



## Investigating Students` Cognitive Style and Problem Solving Skills in Conducting Undergraduate Final Year Project

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DOI: <https://doi.org/10.30880/ojtp.2019.04.01.001>

Received 15<sup>th</sup> December 2018; Accepted 15<sup>th</sup> February 2019; Available online 02<sup>th</sup> May 2019

**Abstract:** Cognitive style was found to be related to problem solving skills including final year project in the majority of studies, field-independent students were found to be superior to field-dependent students. The present study investigated the students` cognitive style and problem-solving skills among final year students. Student`s cognitive style and problem solving in fundamentally different ways, particularly problems requiring conceptual understanding and complicated strategies such as final year project problems. The objectives of this research are to identify students` cognitive styles and problem solving skills also to investigate the relationship of both variables related to students` conducting undergraduate final year project. 347 final year students involved in this research. The GEFT questionnaires and problem solving based on IDEAL Model are research instruments used. The result showed that students are more independent of cognitive style and be able to identify the problem in problem skills context. There is no relationship between cognitive style and problem solving skill found even though the importance of both factors being discussed in previous research. Furthermore, researcher is indebted to make some possible suggestions that will enhance and connect student cognitive styles and problem-solving skills, this are; educational focus should not necessarily be on who has/does not have a particular ability, but on how to capitalize on individual strengths, and how to develop learning potential, a better understanding of cultural, social or experiential factors that affect students` research activities are, thus, critical for enhancement of their active learning through undergraduate research.

Keywords: cognitive style 1, field dependence/independence 2, problem solving skills 3, final year project 4

## 1. Introduction

During the previous years, numerous researchers have studied the cognitive style with respect to problem solving skills, such as final year project (Saxena, Jain, & Jain, 2014). Although much work has been done in the area of FDI cognitive style, less attention has been given to the examination of this type of cognitive style in relation to particular areas of problem solving skills of final year project. It will thus be of interest to investigate the students' cognitive style and problem solving skills in conducting final year project. This study is a step towards this direction. It seeks to discover the students' cognitive style and problem solving skills in conducting final year project, cognitive style FDI and their problem-solving skills. The investigation of this relationship is considered important for two reasons: first, problem solving skills requires different cognitive

Processes compared conducting final year project, such as problem-solving, and second, due to the importance recently attributed to problem-solving skills. A review of investigation literature suggests that solving problem is most of the important abilities in life time matters. Nowadays, in advanced nations, teaching of solving problem establishes one the modules of program. Solving Problem, improve student achievement and performance in all developments (Ahghar, 2012; Nosratinia & Adibifar, 2014) recommended training of problem solving skills improve transmission, decision making, and accountability in the learners. (Mayer & Wittrock, 2006), Describes a many step of solving problem procedure, one essential recognize the association among past understandings and present problems and discovery of appropriate clarification in accordance with these subjects. Solving problems is a cognitive procedure nevertheless it can be incidental as of behaviour. Result of the problem solving procedure is provided that explanations solving the difficult needs work or act is based on previous information. (Funkhouser & Richard Dennis, 1992). Many models are debated for solving problems. Five problem steps is argued rendering to IDEAL model comprise: 1) identifying the problem. 2) Define the problem and collected relative data, 3) explore possible solutions. 4) Applying according to the solutions found, and. 5) Look of the last steps and assessment of conceded out activities (Palmer, Wehmeyer, Gipson, & Agran, 2004).

Problem solving skills is an intelligent, coherent and precise system which benefits person when managing issues, to look for various arrangements at that point, select the best arrangement with support to the conditions. In another investigation preparing problem solving skills, enhance correspondence brilliance, expanding certainty abilities, self-visibility incitement, learning, self-control and selfish understudy's makes (Mukherjee & Chatterjee, 2016). (McDermott & Machotka, 2006), institute that teaching problem-solving skills, improved skill to growth undergraduate thoughtful and individual skills as well as final year project (Palmer et al., 2004). Based on Bornstein results in 2003, self-efficacy, self-assessment, self-governance and problematic conditions are among the principles through which they could appraisal the level of self-regulation. Murtagh et al, (2004) disclosed that problem solving is one of the most essential analytical variables for psychological and educational goals (Ahghar, 2012).

Problem solving is a basic part in writing final project. Problem solving refers to cognitive processing meant at reckoning out how the final year students' succeed a goal. A problem occurs while a final year student' desire a goal in FYP but does not know directly what movements to take to reach that goal. Thus, one faces a problem when one is confronted with an obstacle he/she must overcome to reach a goal. Literature on problem solving (Sevenants, Verschueren, & Schaeken, 2011), shows that solving problem requires the FYS to undergo through cognitive processes of thinking, deciding, reasoning, understanding the language of the problem, and recollecting information stored in memory. Problem solving as a tool, a skill and a process. A tool because it can help FYS to solve an immediate problem or to achieve a goal, a skill because once learnt, it can be used repeatedly (e.g., the ability to solve final year project problem), and as a process because it involves taking a number of steps Eysenck and Keane (1990).

### 1.1 Cognitive Styles and Problem Solving Skills

Cognitive style is related to cognitive process and way of problem-solving the difficult task by a final year student. Cognitive style as an authority term covering many ways an individual perceives organizes, classifies and tags various environmental factors, Study shows that cognitive style in its widest sense can be taken as a typical mode of processing information (Sevenants et al., 2011). Cognitive style is the control process which is self-generated, transient, situational determined mindful activity that a student's uses to form and to control, receive and process information. Studies on cognitive style have shown that individuals do not approach scientific tasks in the same manner, (Jena; Musya, 2015). Cognitive style is the foundation of perception among individuals through their collaboration with the basics of the condition and is a significant method to understanding an individual way of thinking (Musya, 2015).

Cognitive style can be considered as field dependent FD or field independent FI, FD people want to be guided in their education improvements, engagement less critical methods to learning (require more instructional direction to assist them to find out related and important information to decrease disorientation). On the other hand, FI individuals employ less guided but more analytical and independence method to knowledge (Pezzuti, Artistico, Chirumbolo, Picone, & Dowd, 2014). The cognitive style of FD/I is a trait of an individual characterized by a particular method of thinking,

solving problems, and involving to others. According to this approach to cognitive styles, FD students are described as holistic, uncertain and reliant on upon others. Words commonly associated with (FD) learners are warm, tactful, affectionate, non-evaluative and accepting of others. In the language learning classroom, this type of learners tends to prefer group activities, role plays, and socially oriented activities. In contrast, (FI) learners are seen as demanding inconsiderate, manipulating others as a means of achieving personal ends. Words commonly used to describe (FI) learners are cold and distant. In the language learning classroom, these learners tend to prefer working individually, may prefer grammar, and likely enjoy exercises that require them to find specific details (Onyekuru, 2015). Interest in cognitive style has made much educational research, especially research associated with the field-dependence, independence dimension, (FD-I) is the important mutable that can affect problem-solving is cognitive style. Cognitive style discusses to the favourite way in which final year student process information or the different ways in which they think and learn how to conduct their final year project (Pithers, 2002).

Problem-solving skills are generally observed as the most important cognitive activity in everyday and specialized contexts. Most people are required to and satisfied with solving problems. Problem-solving is the skill to classify, define and analyse problems, to generate solutions and evaluate them, and to choose the best solution for a specific setting. It involves creative and innovative thinking to find new means to approach a problem, logical skills to study the effects of a specific result, and reasoning skills to consider one solution against another. Problem-solving is any goal-directed order of cognitive operations (Laxman, 2010). Includes the related skills of imagination and creativity, logic and reasoning, data collection, conceptual thinking, feedback, and scientific experimentation. A problem is any situation where you have a chance to make a difference, to make things improved.

## 1.2 Undergraduate Final Year Project

Final year project is a small investigation project to be carried out by final year students in university under the supervision of a supervisor selected amongst the lecturers. It is a necessary requirement to obtain Bachelor Degree with Honors. Among the purposes of this final year, project is to educate the learners on self-learning by doing small study or investigation. Project topics are also chosen by the students out of their interests or the expansion of materials that they have studied (Ahmad et al., 2011). The FYP has a long and well-known history in the field of studies, an undergraduate project of the scope of research problems, the range of student involvement, and faculty expectations (Stößlein & Kanet, 2016).

Final year students need to have good factors of cognitive style and problem-solving, among the cognitive styles factors are the knowledge level of students and the difficulty level of the learning contact are good factors for adapting presentation layout and selecting appropriate learning contact for individuals and also the way final year students perceive and process information has been recognized as being an important factor in FYP (Yang, Hwang, & Yang, 2013). And also final year student need to develop the ability to think critically, analyse and solve complex to find, evaluate and use appropriate learning resources to work cooperate, to demonstrate effective communication skills and to use content knowledge and intellectual skills to become well problem solvers in writing their final year project, these skills are among the important factors of problem-solving (Savery, 2015).

In the entire Faculties of UTHM undergraduate, final year project is a separate task in the final year study for all student who joins in any course offered at the university. It is a two-semester course being separated into final year project I in Semester I and Research Project II in Semester II of an academic year. The project I usually cater literature review and some initial experimental work. Each student has to come out with a dissertation covering the study background of the research project, literature review, research methodology and some preliminary results on the experimental or modelling work. In the second semester, the student will proceed with their wide work and will have to compile all the obtained data and results. With the obtained data, he/she should try to analyses, interpret, validate and justify them.

All the analysis, interpretation, validation and justification for the results will be part of the chapter of results and discussion. This is basically the same in all the faculties of engineering and, Faculty of Science, faculty of computer and information technology as well as the faculty of management and business. The dissertation will end up with certain conclusions, each student has to defend their findings in his/her research project in a viva session which burst their affective style through communication skills which will make them communicate excellently via writing and speaking to deliver information and present problems and solutions. Final year students need to furnish themselves with basic deduction and critical thinking expertise as this is the concentration of study in enlisting new individuals. There are past reviews revealed that most of the graduates are lacking this skill (Abdullah, Anuar, Rosli, Kofli, & Rahman, 2013). Nevertheless, often there is no uniform process and established principles to get project proposal approved (Abdullah et al., 2013).

Final year students need to come out with the solution of some FYP problem among which are acquiring and applying sufficient knowledge and skills, that is adequate in their respective fields which has to do with their cognitive styles, how to conduct investigation into complex problems using research-based knowledge and research methods, also to examine how they analyse and design solutions in their final year project, and finally to find out how they identify, formulate and develop research literature and analyse complex problems reaching substantiated conclusions final year

student need to have good cognitive style and problem-solving skills in their final year project issues. Therefore this research conducted is to identify the students` cognitive styles and problem-solving skills in conducting final year project and possible solution to each problem.

## 2. Research Objective

- i. To identify final year students` of cognitive styles based on field dependent and field independent
- ii. To investigate final year students` problem solving skills based on IDEAL model
- iii. To know the relationship between cognitive styles and problem solving skills in conducting undergraduate final year project

## 3. Methodology

The sample comprised of 347 final year students` conducting final year project. Eight faculties of University Tun Hussein Onn Malaysia were selected purposefully. With regard to objectives, this research is applied and in terms of data gathering. The instrument use in this study were final year student questionnaire. Instrument which was administered to selected students from 8 faculties, the students were final year students. The instrument was used to gather information from the samples. The GEFT cognitive styles questionnaire contains 18 statements for two cognitive styles (field dependent/field independent) and also contain 40 statements from problems solving skills (IDEAL model of problem solving. In order to answer the research questions descriptive statistics have been calculated. Pearson correlation coefficient has been run to answer the research questions, to measure differences as regards to major, independent samples t-test have been calculated.

## 4. Research and Discussion

- i. Cognitive styles based on field dependent and field independent

The total number of final year students from all faculties, participated in this research is 324 out of 3337, The GEFT questionnaire was categorizes in to two part that is FI/FD to measure the preferences of learner in writing final year project, 9 questions in each part of cognitive style dimension, each dimension contained 5 Likert scale, 1 strongly disagree, 2 strongly agree, 3 neutral, 4 agree, 5 strongly agree. Based on the students` respond from Figure 1 we found that 40% of final year students` were field independent while 60% were field dependent means that majority of final year students` need more encouragements and attention to have good cognitive style while writing final year project.

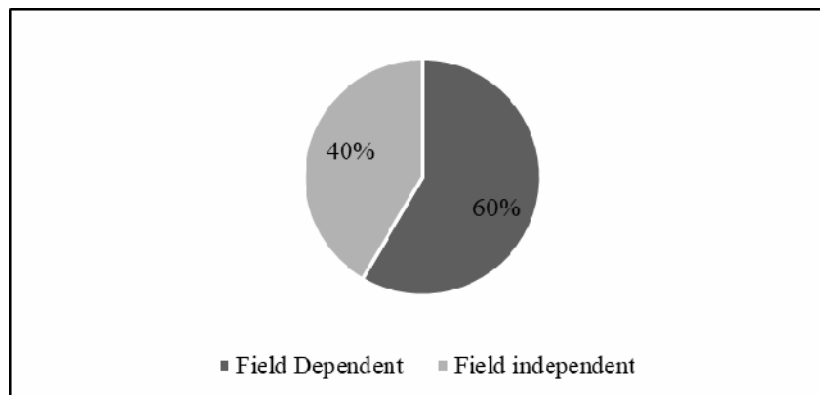


Fig 1: Distribution of cognitive style FI/FD

FI and FD cognitive style is not something stable and unchangeable and it can change with instruction and by the help of superiors, it is part of the teachers` job to teach students how to learn what they are going to learn and teachers also argue to help this type of learners to be able to think globally as well (Rezaee & Farahian, 2012). Less differentiated people were usually also more field-dependent and were more inclined to use what Witkin's clinicians in Psychological Differentiation called massive global repression. Since his experienced clinicians could also recognize field dependence and lack of psychological differentiation upon meeting subjects, however, their conclusion about subjects' use of repression was open to possible contamination (Mischel, 2013). The second dimension of cognitive styles is mentioned in this study is FI learners, final year students are carried out FYP are expected to be FI because FI learners are perceived and interprets information analytically, they tend to reflect individual's ability to rely on one's own knowledge and experience, ignoring the other people's opinion, which makes them better problem solvers in their FYP, likewise their own experience is more important to them than the opinion of their friends (Volkova & Rusalov, 2016).

This finding is supported by other research findings, (Kamaruddin et al., 2004) in their research carried out among the 163 science student (form four) has shown that majority of the students are FD, followed by the intermediates and the FI respectively and only 31 students are FI. On a similar study carried out by (Musya 2015), from her findings among 200 forms three students taking chemistry, the majority of the respondents were FD while the rest indicated they were FI. This indicates that majority of the chemistry students who responded to questionnaires were field dependent. A similar study was also conducted by (Muhammad, Daniel, & Abdurauf, 2015), this study was conducted to examine the association between cognitive styles (Field dependence/Independence) and scientific achievement in Male and Female student of Biology and Integrated science Department of Zamfara State College of Education Maru, the is correlational. A population of 700 students were used and finally found that majority of the respondents were FD.

ii. Problem solving skills based on IDEAL model of problem solving

Figure 2 indicates that only 36.31% among the final year students` can identify the problem, 24.23% can define the problem, while 18.24% can be able to explore alternative, 11.6% have the ability to anticipate that is applying solution to problem and finally 9.62% can be able to look back and evaluate. Final year student` required more attention in problem solving skills.

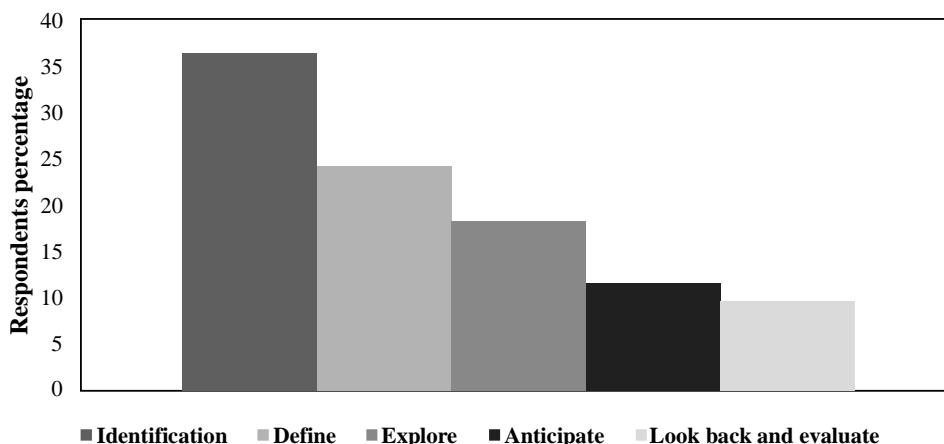


Fig 2: Distribution of problem solving skills

The first dimension of PSS by Bransford`s IDEAL model is identification in this study, problem identification is important in academic settings more especially in FYP were students work with little or no guidance. Identification of research problem is the first and foremost step that every researcher has to undertake. In general, a research problem should be identified and understood as some difficulty, an unclear situation which a researcher experiences in practical or theoretical context and wants to obtain a tangible explanation, clarification or offer a solution to it (Scott, Alter, & McQuillan, 2010). Indeed, in some challenging situations in carrying out FYP numerous learners are overcome with feelings and see just big difficulties, fences or trouble. Nevertheless, countless problem solvers try frequently to categorise the very roots of the difficult situation – the nature of a specific problem which can be undoubtedly distinguished, addressed and ultimately solved. Research has indicated that domain identification is related to future academic outcomes such as academic achievement, behavioral referrals, engagement, and absenteeism (Walker, Greene, & Mansell, 2006).

In terms of defining as the second dimension stated in this study, final year students seem to be more of defining their problem in FYP than any dimension in Bransford`s IDEAL model for problem-solving skills according to this study, it can be said that final year students of UTHM are likely to define their problem in FYP than identifying it. Defining a problem is a capability to breakdown the problem into minor pieces, or minor and wieldier parts by defining the key essentials of the problem. Once you break down a big problem into minor elements, then you are no longer fronting an incredible task and can go about making several very concrete steps to achieve the goal and solve your problem. Defining a problem in FYP include referring to the literature, contemporary practices, personal experiences (Bahçekapili, Bahçekapili, Fis Erümit, Göktaş, & Sözbilir, 2013).

Explore is the third dimension of this study and nearly one-third of the respondents can explore their problem during FYP. This step is one of the most difficult stages in carrying out the project as finding possible solutions is a very tricky step in the problem-solving process, as on the surface it looks like most of the work is already done and the ultimate

goal is close. In reality, students should not just look for simplistic ways to address the elements of the problem. They should find the most effective ways and turn them into an opportunity to make a strong success story.

Second to the last and fourth dimension in problem solving skills model is anticipate and analyses, in this study among the respondents only one over five can anticipate and analyses their problem which is a complete set back for FYP as it's an important step, as it doesn't matter how effectively students identify the problem, define its elements and examine possible solutions; everything still boils down to the ability to perform concrete steps to execute the action plan. Within these problem-solving formula students should also master skills such as monitoring and evaluate the entire action implementation process and – if it is a group undertaking – learn how to delegate certain parts of the work to each other or to external stakeholders, this is a great concern on both the tutors and the learners.

The fifth dimension is look back and evaluate in which from the findings of this study shows that only one-fifth of the respondents have a preference to look and evaluate their FYP problems at the moment when the problem is solved. I suggest that students sit down with all their problem-solving action plans, either alone or together if it is a group project. This is the moment to look back and see if there is a need to tune up the work that has been completed. Especially valuable is taking the time to evaluate the entire process and formulating the lessons to be learned so the next problem-solving project will be more effective and produce even more elegant solution

iii. Relationship between cognitive style and problem solving skills in Undergraduate Final Year Project

Table 1 showed that the correlation between cognitive style and problem-solving skills for undergraduate FYP. The findings showed that there is no significant relationship between cognitive style and problem-solving skills as 51.6% are dependent learners hence they rely on another source to solve their own problems. The findings showed a p-value for all the dimensions are within  $p > 0.05$  but not in the range  $p < 0.05$ . The main result of a correlation is called the correlation coefficient (or "r"). It ranges from -1.0 to +1.0. The closer r is to +1 or -1, the more closely the two variables are related. If r is close to 0, it means there is no relationship between the variables. In order to find out the relationship between cognitive style and problem-solving skills of final year students` Pearson correlation was conducted to determine if there is any significant relationship between CS and PSS. Table shows the number of variables with significant relationship is rather limited, only 2 dimensions had a level of significant smaller than 0.5. The dimension is FI with identification  $p=.012$ , FI and define dimension  $p=.073$ , that is there is no relationship, but FI, explore  $p=.003$  means there is significant relationship also FI and anticipate  $p=.001$  relationship occurred, FI and look back  $p=.012$  means there is no relationship. Meanwhile FD with all problem solving dimensions, shows there is no relationship because p-value is .000 except FD with define dimension which is  $p=.001$ . Our result shows that there is no relationship between cognitive style and problem-solving skill.

Table1: Relationship between Cognitive styles and problem solving skills

		I D	DE	EXP	ATN	LBE
FI	Pearson correlation	.140*	.100	.167**	.178*	.140*
	Sig. (2-tailed)	.012	.073	.003	.001	.012
	N	3	323	323	3	323
FD	Pearson correlation	.312**	.178**	.419**	.326**	.352*
	Sig. (2-tailed)	.000	.001	.000	.000	.000
	N	3	323	323	3	323

The result shows that there is no correlation between cognitive style and problem-solving skills in final year project. That is the cognitive style has no effect problem-solving skills in final year project, in end, the researcher, conducted linear regression test to determine any effect of cognitive style and problem-solving skills in final year project among students. From the findings, the effect of two variables on each other is negligible. This result implies that these variables do not affect each other. The have a negative correlation, the researcher determines the majority of final year student need guidance in FYP. This finding is similar to other research findings, even though some previous researchers indicated that FI students performed significantly better than FD students in both assessment techniques. Moreover, the findings are supported by Jena (2014) study is to find out the difference in cognitive styles of undergraduate students in relation to their problem-solving ability among 300 undergraduate students from Pulwama and Anantnag districts Kashmir by using simple random sampling techniques.

## 5. Conclusion

Based on the above findings the researcher is indebted to make some possible suggestions that will enhance and connect student cognitive styles and problem-solving skills, this are; educational focus should not necessarily be on who has/does not have a particular ability, but on how to capitalize on individual strengths, and how to develop learning potential, a better understanding of cultural, social or experiential factors that affect students' research activities are, thus, critical for enhancement of their active learning through undergraduate research. There is need to give appropriate coaching and support to enhance problem-solving ability of undergraduate students. The findings of this research indicated that majority of the students are FD. This could be due to the teachers' teaching styles which focused on the teacher-centered activities. Teachers should execute activities that would cater the diverse cognitive styles of the students. Research by Ross (2001) suggested that teachers should be flexible with their teaching styles, and use diverse assessment to cater to the needs of the student

## References

- Abdullah, S. R. S., Anuar, N., Rosli, M. I., Kofli, N. T., & Rahman, N. A. (2013). Improvement in the Implementation of Undergraduate Research Project. *Procedia-Social and Behavioral Sciences*, 102, 141-147.
- Ahghar, G. (2012). Effect of problem-solving skills education on auto-regulation learning of high school students in tehran. *Procedia-Social and Behavioral Sciences*, 69, 688-694.
- Ahmad, R. R., Suradi, N. R. M., Majid, N., Shahabuddin, F. A., Rambely, A. S., Din, U. K. S., & Ali, Z. M. (2011). The role of final year project in the School of Mathematical Sciences in human capital development. *Procedia -Social and Behavioral Sciences*, 18, 450-459.
- Ates, S., & Cataloglu, E. (2007). The effects of students' reasoning abilities on conceptual understandings and problem-solving skills in introductory mechanics. *European Journal of Physics*, 28(6), 1161.
- Bahçekapili, E., Bahçekapili, T., Fis Erümit, S., Göktaş, Y., & Sözbilir, M. (2013). The Factors Affecting Definition of Research Problems in Educational Technology Researches. *Educational Sciences: Theory and Practice*, 13(4), 2330-2335.
- Blackburn, J. J., Robinson, J. S., & Lamm, A. J. (2014). How cognitive style and problem complexity affect preservice agricultural education teachers' abilities to solve problems in agricultural mechanics. *Journal of Agricultural Education*, 55(4), 133-147.
- Cataloglu, E., & Ates, S. (2014). The effects of cognitive styles on naive impetus theory application degrees of pre-service science teachers. *International Journal of Science and Mathematics Education*, 12(4), 699-719.
- Funkhouser, C., & Richard Dennis, J. (1992). The effects of problem-solving software on problem-solving ability. *Journal of Research on Computing in Education*, 24(3), 338-347.
- Jena, P. C. (2014). Cognitive Styles and Problem Solving Ability of Under Graduate Students. *International Journal of Education and Psychological Research*, 3(2), 71-16.
- Kamaruddin, M., BAKAR, Z. B. A., SURIF, J. B., Li, W. S. S., PENCAPAIAN, T. P. K. D., & EMPAT, K. D. K. P. T. (2004). Relationship Between Cognitive Styles, Levels of Cognitive Thinking And Chemistry Achievement Among Form Four Science Students. Unpublished note. Universiti Teknologi Malaysia.
- Lamm, A. J., Shoulders, C., Roberts, T. G., Irani, T. A., Snyder, L. J. U., & Brendemuhl, J. (2012). The Influence of Cognitive Diversity on Group Problem Solving Strategy. *Journal of Agricultural Education*, 53(1), 18-30.
- Laxman, K. (2010). A conceptual framework mapping the application of information search strategies to well and ill-structured problem solving. *Computers & Education*, 55(2), 513-526.
- Mayer, R. E., & Wittrock, M. C. (2006). Problem solving. *Handbook of educational psychology*, 2, 287-303.
- McDermott, K., & Machotka, J. (2006). Enhancing final year project work in engineering programmes. *UICEE*.
- Mefoh, P. C., Nwoke, M. B., Chukwuorji, J. C., & Chijioko, A. O. (2017). Effect of cognitive style and gender on adolescents' problem solving ability. *Thinking Skills and Creativity*.
- Mischel, W. (2013). *Personality and assessment: Psychology Press*.
- Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C. (2004). *SPSS for introductory statistics: Use and interpretation: Psychology Press*.

- Mugenda, O., & Mugenda, A. (2003). *Research methodology: qualitative and quantitative techniques*: Nairobi: Acts Press.
- Muhammad, T., Daniel, E. G. S., & Abdurauf, R. A. (2015). Cognitive Styles Field Dependence/Independence and Scientific Achievement of Male and Female Students of Zamfara State College of Education Maru, Nigeria. *Journal of Education and Practice*, 6(10), 58-63.
- Mukherjee, S., & Chatterjee, I. (2016). Cognitive Style of Humanities, Commerce and Science Students-A Study on Higher Secondary Students from West Bengal. *The International Journal of Indian Psychology*, Volume 3, Issue 2, No. 8, 20.
- Musya, M. N. (2015). *Cognitive styles and academic achievement among secondary school learners in Kenya*. University of Nairobi.
- Nosratinia, M., & Adibifar, S. (2014). The Effect of Teaching Metacognitive Strategies on Field-dependent and Independent Learners' Writing. *Procedia-Social and Behavioral Sciences*, 98, 1390-1399.
- Onyekuru, B. U. (2015). Field Dependence-Field Independence Cognitive Style, Gender, Career Choice and Academic Achievement of Secondary School Students in Emohua Local Government Area of Rivers State. *Journal of Education and Practice*, 6(10), 76-85.
- Palmer, S. B., Wehmeyer, M. L., Gipson, K., & Agran, M. (2004). Promoting access to the general curriculum by teaching self-determination skills. *Exceptional Children*, 70(4), 427-439.
- Pezzuti, L., Artistic, D., Chirumbolo, A., Picone, L., & Dowd, S. M. (2014). The relevance of logical thinking and cognitive style to everyday problem solving among older adults. *Learning and Individual Differences*, 36, 218-223.
- Pithers, R. (2002). Cognitive learning style: a review of the field dependent-field independent approach. *Journal of Vocational Education and Training*, 54(1), 117-132.
- Rezaee, M., & Farahian, M. (2012). The case study of a field-independent English language learner. *Procedia-Social and Behavioral Sciences*, 47, 114-119.
- Savery, J. R. (2015). Overview of problem-based learning: Definitions and distinctions. *Essential readings in problem-based learning: Exploring and extending the legacy of Howard S. Barrows*, 5-15.
- Saxena, S., Jain, R. K., & Jain, H. K. (2014). Impact of Cognitive Style on Problem solving Ability among Undergraduates. *International Journal of Human Resource Management and Research (IJHRMR)*, 1(4), 59-64.
- Scott, T. M., Alter, P. J., & McQuillan, K. (2010). Functional behavior assessment in classroom settings: Scaling down to scale up. *Intervention in School and Clinic*, 46(2), 87-94.
- Sevenants, A., Verschueren, N., & Schaeken, W. (2011). The contribution of cognitive style, cognitive abilities and expertise to the solving of complex problems. Paper presented at the CogSci.
- Shute, V. J., Wang, L., Greiff, S., Zhao, W., & Moore, G. (2016). Measuring problem solving skills via stealth assessment in an engaging video game. *Computers in Human Behavior*, 63, 106-117.
- Stößlein, M., & Kanet, J. J. (2016). Undergraduate research experiences: Identifying lessons learned and challenges for business schools. *The International Journal of Management Education*, 14(3), 349-367.
- Volkova, E. V., & Rusalov, V. M. (2016). Cognitive styles and personality. *Personality and Individual Differences*, 99, 266-271.
- Walinga, J., Cunningham, J., & MacGregor, J. (2010). Improving performance in solving insight problems: The roles of assumptions, barriers and goals. *Journal of Creative Behavior*, 45(1), 47-58.
- Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning and Individual Differences*, 16(1), 1-12.
- Yang, T.-C., Hwang, G.-J., & Yang, S. J.-H. (2013). Development of an Adaptive Learning System with Multiple Perspectives based on Students' Learning Styles and Cognitive Styles. *Educational Technology & Society*, 16(4), 185-200.