.53 which was not significant at 0.01 level with $df = 795$. Thus the null hypothesis was accepted. In the light of this result it can be interpreted that no significant difference in Metacognition between male and female and gender does not affect the metacognition of college going students of Meghalaya. It means Knowledge of cognition deal with all the concepts which are related to thinking processes such as self-concept of knowledge, self-intelligence, self-memory, attention, study habits etc., and regulation of cognitive processes include all those mechanisms through which a person regulates thinking process, such as orientation, planning, monitoring, testing, repairing, evaluating, reflecting etc., between male and female are the same.

Difference in Metacognition between students from urban and rural colleges

Table 3: Mean, Standard Deviation and t-value of urban and rural colleges students in Metacognition

Variable	Locale	N	Mean	Std. Deviation	df	t-value	p
Metacognition	Urban	442	89.31	11.510	795	3.27	Significant at 0.01
	Rural	355	86.70	10.802			

$t(795) = 3.27$ and $p = 0.01$

And independent sample test was performed to find the significant difference between urban and rural students in Metacognition. The above table shows that t-value is 3.27 which was significant at 0.01 level with $df = 795$. Thus the null hypothesis was not accepted. In the light of this result it can be interpreted that there was a significant difference in Metacognition between urban and rural college going students of Meghalaya. The mean difference of 2.59 is in favour of urban college students. This pointed out that urban college going students have a high Metacognition as compared to rural counterparts. It mean Knowledge of cognition deal with all the concepts which are related to thinking processes such as self-concept of knowledge,

self-intelligence, self-memory, attention, study habits etc., and regulation of cognitive processes include all those mechanisms through which a person regulates thinking process, such as orientation, planning, monitoring, testing, repairing, evaluating, reflecting etc., is high among urban as compare to rural college going students.

Difference in Metacognition based on the streams

Table 4: Mean, Standard Deviation and t-value of students of different stream in Metacognition

Group	Stream	N	Mean	Std. Deviation	df	t-value	p
1	Science	70	101.46	7.395	725	11.07	Significant at 0.01 level
	Arts	657	87.02	10.633			
2	Science	70	101.46	7.395	138	9.74	Significant at 0.01 level
	Commerce	70	85.40	11.651			
3	Arts	657	87.02	10.633	725	1.20	Not significant at 0.01 level
	Commerce	70	85.40	11.651			

$t_{453}(725) = 11.07$ and $p = 0.01$, $t_{533}(138) = 9.74$ and $p = 0.01$ and $t_{453}(725) = 1.20$ and $p = 0.01$

And independent samples test was performed to find the significant difference between science and arts students in Metacognition. The above table shows that t-value is 11.07 which was significant at 0.01 level with $df = 725$. Thus the null hypothesis was not accepted. In the light of this result it can be interpreted that there was a significant difference in Metacognition between science and arts stream college going students of Meghalaya. The mean difference of 14.44 is in favour of science stream students. This pointed out that students of Science stream have a high Metacognition as compared to Arts stream counterparts. This explained that Knowledge of cognition deal with all the concepts which are related to thinking processes such as self-concept of knowledge, self-intelligence, self-memory, attention, study habits etc., and regulation of cognitive processes include all those mechanisms through which a person regulates thinking process, such as orientation, planning, monitoring, testing, repairing, evaluating, reflecting etc., is high among Science stream as compared to Arts stream counterparts.

And independent samples test was performed to find the significant difference between science and commerce students in Metacognition. The above table shows that t-value is 9.74 which was significant at 0.01 level with $df = 138$. Thus the null hypothesis was not accepted. In the light of this result it can be interpreted that there was a significant difference in Metacognition between science and commerce Stream College going students of Meghalaya. The mean difference of 15.96 is in favour of science stream students. This pointed out that students of Science stream have a high Metacognition as compared to Commerce stream counterparts. This mean that Knowledge of cognition deal with all the concepts which are related to thinking processes such as self-concept of knowledge, self-intelligence, self-memory, attention, study habits etc., and regulation of cognitive processes include all those mechanisms through which a person regulates thinking process, such as orientation, planning, monitoring, testing, repairing, evaluating, reflecting etc., is high among Science stream as compared to Commerce stream counterparts.

And independent samples test was performed to find the significant difference between Arts and Commerce students in Metacognition. The above table shows that t-value is 1.20 which was not significant at 0.01 level with $df = 138$. Thus the null hypothesis was not accepted. In the light of this result it can be interpreted that there was no significant difference in Metacognition between Arts and commerce Stream College going students of Meghalaya. This means that Knowledge of cognition and regulation of cognitive processes among Arts stream as compared to Commerce stream counterparts are the same.

From the above analysed it was found that gender does not affect the Metacognition of college going students. Further stream wise science students has higher metacognition when compared to arts and commerce. But commerce and arts has same metacognition.

Relation between Metacognition and Academic Achievement of students from different streams

Table 5: Correlation coefficient of Metacognition and Academic Achievement of students from different stream

Stream	Variable	r	N	p	Remark
Arts	Metacognition and Academic Achievement	.85	657	0.01	Significant
Science	Metacognition and Academic Achievement	.94	70	0.01	Significant
Commerce	Metacognition and Academic Achievement	.98	70	0.01	Significant

$r_{Arts}(655) = 0.85$, $r_{Science}(68) = 0.94$ and $r_{Commerce}(68) = 0.98$

It is evident from the above table that there was a strong positive correlation between Metacognition and Academic Achievement among the arts stream college going students of Meghalaya. The r value between Metacognition and Academic Achievement among arts is 0.85 which similarly r value between Metacognition and Academic Achievement among science is 0.94 and r value between Metacognition and Academic Achievement among commerce students is 0.98 was significant at 0.01 level with $df = 655$ for arts, and $df = 78$ for commerce and science students respectively. Hence the null hypothesis was not accepted. It was concluded that there was a significant positive correlation between Metacognition and Academic Achievement among students from arts, science and commerce stream of college going students of Meghalaya. This indicated that the higher the level of Metacognition of the students, higher the Academic Achievement. It highlight the fact that Academic Achievement of the students was affected by their thinking. It also indicated that Metacognition is one of the factor which affect strongly and positively on Academic Achievement of college going students from different stream.

Relations between Metacognition and Academic Achievement based on gender

Table 6: Correlations coefficient of Metacognition and Academic Achievement of gender

Gender	Variable	r	N	p	Remark
Male	Metacognition and Academic Achievement	.87	354	0.01	Significant
Female	Metacognition and Academic Achievement	.90	443	0.01	Significant

$r_{male}(352) = 0.87$ and $r_{female}(441) = 0.90$

From the above table it was seen that there was a strong positive correlation between Metacognition and Academic Achievement among male and female students of Meghalaya. The r value between Metacognition and Academic Achievement among male student is 0.87 which similarly r value between Metacognition and Academic Achievement among female student is 0.90 was significant at 0.01 level with $df = 352$ for male student and with $df = 441$ for female respectively. Hence the null hypothesis was not accepted. It was concluded that there was a strong positive correlation between Metacognition and Academic Achievement male and female college going students of Meghalaya. This indicated that the higher the level of Metacognition of the students, higher the Academic Achievement. It highlight the fact that Academic Achievement of the male and female students was affected by their Metacognition. It also indicated that Metacognition is one of the factor which affect positively on Academic Achievement of male students.

Relations between Metacognition and Academic Achievement based on Locale

Table 7: Correlations coefficient of Metacognition and Academic Achievement of students based on locale

Locale Variable	r	N	p	Remark
Urban Metacognition and Academic Achievement	.94	442	0.01	Significant
Rural Metacognition and Academic Achievement	.81	355	0.01	Significant

$$r_{\text{urban}}(440) = 0.94 \text{ and } r_{\text{rural}}(353) = 0.81$$

From the above table it was seen that there was a strong positive correlation between Metacognition and Academic Achievement among rural college students of Meghalaya. The r value between Metacognition and Academic Achievement urban students is 0.94 which similarly r value between Metacognition and Academic Achievement among rural students is 0.81 was significant at 0.01 level with $df = 440$ for urban students and with $df = 353$ for rural student respectively. Hence the null hypothesis was not accepted. It was concluded that there was a strong positive correlation between Metacognition and Academic Achievement urban and rural college going students of Meghalaya. This indicated that the higher the level of Metacognition of the students higher the Academic Achievement. It highlight the fact that Academic Achievement of the urban and rural college students was affected by their Metacognition. It also indicated that Metacognition is one factor which affect positively and highly on Academic Achievement of urban and rural students.

Relation between Metacognition and Academic Achievement of college going students.

The data collected has been analysed below using regression to explain the relation between Metacognition and Academic Achievement of college going students.

Simple Regression of Metacognition and Academic Achievement

Table 8: Model Summary

Model	R	R Square	Adjusted R Square
1	.886 ^a	.786	.785

a. Predictors: (Constant), Metacognition

From the above table $R = 0.89$ which indicate a positive correlation between Metacognition and Academic Achievement. R Square 0.79, which means that the Metacognition can explain about 79% of the change in Academic Achievement.

Table 9: Anova^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43136.447	1	43136.447	2912.732	.000 ^b
	Residual	11773.644	795	14.810		
	Total	54910.091	796			

a. Dependent Variable: Academic Achievement

b. Predictors: (Constant), Metacognition

From the above table, $p = 0.000$ which is less than $p = 0.05$ and indicated that the F -statistic is large enough to reject the null hypothesis. It met the condition so it was statistically significant. It indicated that Metacognition effect on Academic Achievement is statistically significant and it can predict the result of Academic Achievement.

Table 10: Coefficients^a

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
1	(Constant)		-13.250	1.076
	Metacognition	.653	.012	.886

a. Dependent Variable: Academic Achievement

$$Y = b_0 + b_1 X_1$$

Each of the other coefficients are b variables, or the slope of the line. For each 1-unit change in Metacognition, Academic Achievement will change by b units. Since we only have one variable in this case, we just have a b_1 (the slope) and X_1 (the value of Metacognition).

For prediction, we can plug the coefficients into the formula to predict Academic Achievement using a value of Metacognition.

We just have a b_1 (the slope) and X_1 (the value of Metacognition).

$$Y = b_0 + b_1 X_1$$

$$\text{If } X = 1,$$

$$\text{Then, } Y = -13.25 + .65 * (1)$$

$$Y = -13.25 + 0.65 = -12.6$$

From the above analysed it was understood Metacognition alone can explain about 79% change in Academic Achievement.

X. CONCLUSION

The study found that majority of college going students of Meghalaya have average level of Metacognition which means majority has average level of understanding their own thinking. Gender does not affect the metacognition of college going students of Meghalaya. Urban college going students have a high Metacognition as compared to rural counterparts. Students from Science stream have a high Metacognition as compared to Arts and Commerce stream students not the same in Arts and commerce students.

Metacognition is one of the factor which affect strongly and positively on Academic Achievement of both the gender, locale and different stream. Metacognition of the students influences the Academic Achievement of more among; (a) commerce students, (b) female students, (c) urban students Metacognition i.e. ability to understand own thinking alone can explain about 79% change in Academic Achievement. The study highlighted the need of developing skills of planning, ability to comprehend, and evaluate own thinking as it has direct and major bearing on performance academically. The education should focus on developing problem solving skills and identifying accurate cognitive tools for solving problems.

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