



Construction of Metacognition Assessment Scale to Enhance Learning Efficiency among students in Secondary school, Orhionmwon local Government, Edo State, Nigeria

JOSEPH Obiajuru

Department of Guidance and Counseling (Educational Psychology)
Delta State University, Abraka,
Delta State.

ABSTRACT

The aim of this study was to develop a Metacognition Assessment Scale for secondary school students in Orhionmwon Local Government, Edo State, Nigeria. The research design employed was a survey descriptive approach, with a sample size of 50 participants. The scale comprised 30 items adapted from Schrew and Dennis' (1994) metacognitive inventory. Questionnaires, totaling 50 copies, were distributed to the study participants. To validate the scale, factor analysis was employed, resulting in the identification of 13 items from the original 30. Principal Component Analysis (PCA) revealed a five-factor structure, ensuring content validity. The factors and their respective percentages of variance explained were as follows: Cognitive Knowledge (F1) with 4 items (1, 2, 3, and 4) at 17.25%, Procedural Knowledge (F2) with 2 items (5 and 6) at 14.08%, Evaluation (F3) with 2 items (7 and 8) at 11.35%, Cognitive Monitoring (F4) with 2 items (9 and 10) at 10.52%, and Information Management Strategies (F5) with 3 items (11, 12, and 13) at 9.26%. In total, these factors explained 62.46% of the variance. Factor-loading matrices were employed to identify related items describing each component, with factor loadings ranging between .42 and .83, indicating robust construct validity. The mean score of each item on the scale met the benchmark of 2.5. The Metacognition Assessment Scale demonstrated a Cronbach's alpha reliability coefficient of .73, affirming its reliability. Researchers interested in promoting effective teaching and learning are recommended to utilize this scale in their studies.

ARTICLE INFO

Article History

Received: September, 2023

Received in revised form: October, 2023

Accepted: November, 2023

Published online: November, 2023

KEYWORDS

Metacognition Assessment Scale, Content Validity, Constructs Validity, Reliability, communalities

INTRODUCTION

The improvement of students' ability to learn and retain knowledge efficiently is a central concern in the field of education, capturing the keen attention of psychologists. Metacognition, a crucial concept in this context, equips students with tools to comprehend and harness their cognitive processes. This comprehension enables the effective organization, analysis, and interpretation of learning materials. Coined by American psychologist John Flavell in 1977, the term "metacognition" refers to the awareness of

one's cognitive processes and thinking patterns. Flavell later distilled metacognition to "cognition about cognition" or "thinking about thinking." Schiopu (2018) emphasized that Flavell's concept systematizes knowledge and regulates cognitive activities, enabling effective representation and access to cognitive processes.

The development of metacognitive skills plays a pivotal role in understanding and improving how we learn, remember, and perform. O'Leary and Sloutsky (2018) noted that

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



metacognition facilitates the ongoing use of effective learning strategies. Abdelrahman (2020) further highlighted the importance of metacognition in guiding students towards their academic goals by helping them choose the most appropriate cognitive tools for the task at hand. Shea (2019) stressed that metacognition is crucial in preparing individuals for future actions and in helping students evaluate their learning, including memorization and readiness for examinations.

It is essential to recognize that metacognition is not a monolithic concept with a single underlying cognitive process. Shea (2019) pointed out that metacognition encompasses a set of capacities through which one subsystem evaluates or represents another subsystem in a context-sensitive manner. The complexity of metacognition is underscored by Capobianco et al. (2020), who proposed a metacognitive model that includes the emotional system as an integral part of the equation, aiming to modify specific psychological factors that can hinder psychological adjustment.

Students with well-developed metacognitive skills generally experience enhanced academic performance. Nongtodu and Bhutia (2017) provide a nuanced perspective, viewing metacognition as a concept encompassing various epistemological processes. Essentially, metacognition involves thoughts about thoughts, knowledge about knowledge, or reflections on actions. In simpler terms, if cognition involves perceiving, understanding, remembering, and more, metacognition involves contemplating one's process of perceiving, understanding, and remembering. Metacognition thus offers valuable insights into how students learn, providing opportunities to optimize teaching and learning for greater efficiency.

Statement of Problem

Engaging in learning is a continual endeavor that presents challenges to individuals, drawing considerable scholarly attention aimed at refining learning methodologies. The hurdles associated with learning often stem from a lack of

understanding about one's learning process, leading to frustration among many students. This deficit is primarily attributed to the absence of essential metacognitive skills crucial for effective learning. In addressing this issue, there arises a necessity to develop and validate a Metacognition Awareness Scale tailored for senior secondary school students in Orhionmwon Local Government, Edo State, Nigeria. The creation of such a scale holds significance for advancing pedagogy within the educational system. Historically, Schraw and Dennison (1994) introduced a metacognitive inventory comprising 52 items with a binary scoring system, where "True = 1" and "False = 0." However, contemporary analysis has revealed limitations in this binary scoring method. The current study seeks to construct and validate the Metacognition Awareness Scale, utilizing a more contemporary scoring format with four points: "SA (Strongly Agree) = 4," "A (Agree) = 3," "D (Disagree) = 2," and "SD (Strongly Disagree) = 1." The primary objectives of this study encompass assessing both the content and construct validity of the scale, determining its reliability, and calculating the mean score for each item within the scale.

Research Question

1. What is the content validity, content of the metacognition assessment scale?
2. What is the construct validity of the metacognition assessment scale, content and the means score mean score of each item on the metacognition assessment Scale?
3. What is the reliability of the metacognition assessment scale?

LITERATURE REVIEW

Metacognition refers to the process of monitoring and overseeing one's own thoughts and task performance (Shehzad, 2012). Metacognitive knowledge is concerned with self-awareness and understanding of cognitive processes, allowing individuals to take control of their learning (Jaleel & Premachandran, 2016; Özçakmak et al., 2021). Metacognition empowers

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved

learners to achieve personal goals by selecting appropriate cognitive strategies (Abdelrahman, 2020).

Young and Fry (2008) defined metacognition as the practice of monitoring and managing one's cognitive functions, which is a significant predictor of academic performance (Abdelrahman, 2020). Narang and Saini (2013) highlighted that metacognition enables students to develop strategic learning approaches. Beyond knowledge acquisition, contemporary education aims to instruct students on how to learn, organize their thought processes to solve problems and cultivate the competencies needed

to tackle future challenges (Mir & Peerzada, 2022).

Metacognition is closely linked to reflection, a fundamental mechanism that governs an individual's thinking process (Karpov & Skityayeva, 2005, as cited by Mergalyas et al., 2017). As per Karpov and Skityayeva (2005), cited by Kashapova et al. (2017), metacognition is intertwined with reflection, a core element of regulating one's thinking.

Flavell (1977) categorized metacognition into three components: metacognitive knowledge, metacognitive regulation, and metacognitive experience. The following model serves as the basis for this study.

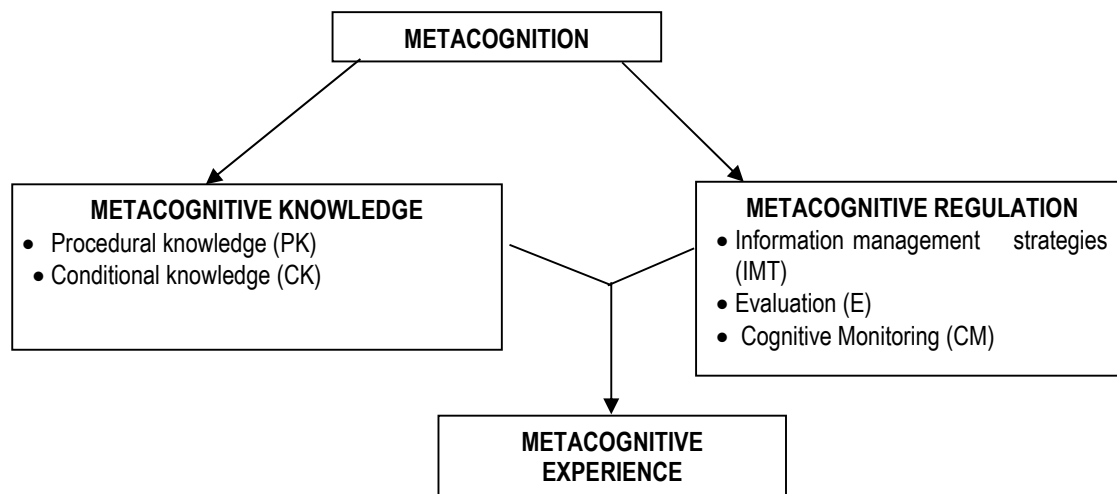


Fig. 1: Conceptual Model of the Study

The graphic framework illustrates the components of metacognition and its sub-components, which form the foundation for this study.

Metacognitive Knowledge (Metacognitive Awareness)

Metacognitive Knowledge encompasses the knowledge and beliefs accumulated through experience and stored in long-term memory, about the human mind and its functions (Papaleontiou-louca, 2003). According to Jia and Cao (2019), metacognitive knowledge

plays a crucial role in guiding individuals to select, evaluate, and correct cognitive strategies, particularly in the context of creative thinking. Kallio et al. (2018) have noted that metacognitive knowledge consists of conditional knowledge (knowledge about when and why to learn), declarative knowledge (knowledge about the content of learning), and procedural knowledge (knowledge about how to use learning strategies). Metacognitive knowledge serves as the cornerstone for metacognitive experiences, governing the utilization of cognitive and metacognitive strategies (Diken, 2020). It is

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



important to recognize that metacognitive knowledge about one's learning processes can be either correct or incorrect, and this self-awareness may be resistant to change. For instance, a student may mistakenly believe that they invested sufficient time in preparing for math exams, despite repeated failures (attributing it to the difficulty of the exams, as in "But the teacher made the exams so hard to pass...") (Veenman et al., 2006). Metacognitive knowledge includes:

1. **Procedural Knowledge:** This refers to knowledge about how to execute procedural skills, such as heuristics and strategies like how to "chunk" information. Individuals tend to employ this knowledge and select appropriate skills more automatically. Madhav (2014) emphasizes that procedural knowledge pertains to understanding "how to do things" and the various procedures involved, including learning strategies.
2. **Conditional Knowledge:** Conditional knowledge refers to the understanding of when and why to apply various cognitive actions. For example, it involves knowing when and what information to rehearse, enabling students to allocate their resources effectively (Nongtodu & Bhutia, 2017).

Metacognitive Regulation

The regulation of cognition encompasses a range of specific skills, including information management, monitoring, and evaluation, which can be categorized as monitoring of cognition (an individual's real-time awareness of comprehension and task performance, as well as the ability to engage in periodic self-testing during learning) or control of cognition (the conscious and non-conscious decisions made based on the output of monitoring processes (Stine-Morrow et al., 2013).

1. **Information Management Strategies:** This involves the selection of appropriate strategies and the allocation of resources that impact

performance. Examples include making predictions before reading, sequencing strategies, and selectively allocating time or attention before commencing a task. Information Management Strategies also encompass skills related to processing information, such as organizing and elaborating (Sonowal & Mun Kalita, 2019).

2. **Cognitive Monitoring:** Monitoring refers to an individual's awareness of comprehension and task performance, including self-testing during the learning process. Jia et al. (2019) underscore the significance of metacognitive monitoring and control, which entails an individual's self-conscious supervision and regulation of cognitive processes.
3. **Evaluation:** Evaluation involves the assessment of the products and regulatory processes of learning, including re-evaluating goals and conclusions (Nongtodu & Bhutia, 2017). This assessment serves to determine if one has accomplished their objectives (Sonowal & Mun Kalita, 2019). Evaluation generally encompasses the examination of progress toward goals, which can trigger further planning, monitoring, and evaluation (Mahdavi, 2014).

Metacognitive Experiences

Metacognitive experiences refer to the ongoing cognitive endeavors that provide insight into one's cognition and trigger control processes, contributing to the pursuit of self-regulation (Nongtodu & Bhutia, 2017).

METHOD AND PROCEDURE

To achieve the purpose of this study, a survey descriptive research design was adopted. According to Salaria (2012), the research method that focuses on current phenomena, encompassing conditions, practices, beliefs, processes, relationships, and trends, is commonly referred to as a 'descriptive survey

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



study.' In survey research, respondents provide information through surveys, questionnaires, or polls. As emphasized by Manjunatha (2019), to ensure the collection of high-quality data, it is essential to have well-constructed survey questions. In this study, a sample of fifty (50) senior secondary school students from Orhionmwon Local Government in Edo State, Nigeria, was surveyed."

SCALING

To construct and validate the metacognition assessment scale among sampled senior secondary school students in Orhionmwon Local Government, Edo State, Nigeria, 30 items were adapted and modified from the original 52 items in Schrew and Dennison's (1994) metacognitive inventory. In this study, the instrument consisted of five sub-components, which were later categorized into two major components: metacognitive knowledge and metacognitive regulation. These sub-components on the instrument include:

- i. Conditional knowledge
- ii. Procedural knowledge
- iii. Evaluation
- iv. Cognitive monitoring, and
- v. Information management strategies.

Items were constructed on each of the components of metacognition.. Kalkbrenner and Michael (2021) noted that in constructing an instrument when creating a Likert scale, items are presented in declarative statements with anchor definitions (i.e., response options) that designate fluctuating amounts of agreement or approval of the statement. Furthermore, the Test questions should be as brief and concise as possible and do not necessarily has to be complete sentences. This present study will adopt a scoring four-point format with options of Strongly Agree (SA) = 4, agree (A) = 2, disagree (D) = 2, and strongly disagree (SD) = 1.

Validity

Validity is a critical aspect of research instruments, ensuring they measure what they are intended to measure. In this study, validation

is achieved through both experts' judgment and factor analysis.

1. Expert Judgment for Face Validity: To ensure the face validity of the metacognitive awareness scale, experts assess clarity, completeness, and relevance, providing feedback on the format and structure of the instrument (Pentang, 2023). This step aims to make the instrument understandable and relevant to the subject matter.

2. Factor Analysis for Content and Construct Validity: Factor analysis, specifically Principal Component Analysis (PCA) with Varimax and Kaiser Normalization, is employed to assess content and construct validity. Factor loading, indicating the correlation between items and factors helps establish the relationship between the items and the underlying constructs (Tavakol & Wetzel, 2020). Content validity is vital to ensure the instrument accurately covers the intended content (Lamm et al., 2021). Total Variance Explained (TVE) is a critical aspect of content validity, with values at or above 60% considered appropriate (Joseph et al., 2019). This approach involves assessing the wording, format, and presentation of items to represent the construct adequately.

Reliability

Reliability, the consistency of the instrument's measurements, is assessed using Cronbach's alpha. A higher Cronbach's alpha value suggests better internal consistency among the test items (Brown, D. J., 2002). Typically, values above 0.7 are considered acceptable for internal consistency. This is important to ensure that the instrument provides consistent results over time (Taber, 2018). Cronbach's alpha is a common method for estimating internal consistency, particularly when multiple items measure the same underlying construct (Shrestha, 2021). Interpreting Reliability, It is worth noting that the reliability index varies from poor to excellent, with values below .67 considered poor, .67-.80 as fair, .81-.90 as good, and .91-.94 as very good. An alpha value above 0.6 is generally considered reliable, but it's crucial to consider the confidence interval for a more

accurate assessment (Mohamad et al., 2015; Bonett & Wright, 2014).

This study employed a comprehensive approach, combining expert judgment and factor analysis for validity assessment and Cronbach's alpha for reliability assessment, ensuring the

metacognition assessment scale's robustness and accuracy.

RESULTS AND DISCUSSION

Research question one: What is the content validity of metacognition assessment scale?

Table 1: Principal Component Analysis (PCA) of Content Validity Estimates of Metacognition Assessment Scale (MAS)

S/N	Components	No of Items	Explained	Cumulative Variance%
1	Cognitive Knowledge (C.K)	4	17.25	17.25
2	Procedural knowledge (P.K)	2	14.08	31.33
3	Evaluation (EVA)	2	11.35	42.68
4	Cognitive monitoring (C.K)	2	10.52	53.2
5	Information management strategies(I.M.S)	3	9.26	62.46

The total number of items in the scale was thirteen (13). Therefore, the scale extracted five components such as: cognitive monitoring; procedural knowledge, evaluation, cognitive monitoring and information management strategies expressed the content validity as the percentage of each component had 17.25%, 14.08%, 11.35%, 10.52% and 9.26%

respectively. This yielded a total explained variance of 62.46%.

Research question Two: What is the Construct validity of metacognition assessment scale and the means score mean score of each item on metacognition assessment scale?

Table 2: Principal Component Analysis (PCS), Rotation Method, Varimax with Kaiser Normalization and Communalities (h²) Indicating the five Factor Structure Construct Validity and Descriptive statistics of Metacognition Assessment Scale (MAS)

S/N	ITEMS	M	SD	F1 C.K	F2 P.K	F3 EV	F4 C.M	F5 I.M.S	h ²
1.	I am aware of what strategies I use when I study	3.26	.80	.77					.64
2.	I know when each strategy I use work effective.	2.90	.93	.69					.60
3.	I use strategies that have worked in the past.	2.88	.98	.57					.53
4.	I have a specific purpose for each strategy I use.	2.84	.96	.42					.57
5.	I use different learning strategies depending on the situation.	3.06	.93		.79				.63
6.	I try to break a topic into smaller steps while I study.	3.20	.93		.73				.63
7.	I ask myself if there was an easier way to do things after study	3.12	.87			.77			.64
8.	I ask myself how well I accomplish my goals once I finished	3.20	.78			.76			.59
9.	I consider several alternatives to a problem before I answer	3.30	.71				.81		.79
10.	I focus on the new information	3.26	.78				.64		.63
11.	I can motivate myself to learn when I need to.	3.50	.61					.83	.80
12.	I find myself analyzing the strategies I use while I study.	3.20	.87					.42	.55
13.	I consciously focus my attention on important information	3.16	.79					.54	.52

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



Factor 1: C.K (conditional Knowledge). This factor had 4 items (1, 2, 3 and 4) which between .42 and .77.

Factor 2: P.K (Procedural Knowledge). This factor had 2 items (5 and 6) that loaded between .73 and .77.

Factor 3: EVE (Evaluation). This factor had 2 items (7 and 8) that loaded between .76 and 77.

Factor 4: K.M (Cognitive Monitoring). This factor had 2 items (9 and 10) loaded between .64 and .81.

Factor 5: I.M.S (Information Management Strategies). This factor had 2 items (11, 12 and 13) which loaded between .42 and .83. The mean score of each item was above the bench mark of 2.5. The communalities loaded between .52 and .80.

Research Question 2: What is the Reliability of the Metacognition Awareness scale?

Table 3: Reliability of Metacognition Assessment Scale (MAS)

Cronbach's Alpha	Cronbach Alpha based on Standardized items	No of valid items
.73	.72	13

The Cronbach's Alpha method was used to estimate the coefficient of the scale using SPSS. The scale yielded a coefficient of 0.73.

DISCUSSION OF RESULTS

The results of this study were presented in three tables. Table 1, indicated that the metacognition assessment scale had five components as extracted by Principal Component Analysis. These components were cognitive conditional knowledge, procedural knowledge, evaluation, cognitive monitoring, and information management strategies. The content validity of each component was expressed as a percentage, with values of 17.25%, 14.08%, 11.35%, 10.52%, and 9.26% respectively. Altogether, these components explained 62.46% of the variance. The results of this study were consistent with Joseph et al.'s (2019) suggestion that total variance explained (TVE) should be at or above 60%. In this case, the TVE was appropriate at 62.46%. Therefore, it can be concluded that the metacognition awareness scale is appropriate for use.

Table 2 shows the factors loading metrics, communities, and mean scores. The factors loaded between .42 and .83 generally, while all mean scores of each item were above the benchmark of 2.5, which indicated that every item in the scale is accepted. The communalities had values ranging from .80 to .52 which agreed with Okorodudu and Nwakakego (2015), Abashi

and Ghosh (2020) as cited by Joseph et al. (2023) that items having a factor loading matrix exceeding .40 would contribute a meaningful measure of traits to each component or factor. Furthermore, Bolarinwa (2015) emphasized that construct validity measures how meaningful a scale or instrument is when it is in practical use. The result obtained showed factor loading between .42 and .83 thereby indicating that construct validity measured in this study is meaningful.

Finally, Table 3 revealed that the Cronbach Alpha method estimated a coefficient of 0.73 which indicates good internal consistency according to Taber (2018). This result also agrees with Daud et al.'s (2018) suggestion that an Alpha Cronbach's value above 0.6 is considered a high reliability and acceptable index, as cited by Joseph et al. (2023).

CONCLUSIONS AND RECOMMENDATIONS

The findings of study yield several conclusions:

The metacognition assessment scale demonstrated a high degree of internal consistency, suggesting that its questions reliably measure similar constructs. The scale displayed good content and constructs validity, indicating that it accurately measures its intended purpose and is a valid assessment tool.

The study revealed that the metacognition assessment scale achieved a high measure of internal consistency when compared

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



to a benchmark mean score of 2.5. This indicates that the scale performed well in terms of reliability and consistency.

Given these discoveries, educators are recommended to employ this scale to gather information on their students' learning strategies. By comprehending how students approach learning tasks through metacognition, educators can better equip themselves to provide appropriate support and guidance for developing effective learning skills among students.

The study underscores the significance of the metacognition assessment scale in academic success and is a practical step for enhancing student learning outcomes among educators.

REFERENCES

- Abdelrahman, M. R. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. <https://doi.org/10.1016/j.heliyon.2020.e04192>.
- Bolarinwa O. A. (J2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science research. *Niger Postgrad Med*; 22:195-201.
- BONETT, G. D. & Wright, A. T. (2014). Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning. *Journal of Organizational Behavior*, 1-14, DOI: 10.1002/job.1960.
- Capobianco, F., Husain, Z., & Wells, A. (2020). Metacognitive Beliefs and their Relationship with Anxiety and Depression in Physical Illness. A systematic Review. *PLOS ONE* 15(9). 12- 25. <https://doi.org/10.1371/journal.pone.0238457>.
- Diken, H. E. (2020). Cognitive and metacognitive strategies of 6th-grade students to answer multiple-choice questions on "human body systems. *International Journal of Curriculum and Instruction* 12(2), 436-456.
- Flavell, J. H. (1977). *Cognitive development*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
- Hamed, T. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *International Journal of Academic Research in Management (IJARM)*, 3(5), 28-36.
- Jaleel, S. & Premachandran. P (2016). A Study on the Metacognitive Awareness of Secondary School Students. *Universal Journal of Educational Research* 4(1): 165-172. DOI: 10.13189/ujer.2016.040121.
- Jia X, Li W & Cao L (2019). The Role of Metacognitive Components in Creative Thinking. *Front. Psychol.* 10:2404. doi 10.3389/fpsyg.2019.02404.
- Joseph, F. H., Marcelo, L. D. S. G., Dirceu, S. & Sergio, B. J. (2019). Development and validation of attitudes measurement scales: fundamental and practical aspects. *RAUSP Management Journal*, 54(4), 490-507: DOI 10.1108/RAUSP-05-2019-0098.
- Joseph, O., Okorordudu, R. I. & Ebenuwa-okoh, E. E. (2023). Validation of Examination Anxiety Behaviour Scale among Senior Secondary School Students in Orhionmwon Local Government, Edo State. *Journal of Science Technology and Education*, 11(1), 399-404.
- Joseph, O., Okorordudu, R. I. & Ebenuwa-okoh, E. E. (2023). Validation and standardization of moral judgment scale among students in senior secondary school in Orhionmwon Local Government, Edo State, Nigeria. *International Journal of Scientific Research in Multidisciplinary Studies*, 9 (9), pp.36-40.
- Kalkbrenner, Michael T. (2021) "A Practical Guide to Instrument Development and Score Validation in the Social

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



- Sciences: *The MEASURE Approach, " Practical Assessment, Research, and Evaluation*. 26,. DOI:
<https://doi.org/10.7275/svg4-e67>.
- Kashapova, M. M., Serafimovichb, V. I. & Poshekhonovaa, V. Y. (2017). Components of metacognition and metacognitive properties of forecasting as determinants of supra-situational pedagogical thinking. *Psychology in Russia: State of the Art*, 1(10), 80 – 94.
- Lamm, W. K. Lamm, J. A., Edgar, D. (2021). Scale Development and Validation: Methodology and Recommendations, *Journal of International Agricultural and Extension Education*, 2(27), 25 – 35. doi: 10.5191/jjaee.2020.27224.
- Mahdavi, M. (2014). Metacognition in Education. An Overview: *International Journal of Multidisciplinary and Current Research* 2(5)29 – 535.
- Mahdavi, M. (2014). An Overview: Metacognition in Education. *International Journal of Multidisciplinary and Current Research*, 2, 529 – 535.
- Manjunatha, N. (2019). Descriptive Research, *Journal of Emerging Technologies and Innovative Research (JETIR)*, 6(6), 863 – 867.
- Mir, A. A. & Peerzada (2022). A Study of Metacognition and Academic Achievement among College Students of Kashmir. *International Journal of Advanced Research in Science, Communication, and Technology (IJARSCT)*, 1(2).
- Mohamad, M. M., Sulaimanb,L. N., Sern, C. L., & Sallehd, M. K. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia - Social and Behavioral Sciences*, 164 – 171.
- Narang, D. & Saini, S. (2013). Metacognition and Academic Performance of Rur. *Stud Home Com Sci*, 7(3): 167-175. DOI: 10.31901/24566780.2013/07.03.06al Adolescents.
- Nongtodu, S. & Bhutia, Y. (2017). Metacognition and its relation with academic achievement among college-going students of Meghalaya. *International Journal of Education and Psychological Research (IJEPR)* 6(2), 54 – 60.
- O'Leary, A. P., & Sloutsky, V. M. (2018). Components of meta-cognition can function independently across development developmental psychology. Advance online publication. <http://dx.doi.org/10.1037/dev0000645>
- Özçakmak , H., Köroğlu, M. , Korkmaz, C. & Bolat, Y. (2021). The effect of metacognitive awareness on academic success. *African Educational Research Journal*, 9(2), pp. 434-448. DOI: 10.30918/AERJ.92.21.020.
- Pentang, T. J. (2023). Quantitative Research Instrumentation for Educator. : <https://www.researchgate.net/publication/n/369119498>.
- Salaria, D. (2012). Meaning of the Term- Descriptive Survey Research Method. *International Journal of Transformations in Business Management*. 2(2), 8- 14.
- Schraw, G. & Dennison, R.S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, 19, 460-475.
- Shea, N., (2019). Concept of Metacognition. <https://doi.org/1101111/mila.12235>.
- Shehzadb , F. S. (2012). Relationship between metacognition, goal orientation, and academic achievement. *Procedia - Social and Behavioral Sciences* 47, 1864 – 1868.
- Shrestha, N. (2021). Factor Analysis as a Tool for Survey Analysis. *American Journal of Applied Mathematics and Statistics*, 1(9) 4-11.
- Sonowal, M. & Mun Kalita, M. (2019). Metacognitive Awareness and Academic Achievement of Higher Secondary Level Arts Stream Students of Dibrugarh District, Assam.

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved



- International Journal of Humanities and Social Science (SSRG-IJHSS)* 4(6), 17-23.
- Stine-Morrow, L. A. E., & Amzil, A. (2013). Metacognition: Components and Relation to Academic Achievement in College. *Arab World English Journal*, 4(4), 371- 385.
- Sürücü, L. & Maslakçı, A., (2020). Validity and Reliability in Quantitative Research, *BMIJ*, 8(3): 2694-2726, doi: <http://dx.doi.org/10.15295/bmij.v8i3.154>
- Taber. S. K. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Res Sci Educ*, 48:1273–1296. DOI 10.1007/s11165-016-9602-2.
- Tavakol, M. & Wetzel, A. (2020). Factor Analysis: a means for theory and instrument development in support of construct validity. *International Journal of Medical Education*, 11: 245-247.
- Veenman, J. V. M, Bernadette H. A. M., Hout-Wolters, V, M. A. H. & Afflerbach, P. (2006). Metacognition and learning: conceptual and methodological considerations, 1: 3–14. DOI 10.1007/s11409-006-6893-0.
- Young, A. & Fry, D. J. (2008). Metacognitive awareness and academic achievement in college students. *Journal of the Scholarship of Teaching and Learning*, 2(8), 1-10.

Corresponding author: Joseph, Obiajuru

✉ joseph.obiajuru@delsu.edu.ng

Department of Guidance and Counseling (Educational Psychology), Delta State University, Abraka.

© 2022. Faculty of Technology Education. ATBU Bauchi. All rights reserved