

Learning Style, Environment and Its Influence on Student Interest for Higher Order Thinking Skills in Science Subject

Zurinah binti Yunus¹, Kamisah Osman², Zanaton Ikhsan³

¹Institut Aminuddin Baki, Negeri Sembilan, Malaysia

^{2,3}Fakulti Pendidikan, Universiti Kebangsaan Malaysia, Malaysia

Abstract

Thinking skills are important elements that need to be considered to produce highly competitive students. The rapidly changing and challenging world requires students to go beyond building their knowledge capacity and develop higher order thinking skills, such as critical thinking, decision making and problem solving. Mastery of high -level thinking skills (HLTS) needs to be applied from the beginning to familiarize students with situations that require them to use those skills in their lives. An important goal of early childhood education is to promote effective thinking in young children. In this regard, the mastery of HOTS must be applied as early as possible with the help of parents in their own family environment. The mastery of HOTS also needs to continue to grow with a more appropriate environment and supported by a deep interest in a subject. This study was conducted to examine the factors of learning style and environment in influencing students' mastery of HOTS for Science subjects. It is hoped that the findings of this study can be used as a guide for future researchers.

Keyword: Learning style, environment, higher order thinking skills, HOTS, science

Introduction

Malaysia's aspiration to achieve the status of a high -income country requires various plans that need to be realized. The need for a workforce with sufficient knowledge and skills to support and drive economic growth must be met. To achieve this, science, mathematics, engineering and mathematics (STEM) education has been introduced. STEM is an agenda that is given attention and emphasis due to the importance of its value for a country. The direction of STEM education in the Malaysia Education Development Plan 2013-2025 outlines several steps in strengthening STEM education such as increasing student interest through new learning approaches and strengthening the curriculum, incorporating mastery of HOTS, increasing the use of practical teaching facilities and making content relevant to life. daily to increase interest. The mastery of HOTS is an important element and needs to be nurtured and strengthened to obtain quality human resources in the future. According to a World Economic Forum (WEF) report (2016), by 2020 some of the relatively key skills required by most jobs and industries are cognitive abilities (such as creativity and mathematical thinking) and process skills (such as active listening and critical thinking). In addition, other skills that are also required are complex problem -solving skills (Aminah et al., 2021; Azlisham et al., 2021; Saadiah et al., 2021; Firkhan et al., 2021; Ishak et al., 2021).

Literature Review

Noor Ashikin (2017) listed three issues related to the mastery of HOTS among students. The issues are student engagement, student communication and lack of knowledge. These issues are seen as problems that need to be resolved if the mastery of HOTS is to be improved. Student involvement requires students to be active in teaching and learning activities, but the opposite situation occurs where most students are passive and less responsive. A conducive learning environment will encourage students to be more active in the classroom. In fact, the high -level thinking agenda is a relative construct that requires a force to act on each student to develop a readiness in the minds of practitioners to absorb and digest the learning environment and acquire what is introduced to it (Azreen & Mohamed, 2017).

In addition, students' learning styles can also influence students' involvement in the classroom. By identifying learning styles in the context of education and behavior in student learning, teachers can use different teaching strategies related to the type of learning (Norazmi, 2020). Each student has their own learning style where the learning style may feel effective or comfortable for themselves such students but may not for other students. One of the most important learning factors that may influence higher order thinking can be seen in studies of learning approaches and learning style research (Leite, 2013).

Learning style factors are important in determining a student's success because each student has different characteristics in terms of their respective abilities and the way a student's understanding leads to different learning styles between students (Anisah & Ruslin 2016). Therefore, students' learning style will indirectly be able to impact on students' mastery of HOTS. In addition, some students like to be given guidance, study in groups and do things better if they can engage in learning activities. Some students are also actively involved, being observers and listening to music while learning (Roszi et al., 2021).

The combination of all this is related to the way students learn that need to be identified by teachers to ensure that the teaching and learning process can be carried out effectively and can achieve objectives. Students do not have the same learning style and they are willing to learn through different means (Rosnee et al., 2021). Teaching strategies that follow the learning style of students can provide satisfaction and make learning easier and better for students. Unaware of this learning style, students tend to miss out on what they are learning. Therefore, students' learning styles need to be observed in order to ensure the effective implementation of PdP activities.

Next, students need to have certain education, experience, practice, resources and support before they can demonstrate mastery of HOTS. Zaid et al. (2020) argues that students' progress from low -level thinking to higher -level thinking is in line with age. It is important for students to have the motivation and resources to do so. This is because student attitude factors indicate that many students display an easy -going attitude and /or lack motivation to think even for good students (Zaid et al., 2021). All these elements are factors that need to be

given attention if we want to produce students who meet the criteria for mastery of HOTS as outlined by the MOE.

In addition, a conducive learning environment will also help in developing students' HOTS. The learning environment has an impact on thinking skills (Ishak et al., 2021). The study conducted by Budsankom et al. (2015) showed that classroom climate, teaching and learning methods influence students' HOTS. In addition, researchers suggest that psychological factors should also be considered and applied to the classroom environment. For example, with the management of positive learning activities, the classroom climate should support positive thinking in learning, teaching behaviors or teachers' personalities to support attitudes toward learning. A positive learning environment will help teachers and students achieve the best in the learning process (Firkhan et al., 2021). Therefore, the factors of the learning environment must be given attention to ensure that the achievement of students' HOTS continues to increase.

There are several factors that contribute to the well-being of students in school namely psychological, physical, cognitive and social. Threats to the well-being of students in schools can be addressed in a number of ways namely teacher support, positive peer relationships, a disciplined learning environment and caring parents. Parents who care about their children and always communicate with their children will contribute to more prosperous students in school (OECD 2017). A parental environment that can stimulate students' HOB is an environment that needs to be created in the family institution as a conducive environment will cause students to be able to show better achievement in school.

However, the parenting factor has also been studied for decades as one of the most important environments of its influence on a child's well-being. Democratic parenting style and family support will help students improve their attitudes towards learning, achievement motivation, and self-confidence will also affect the mastery of HOTS (Mohd Norazmi et al., 2021). Among the parenting variables are parenting style, differences in parental treatment and co-parenting consistency (Fauziyana et al., 2020). Therefore, parents should take care of their children carefully and fairly and give children opportunities to share ideas, make decisions, and solve problems. Parents should also encourage their children to participate in activities inside and outside the classroom to stimulate the application of HOTS in them.

Students, on the other hand, often feel that KBAT questions are not important in their studies. The LPM study showed almost 30% of students did not answer non-routine questions. Community culture often emphasizes excellence and A number as one of the aspects of student success. The culture of the society formed is closely related to the family environment and the socioeconomic status (SSE) of the student's own family. Saadiah et al. (2021) conducted research to provide comprehensive validation of children's differences in thinking, beliefs, doing or choosing not to do, feelings and so on that can be attributed to different parenting styles. Parents are very influential on the personal formation of children in the environment in which they are shaped. For nearly a century research has been conducted

on the relationship between parents' SSE and their children's cognitive abilities (Rindermann & Baumeister 2018).

Methodology

This quantitative survey study uses data obtained through a spread of survey questionnaires. The data were analyzed with CFA test with the records recorded on several aspects, namely Internal consistency, convergent validity and discriminant validity.

Findings

Internal consistency reliability

Internal consistency is important for testing item reliability. Internal consistency can indicate the degree of measurement of items that measure the same or interdependent constructs. To test the internal consistency in PLS-SEM, it is necessary to refer to a value known as composite reliability (CR) which has a value between 0 to 1. Higher CR values indicate higher reliability. CR values below 0.60 indicate a lack of internal consistency reliability. If the scores produced are nearly the same and stable each time the instrument is used (Jackson 2006), then scores from consistent instruments can indicate the reliability (Creswell 2012) of a study. Table 1 shows the CR values for the pilot study. It was found that the CR values for all constructs were between 0.799 and 0.945. According to Nunally and Bernstein (1994), CR values between 0.6 and 0.7 are acceptable. Thus, the level of internal consistency for the pilot study was high and reliable.

Convergent validity

A positive relationship between items that measure the same construct is known as convergent validity. To determine convergent validity, a reliability indicator that aims to assess the extent to which an indicator or a set of indicators is consistent with what is to be measured is used. Reliability indicators or also called outer loading and average variance extracted (AVE) are taken into account for this validity assessment. Outer loading values above 0.4 are acceptable if contributing to the AVE score is greater than 0.5 (Hulland 1999). In addition, items with an outer loading value between 0.4 to 0.7 should be considered for removal. Item removal can be done if it can increase the AVE value. Byrne (2016) argues that the value of outer loading must be above 0.5 and the value of AVE must be equal to or higher than 0.5. Analysis of the measurement model to obtain the values of outer loading and AVE was performed. These values were used in the pilot study. Figure 3.3 shows the measurement model for obtaining the results of the pilot study analysis.

A minimum AVE value of 0.5 is obtained by removing items with an outer loading value of less than 0.5. The items were discarded one by one sequentially by performing the PLS algorithm process repeatedly. shows the AVE values obtained from the analysis of the PLS-SEM measurement model. The AVE values for all constructs exceeded the prescribed

minimum requirement of 0.5 as reported in the table. Therefore, it can be concluded that the level of convergent validity for the pilot study is satisfactory.

Table 1: CR values for the internal consistency assessment of the construct (first level) of the pilot study

Construct	Composite Reliability (CR)
free	0.806
depends	0.820
equity	0.896
cognitive interaction	0.871
parental personality	0.897
cooperation	0.888
student cohesive	0.844
ksma	0.904
making decisions	0.839
dodge	0.837
interest in the situation	0.895
task orientation	0.886
parents occupation	0.915
creative thinking	0.902
critical thinking	0.901
parental income	0.830
parental education	0.826
involvement	0.827
problem solving	0.862
investigation	0.896
competition	0.848
environmental stimuli	0.799
concrete	0.914
parental attitudes towards children's intelligence	0.890
teacher support	0.853

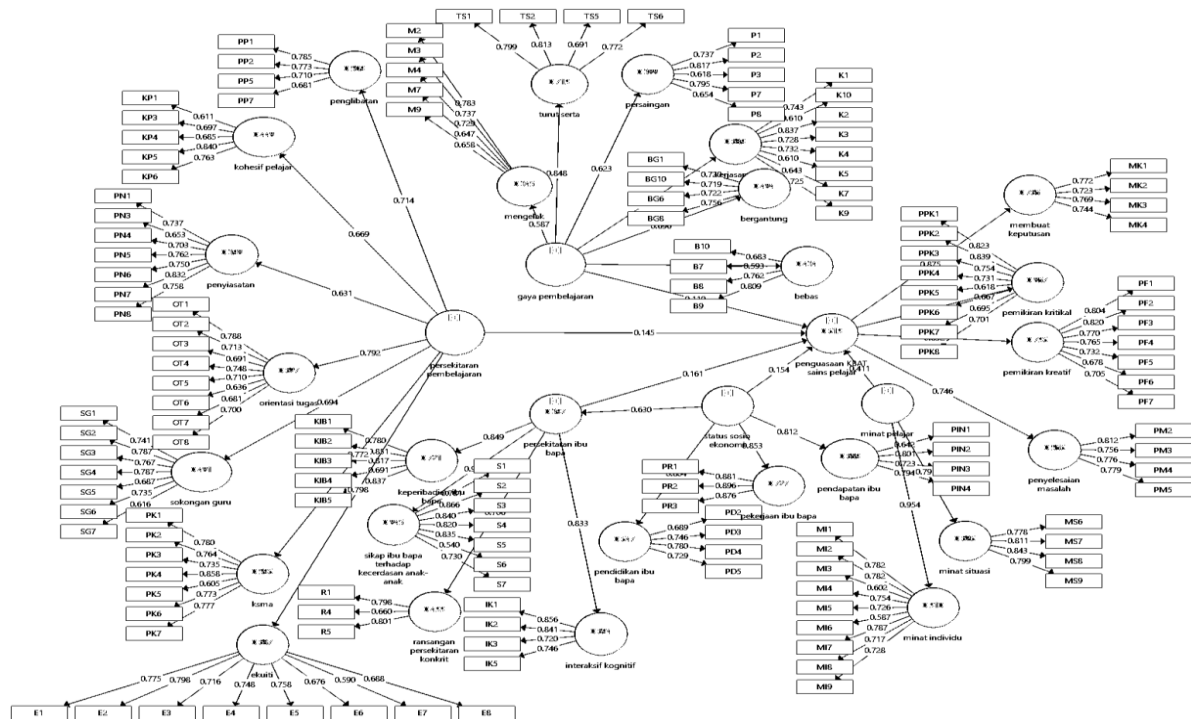


Figure 1: PLS-SEM Measurement Model for the pilot study

Table 2: AVE for internal consistency assessment of the construct (first level) of the pilot study

Construct	Average Variance Extracted (AVE)
free	0.513
depends	0.532
equity	0.520
cognitive interaction	0.629
parental personality	0.635
cooperation	0.500
student cohesive	0.523
ksma	0.576
making decisions	0.566
dodge	

	0.508
interest in the situation	
	0.521
task orientation	
	0.631
parents occupation	
	0.528
creative thinking	
	0.782
critical thinking	
	0.570
parental income	
	0.536
parental education	
	0.552
involvement	
	0.543
problem solving	
	0.546
investigation	
	0.610
competition	
	0.554
environmental stimuli	
	0.530
concrete	
	0.571
parental attitudes towards children's intelligence	0.608
teacher support	
	0.538
participate	
	0.593

Discriminant validity

Each construct should be different from the other constructs in a model. The extent to which a construct is completely different from other constructs indicates discriminant validity in a model. Cross loading assessment is typically the first approach taken to determine discriminant validity. The outer loading indicator on the relevant construct must be larger than any cross loading. This means that the indicator for each construct shows a greater value than the cross loading for the other constructs. Table 2 shows the cross loading values for this study.

The Fornell-Larcker criterion is also used in assessing discriminant validity. It compares the power source of the AVE value with the correlation of the latent variable. Specifically the

power source for the AVE of each construct must be greater than the highest correlation value of that construct compared to the other constructs of the Fornell-Larcker criterion evaluation results of the study. From the table, the AVE power source values for each construct are located at the top and rightmost in each row and column respectively. The values below represent the values of the correlation between the construct with other constructs. The power source value of AVE is found to be higher than the correlation value in the rows and columns of the construct. This means that the constructs are different from each other. Thus the condition of discriminant validity has been reached

Discussion

The advancement of cognitive ability in many ways is following the same principles. According to Een et al. (2021), thinking is not a natural function like sleeping, walking and talking. Thinking needs to be developed and a person does not necessarily become smarter as they get older. Some children are lucky because they learn thinking skills from their parents or others. Serious parents will engage in meaningful conversations, inspire their imaginations, ask questions that make them think and so on. Other underprivileged children do not have an environment that nurtures and encourages their cognitive development. As children become accustomed to systematic thinking skills and experience positive learning experiences, they will gradually learn to enjoy more challenging tasks. Eventually their self-confidence will grow (Norazmi et al., 2019; Fauziyana et al., 2020; Norazmi, 2020; Zaid et al., 2020;).

Thus, the needs of the contemporary workplace including the ability to think critically and creatively in solving problems and responding to changes in economic and social conditions can be met. High-level thinking has long been confirmed as a key predictor of success in academia and the workplace. Extensive efforts to foster high-level thinking have involved the implementation of instructional design interventions that involve students in complex cognitive activities (Zaid et al., 2021).

Moreover, the current, information-intensive and ever-evolving workplace environment desperately requires employees to continually acquire and transfer skills and competencies to change economic conditions and demands (Zaid et al., 2021). In meeting the needs of the workplace that demands this diversity of skills and needs, then the human resources that will be produced must have good competencies in various aspects. It needs to start with a child and student who knows their life goals and then try their best to achieve them. A very conducive environment needs to be created to achieve that goal. Students are active interpreters of the environment, culture, values and challenges around them (Mohd Norazmi et al., 2021; Rosnee et al., 2021; Roszi et al., 2021; Een et al., 2021; Yusaini et al., 2021). The way students interpret task requirements greatly influences learning outcomes. Such interpretations in turn are influenced by how students view the larger environment in which they learn (Nik Nurhalida et al., 2021).

Conclusion

Students desperately need thinking skills to keep abreast of developments and competition in the global education stream and will be able to prepare them for a better future job market. Mastery of HOTS in Science subjects is very important to be implemented because it will be able to be practiced by students in their daily lives. Students can ask, obtain or determine answers to questions drawn from everyday experience and are able to describe, explain and predict natural phenomena. The teaching and learning process that successfully applies the mastery of HOTS as much as possible is very beneficial to students. KSSM which was introduced in 2017 requires changes that need to be implemented, namely the mastery of HOTS is applied in PdP while implementing in -depth learning. Students are expected to be able to solve problems and make decisions through inquiry approaches and applications of mastery of HOTS.

References

1. Aminah Binti Mat Yusoff, Mohd Hisyam Bin Abdul Rahim, Azizul Azra bin Abd Hamid, Fatimah binti Ahmad, Mohd Norazmi bin Nordin (2021). Metacognitives And Morals: The Qur'an As A Guide. Turkish Journal of Computer and Mathematics Education Vol.12 No. 4(2021), 659-664.
2. Anisah Samingan & Ruslin Amir. 2016. Keserasian gaya pembelajaran dengan penerapan kemahiran aras tinggi (KBAT) dalam pengajaran dan pembelajaran Bahasa Melayu. International Conference on Education and Regional Development 2016 (ICERD 2016) "Cross-Cultural Education for Sustainable Regional Development,"
3. Azlisham Abdul Aziz, Mohd Nor Mamat, Daud Mohamed Salleh, Syarifah Fadylawaty Syed Abdullah, Mohd Norazmi Nordin (2021). An Analysis Of Systematic Literature Review On The Development Of Islamic Oriented Instruments. Journal of Contemporary Issues in Business and Government Vol. 27, No. 1: 3222-3233.
4. Azreen, S. & Mohamed, M. 2015. The Perception of Critical Thinking and Problem Solving Skill among Malaysian Undergraduate Students. Procedia - Social and Behavioral Sciences, 172(2012), 725–732.
5. Een Nurhasanah, Uah Maspuroh, Nia Pujiawati, Mohd Norazmi bin Nordin. (2021). Socio-Economic Study: Middle Class Society Portraits in Drama "Sayang Ada Orang Lain" By Utuy Tatang Sontani. Multicultural Education Volume 7, Issue 2, 2021 189-199.
6. Een Nurhasanah, Uah Maspuroh, Rina Marlina S. Psi, M.Pd, Mohd Norazmi bin Nordin. (2021). Arifin C. Noor's Drama "Matahari Di Sebuah Jalan Kecil" As A Media For Literature Learning In Senior High School: A Study Of The Structure And Psychological Value. Psychology and Education (2021) 58(2): 11315-11328.
7. Fauziyana, M., Zaid, M., Rasid, A. R., Rosnee, A., Norazmi, N. (2021). Meta Analysis for Special Education Leadership In Malaysia. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(7), 13455-13468.
8. Fauziyana, M., Zaid, M., Rosnee, A., Norazmi, N. (2021). Teachers Competency Elements of Special Education Integrated Program for National Type Schools in Johor, Malaysia on Implementation of Individual Education Plan. *International Journal Of Pharmaceutical Research* Volume 13 ,Issue 2, Apr - Jun, 2021.
9. Firkhan Ali Bin Hamid Ali, Mohd Zalisham Jali, Mohd Norazmi bin Nordin. (2021). Preliminary Study On It Security Maintenance Management In Malaysia Organizations. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 18(1), 4061-4073.
10. Ishak Khairon, Kamarul Azmi Jasmi, Mohamad Khairul Latif, Muhammad Yusof Hakimi Mohd Kanafiah, Mohd Norazmi bin Nordin. (2021). Thrust Of Faith And Manifestations To Faith According To The Qur'an And Hadith: A Study Of Content Analysis. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 18(4), 295-314.

11. Leite, L. & Dourado, L. 2013. Laboratory Activities, Science Education and Problem-solving Skills. *Procedia - Social and Behavioral Sciences*, 106, 1677–1686.
12. Mohd Norazmi bin Nordin, Faiza Iqbal, Ruqia Safdar Bajwa. (2021). Challenges Of Parents In The Implementation Of Teaching Process And Facilitation At Home During Movement Control Order For Students With Special Needs With Hearing Impairment In Malaysia. *Psychology And Education* (2021) 58(2): 9188-9193.
13. Nik Nurhalida Binti Nik Hariry, Fahirah Syaliza binti Mokhtar, Nor Aeini binti Haji Mokhtar, Mohd Norazmi bin Nordin (2021). Enforcement Of Maritime Archaeology In Malaysia: A Review. *Journal of Contemporary Issues in Business and Government* Vol. 27, No. 2, 2021: 2201-2210.
14. Noor Ashikin Binti Ibrahim, K. O. 2017. Kesan FROG VLE Secara Pembelajaran Kooperatif Terhadap Pencapaian, KBAT dan Minat Pelajar Bagi Subjek Kimia. *Seminar Pendidikan Transdisiplin (STEd2017)*, hlm. 635–649.
15. Norazmi, N. (2020). Effect Size for Model of the Influence of Headmasters Leadership on Teacher Task Load and Teacher Job Satisfaction of Special Education Integration Program. *International Journal of Physopsocial Rehabilitation*. Vol. 24, Issue 10, 2020: 2102-2112.
16. Norazmi, N. (2020). Factors for the Task Load of Special Education Integration Program (PPKI) Teachers in Johor. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, Volume 9, Issue 3: 2413-2416.
17. Norazmi, N., Zaid, M. & Abdul Rasid, A. R. (2019). The Practice of Headmasters' Leadership and Its Effect on Job Satisfaction of Special Education Integration Program (PPKI) Teachers in Johor, Malaysia. *Universal Journal of Educational Research* 7.9 (2019): 2008-2014. DOI: 10.13189/ujer.2019.070923.
18. Norazmi, N., Zaid, M. & Abdul Rasid, A. R. (2020). Relationship between Headmasters' Leadership, Task Load on Special Education Integration Programme Teachers' Job Satisfaction. *Universal Journal of Educational Research* 8(8):3398-3405
19. Norazmi, N., Zaid, M. & Abdul Rasid, A. R. (2020). Special Education Integration Program (PPKI) Teachers: Task Load and Job Satisfaction. *International Journal of Psychosocial Rehabilitation*, Vol. 4, Issue 7: 7439-7445.
20. Rosnee Ahad, Mohamad Zaid Mustafa, Suhaimi Mohamad, Nur Hanim Saadah Abdullah, Mohd Norazmi Nordin (2021). Work Attitude, Organizational Commitment and Emotional Intelligence of Malaysian Vocational College Teachers. *Journal of Technical Education and Training* Vol. 13 No. 1 (2021): 15-21.
21. Roszi Naszariah Nasni Naseri, Harniyati Hussin, Maryam Mohd Esa, Noorizda Emellia Mohd Aziz, Mohd Norazmi bin Nordin (2021). What is a Population in Online Shopping Research? A perspective from Malaysia. *Turkish Journal of Computer and Mathematics Education* Vol.12 No.4 (2021), 654-658.
22. Saadiah Kaspin, Hanif Khairi, Oskar Hasdinor Hassan, Nadiah Mohamad, Mohd Norazmi bin Nordin (2021). Identifying Factors Leading To Gold Losses During The Fabrication Process And Assessing Its Impact On The Smes Jewellery Industry. *Turkish Journal of Computer and Mathematics Education* Vol.12 No.7 (2021), 975-985.
23. Yogesh Hole et al 2019 J. Phys.: Conf. Ser. 1362 012121
24. Yusaini Hisham Bin Mohamed, Prof Madya Dr Abd Rahman Bin Abdul Rahim, Prof Madya Dr Azanizawati Binti Ma'aram, Mohd Norazmi bin Nordin. (2021). The Moderating Effect of Halal Traceability System on Halal Food Supply Chain Management and Halal Integrity Assurance Relationship. *Journal of Contemporary Issues in Business and Government*, 2021, Volume 27, Issue 2, Pages 5060-5075.
25. Zaid, M., Norazmi, N. & Abdul Rasid, A. R. (2020). Headmaster Leadership Effect On Task Load Of Special Education Integration Program Teacher. *Humanities & Social Sciences Reviews*, Vol. 8 No. 2 (2020): 451-456.
26. Zaid, M., Norazmi, N. & Abdul Rasid, A. R. (2020). Headmaster Leadership Effect On Task Load Of Special Education Integration Program Teacher. *Humanities & Social Sciences Reviews*, Vol. 8 No. 2 (2020): 451-456.
27. Zaid, M., Norazmi, N. & Abdul Rasid, A. R. (2020). Regression between Headmaster Leadership, Task Load and Job Satisfaction of Special Education Integration Program Teacher. *Universal Journal of Educational Research* 8.4 (2020) 1356 - 1362. Doi: 10.13189/ujer.2020.080428.

28. Zaid, M., Norazmi, N. & Abdul Rasid, A. R. (2020). Structural Equation Modelling Using AMOS: Confirmatory Factor Analysis for Taskload of Special Education Integration Program Teachers. *Universal Journal of Educational Research*, Vol 8 (Jan, 2020) No 1: 127-133. DOI: 10.13189/ujer.2020.080115.
29. Zaid, M., Norazmi, N. & Abdul Rasid, A. R., Badaruddin, I. (2021). Vocational College Teachers In Malaysia: Confirmatory Factor Analysis for Job Attitude. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(9), 5091 - 5098.
30. Zaid, M., Norazmi, N. & Abdul Rasid, A. R., Badaruddin, I. (2021). Vocational College Teachers In Malaysia: Emotional Intelligence. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(9), 5099 - 5106.
31. Zaid, M., Norazmi, N. & Abdul Rasid, A. R., Badaruddin, I. (2021). Organizational Commitment of Vocational College Teachers in Malaysia. *PalArch's Journal of Archaeology of Egypt / Egyptology*, 17(9), 5023-5029.