

# Computer Simulation Of Weirs In A Crest

Mohd Norazmi bin Nordin

*Cluster of Education and Social Sciences, Open University Malaysia*

**Abstract:** *This paper presents an experimental study to define the hydraulic characteristics of flow over square labyrinth weirs with semi-circle and sharp crest, by using range of experiments and compare their efficiency with conventional weirs (Suppressed rectangular weir) with same shape of crest, three different heights ( $p$ ) for each one of these weirs were used ( 25,20 and 15 ) cm for each of the above cases , seven different discharge were passed. The overall tests in this study were 84. Data obtained from laboratory and according to the result parameters from the dimensional analysis of the factors affecting on the flow over the labyrinth weirs, parameters were plotted, it was found that the labyrinth weirs gave better performance efficiency when compared to conventional weirs (Suppressed rectangular weir) for their passage and capacity high discharge. Also the results show that the coefficient of discharge ( $C_d$ ) with constant height of weir have a high value in low values of  $H/P$  and decrease gradually with increase this ratio , where gave the square labyrinth weirs with semi-circle the highest value of the discharge coefficient reached (2.55). In additional to shape of crest weir has great effect on ( $C_d$ ) and on performance efficiency, where the labyrinth weir with semi -circular crest gave high performance from sharp crest.*

## 1. INTRODUCTION

Through Labyrinth weirs, there is likely to be a significant increase in the discharge capacity of dams' spillways. Therefore, the weirs are worth considering during the implementation of regeneration projects because they tend to increase the capacity of flood inflows to various dams' reservoirs (Ahmad Shakani et al., 2021; Mohd Norazmi et al., 2021f; Mohd Norazmi et al., 2021g; Mohd Norazmi et al., 2021g; Mohd Norazmi et al., 2021i). It is also imperative to highlight that there is a direct relationship between the variables of the length of the crest and the discharge capacity of dams (Faiza et al., 2021; Mohd Norazmi et al., 2021j; Mohd Norazmi et al., 2021k; Mohd Norazmi et al., 2021l; Mohd Norazmi et al., 2021m). As such, different forms of labyrinth weirs have been developed with the aim of increase the length of the crest (Khasturi et al., 2021; Mohd Norazmi et al., 2021n; Mohd Norazmi et al., 2021o; Mohd Norazmi et al., 2021p; Mohd Norazmi et al., 2021q). Recently, a lot of scholarly attention has been drawn to the relationship between hydraulic parameters (and geometric parameters) on labyrinth weirs' hydraulic behavior. Specifically, a factor that has attracted the most attention entails the discharge capacity of the weirs. Hence, various investigations have strived to discern flow characteristics in different canals and rivers.

For example, Taylor [1] implemented an experimental framework on various labyrinth weir configurations. The aim of the study was to establish a relevant design that could improve system performance. Also, the study examined the relationship between the performance of the labyrinth weir and the attribute of nappe interference (Marziana et al., 2021; Mohd Norazmi et al., 2021r; Mohd Norazmi et al., 2021s; Wan Nor et al., 2021). Of importance to note further is that the moderating role of the vertical aspect ratio as that which dictates the existence of the effect of nappe was evaluated to discern whether or not it could play a

moderating role (Nur Hidayah et al., 2021; Mohd Norazmi et al., 2021a; Senin et al., 2021a; Senin et al., 2021b; Senin et al., 2021c). The ratio was developed in terms of a single labyrinth weir's width over the height ( $w/P$ ). In the findings, the study established that when the ratio is large, the effect of nappe interference tends to be minimized or eliminated. On the other hand, the study documented that an increase in the ratio causes the effect of nappe, an outcome that was documented further to affect the performance of labyrinth weirs.

In another study, Lx [2] examined the labyrinth weir's hydraulic performance based on site-specific frameworks, as well as flume system designs. The labyrinth weir's discharge equation was developed based on the aspects of experimentation and dimensional analysis (Nor Zanira et al., 2021; Mohd Norazmi et al., 2021b, Mohd Norazmi et al., 2021c, Mohd Norazmi et al., 2021d). The study also defined the discharge coefficient for trapezoidal and triangular arrangements in the quarter round and sharp-crested labyrinth weirs that were investigated. In a similar investigation, Cassidy et al. [3] focused on Boardman labyrinth spillway. In the results, it was reported that the performance of the system depended on the discharge coefficients that were calculated. In another investigation by Hay and Taylor (1970), the findings indicated that at high heads, the discharge capacity varied between 20% and 25%. It is also notable that Amanian [4] examined eight half-round triangular labyrinth weirs and eleven linear weirs in a selected channel. In the study, oblique labyrinth weirs were also considered and investigated accordingly. In the findings, the study indicated that with an increase in the HT value, there is likely to be a decrease in the labyrinth weirs' discharge efficiency. Factors that accounted for these results were documented to include nappe interference and submergence. Additional investigation was conducted by Nuri and Hayawi [5], who strived to unearth the flow behavior of long labyrinth weirs whose heights were 20cm, 15cm, and 10cm. In the findings, it was asserted that when the height is low and the angle is small, there is greater discharge and better performance.

In the study by Kocahan and Taylor [6], it was asserted that labyrinth weirs provide room for more discharge capacity or flow compared to regular ogee weirs, especially at the initial stages of flooding. Also, it was documented that factors of human intervention or mechanical equipment do not affect the behavior or performance of the weirs, suggesting a state of "passive control" (Zulfadli et al., 2021; Siti Saidatul et al., 2021; Een et al., 2021; Nazrah et al., 2021; Senin et al., 2021d). It was noted further that when  $Q$  is increased due to an increase in the length of the weir in a given spillway channel, with the labyrinth weir used to replace the linear weir, the resultant system tends to be efficient and economical and that it aids in avoiding the otherwise problematic step of increasing the width of the spillway channel (Salsuhaida et al., 2021; Siti Farhani et al., 2021; Salmiwati et al., 2021; Ahmad Shakani et al., 2021b; Mohd Norazmi et al., 2021t).

In the investigation by Emiroglu et al. [7], the aim was to examine labyrinth side weir performance and the impact of varying discharge curve coefficients on system performance. In a similar investigation, Crookston [8] focused on the behavior of labyrinth weirs in rehabilitation projects. In the findings, these studies avowed that when the length of the labyrinth weir is increased, the discharge efficiency increases significantly. With an elevation in the upstream pool, it was reported further that larger discharge tends to be produced by the labyrinth weirs, outperforming the linear weirs (Irfana et al., 2021). Also, the study by Bilhan et al. [9] sought to examine the behavior of sharp-crested trapezoidal labyrinth weirs, with an analysis technique and hydraulic design achieved based on 21 physical frameworks that were developed and implemented. In another investigation by Anderson and Tullis [10] laboratory-scale physical frameworks were used for the purpose of comparing the Piano Key weir

design's hydraulic efficiency with the efficiency of a geometrically identical labyrinth weir without and with sloping floors that were installed in the outlet and inlet keys. From the results, it was established that the Piano Key labyrinth weir exhibits superior performance because it is more efficient compared to the case of the rectangular labyrinth weir. Indeed, the outcomes could be attributed to reduced loss at the entrance for the case of the Piano Key weirs. In this study, the main aim lies in the evaluation of different flow behaviors for labyrinth weirs. Particularly, the experimental study focuses on various crucial parameters deemed to play a moderating role in shaping those behaviors.

## 2. METHODOLOGY

The relationship between the actual discharge ( $Q_{act}$ ) and the ratio ( $H/P$ ) was plotted. It is apparent from the results in Figs. (9-15). The shape of this relationship is directly proportional if the height is stabilized and the weir type is changed or vice versa, and for any value to ratio ( $H/P$ ) noted that discharge capacity for the square labyrinth weirs with semi-circular or sharp crest is higher than the Suppressed rectangular weirs (the value of the discharge coefficient ( $C_d$ ) is high in the low ratios of ( $H/P$ ) for all models and gradually decrease with increasing the ratio ( $H/P$ ), where the model of the square labyrinth weir with semi-circular crest gave the highest value of the discharge coefficient reached (2.55), while the discharge coefficient reached its lowest value reached (0.719) for conventional weirs with sharp crest. This indicates that the ratio ( $H/P$ ) is affected by the type of weir and shape of the crest that would influence the behavior and results in curves shown, while noticed that ( $Q_{act}$ ) inversely proportional to ( $C_d$ ) in Figs. (16-18) where the value of the coefficient is high when the low discharge and gradually decrease as the discharge increases, this is due to the fact that in the case of a few discharges there is a smooth flow of water that is good.

## 3. RESULTS AND DISCUSSION

The dimensional analysis is a function of many variables involved in the calculation of the discharge passing over the studied weirs.

As notes that represents the number of Reynolds ( $Re$ ), that its effect on flow can be neglected only at very few depths above the weir (Boss, 1989) [12]

After neglecting Reynold 's number, the equation above will be as follow:

Experimental tests were carried out in a horizontal and rectangular laboratory channel in the field of environmental engineering, Tikrit University. The dimensions of this channel are 6m length, 30 cm width and 40cm height. This channel is equipped with water by a hydraulic pump, the maximum discharge of this pump is 22l/s and controlled by a valve which can be changed according to the required discharge.

All experiments were carried out on square labyrinth weirs models from the upper perspective having semi-circular and sharp crest, in addition to conventional weirs (Suppressed rectangular weir models) having same shape of the crest of the labyrinth weirs models (for comparison purposes). Figs. (1-4) shows samples of weirs used in this study before and after test. For each model, three different heights ( $p=15, 20$  and  $25\text{cm}$ ) were used. All models were made by using fiberglass with thickness 1 cm, the head over the weir models was measured by using a point gauge.

The study models of weirs were performed by separated it with two groups, has been used (84) discharges by seven runs for each of the twelve models. The discharge of the channel

was measured by using a standard triangle weir, which was fixed at the end of the channel as shown in Fig. (5). This weir was made by 1cm thickness plastic material plate.



Standard triangle weir

$$Q_{sw} = 0.0132 (H_w)^{2.5622} \dots\dots\dots (6)$$

Where  $Q_{sw}$  is the discharge over a Standard triangle weir (L/s) and  $H_w$  is the water depth above the Standard triangle weir (cm)

The discharge coefficient  $C_d$  can be calculated as follows:

$$C_d = \frac{Q_{(act.)}}{Q_{(theo.)}} \dots\dots\dots (7)$$

The relationship between the actual discharge ( $Q_{act}$ ) and the ratio ( $H/P$ ) was plotted. It is apparent from the results in Figs. (9-15). The shape of this relationship is directly proportional if the height is stabilized and the weir type is changed or vice versa, and for any value to ratio ( $H/P$ ) noted that discharge capacity for the square labyrinth weirs with semi-circular or sharp crest is higher than the Suppressed rectangular weirs (the value of the discharge coefficient ( $C_d$ ) is high in the low ratios of ( $H/P$ ) for all models and gradually decrease with increasing the ratio ( $H/P$ ), where the model of the square labyrinth weir with semi-circular crest gave the highest value of the discharge coefficient reached (2.55), while the discharge coefficient reached its lowest value reached (0.719) for conventional weirs with sharp crest. This indicates that the ratio ( $H/P$ ) is affected by the type of weir and shape of the crest that would influence the behavior and results in curves shown, while noticed that ( $Q_{act}$ ) inversely proportional to ( $C_d$ ) in Figs. (16-18) where the value of the coefficient is high when the low discharge and gradually decrease as the discharge increases, this is due to the fact that in the case of a few discharges there is a smooth flow of water that is good.

#### 4. CONCLUSION

Referring to the figures the findings, the performance of weirs was documented. For the comparison of square labyrinth weirs performance with hydraulic performance of Suppressed rectangular weirs variation of ( $Q_L/Q_C$ ) with  $H/p$  was considered.

#### 5. REFERENCES

[1]. Ahmad Shakani Abdullah, Salwati Su@Hassan, Nurashikin Nazer Mohamed, Syukriani Yulia, Mohd Norazmi bin Nordin, Nasihah Naimat, Salmiwati Othman (2021). Women

- and Leadership: Ability and Qualification. LINGUISTICA ANTVERPIENSIA, 2021 Issue-2: 2782-2787
- [2]. Ahmad Shakani bin Abdullah, Mohammad Halim bin Jeinie, Mohd Norazmi bin Nordin, Shiveh Sivalingam, Fazlinah binti Mohd (2021). Political Leadership Desired By The People: A Brief Study Among Teachers In Johor, Malaysia. Turkish Journal of Physiotherapy and Rehabilitation; 32(3): 4712-4716
- [3]. B. Noori, And G. Hayawi, "Hydraulic Characteristics of Flow Over Semicircular Sharp-Crested Weirs", Journal of Diraset for Engineering Science, Vol.23, No.1, 1996, P.P. 37-46, 1996
- [4]. B.M. Crookston, and B. Tullis, "Hydraulic performance of labyrinth weirs," Proc. of the Int. Junior Researcher and Engineer Workshop on Hydraulic Structures (IJREWHS '10). Edinburgh, U.K, 2010
- [5]. Een Nurhasanah, Andrie Chaerul, Uah Maspuroh, Dian Hartati, Farah Adibah Ibrahim, Saadiyah Kaspin, Mohd Norazmi Nordin (2021). Online Learning of Indonesian Drama Appreciation Course Adaptation to the COVID 19 Period. LINGUISTICA ANTVERPIENSIA, 2021 Issue-2: 2572-2797
- [6]. F. Lux, "Discharge characteristics of labyrinth weirs," Proc. of Conference on Water for Resources Development, ASCE, Courd'Alene, ID, 1984
- [7]. Faiza Iqbal, Senin M.S, Mohd Norazmi bin Nordin, Muhammad Hasyim (2021). A Qualitative Study: Impact of Bullying on Children with Special Needs. LINGUISTICA ANTVERPIENSIA, 2021, Issue 2: 1639-1643.
- [8]. G. Taylor, "The Performance of Labyrinth Weirs", PhD Thesis, University of Nottingham, UK, 1970
- [9]. H. Kocahan, and G. Taylor, "Rehabilitation of Black Rock Dam seepage & inadequate spillway", Hydroplus, Inc., Arlington, Va, 2002
- [10]. Irfana K. A., Jamilah A., Nurul Ain A. J., Nur Aimi N. M., Noor Ezlin A. B., Mohd. Reza A., Mohd. Norazmi Bin Nordin (2021). Composting of Food Wastes by Using Black Soldier Fly Larvae. LINGUISTICA ANTVERPIENSIA, 2021 Issue-2: 3435 – 3449.
- [11]. J. Cassidy., C. Gardner, and R. Peacock, "Boardman labyrinth – crest spillway", J. Hydraul. Eng., 111(3), 398-416, 1985
- [12]. Khasturi Ramalingam, Mohd Norazmi bin Nordin, Siti Nor Haslinda Megat Hasan, So'bah binti Ahmad, Mazira Mohd Zain (2021). The Effects Of The Use Of Technology In Primary School Classrooms. Turkish Journal of Physiotherapy and Rehabilitation; 32(3): 4844-4853
- [13]. M. G. Bos, "Discharge Measurement Structures", third end, International Institute for Land Reclamation and Improvement, Wageningen, 1989
- [14]. M.E. Emiroglu, N. Kaya, and H. Agaccioglu, "Discharge Capacity of Labyrinth Side Weir Located On a Straight Channel", Journal of Irrigation and Drainage Engineering (ASCE), 136, 37-46, 2010
- [15]. Marziana Binti Abd. Malib, Ruzian Binti Markom, Mohd Norazmi Bin Nordin, Mimi Sofiah Binti Ahmad Mustafa, Mohd Izzat Amsyar Bin Mohd Arif (2021). The Role Of The State Islamic Religious Council (SIRC) In Strengthening Thewaqf Management In Malaysia: An Overview And Recommendations. Turkish Journal of Physiotherapy and Rehabilitation; 32(3): 4871-4880
- [16]. Mohd Norazmi bin Nordin, Ainaatul Fathiyah Abdul Rahim, Norathirah Nabila binti Abd Mutalib, Norzilawati Zainal Abidin, Rehaq binti Ismail (2021a). A Comparative Analysis Of International Frameworks For 21st Century Competences: Implication For

- National Curriculum Policies. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4912-4919.
- [17]. Mohd Norazmi bin Nordin, Albert Feisal@Muhd Feisal bin Ismail, Pg Ahmad Hasanuddin Pg Tejudin, Saadiah Kaspin, Hadiati Fitri, Ahmad Tarmizi bin Md Nor (2021b). The External Characteristic Features Of The Special Education Leader. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4657-4661.
- [18]. Mohd Norazmi bin Nordin, Amutha A/P Anathuri, Syahiru Shafiai, S. Johari, Mohd Ab Malek Md Shah (2021c). Review Of The Theories Of Leadership Practice In Special Education Scene. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4830-4835
- [19]. Mohd Norazmi bin Nordin, Elia binti Md Zain, Nor Zanira Abd Manan, Ahmad Faqih Ibrahim, Syahrul N. Junaini (2021d). Implications f 21<sup>st</sup> Century Competencies On Teaching, Learning And Assessment Through ICT. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4779-4785
- [20]. Mohd Norazmi bin Nordin, Hilmiah binti Haji Hassan, Masita binti Hj Ismail, Norkhafizah binti Yussuf, Mohd Hilmi bin Ahmad (2021e). Effectiveness Of Counseling In Schools: Malaysia Setting. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4677-4681
- [21]. Mohd Norazmi bin Nordin, Intan Suraya Noor Arzahan, Norkhafizah binti Yussuf, Albert Feisal@Muhd Feisal bin Ismail, Sharifah Fazirah Syed Ahmad (2021f). Student Changes In The Implementation Of Guidance And Counseling In Schools, *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4673-4676
- [22]. Mohd Norazmi bin Nordin, Izzat Fadhli Bin Hamdan, Ekmil Krisnawati Erlen Joni, Nor Zanira binti Abd Manan, Nor Adila binti Mohd Noor (2021g). Leading Special Education Is Not An Easy Job: Expressions Of Headmasters And Principals. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4717-4722
- [23]. Mohd Norazmi bin Nordin, Kavita Vellu, Intan Suraya Bt Noor Arzahan, Ahmad Faqih Ibrahim, Syahrul Anuar Ali, Salwati binti Su@Hassan (2021h). Politics And Education: Why Don't We Lead And Create Leadership? *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4723-4726
- [24]. Mohd Norazmi bin Nordin, Marziana Abd Malib, Mohd Izyan Zuhaili Zainudin, Muhd Zulhilmi Haron, Zurani Buang (2021i). 21<sup>st</sup> Century Curriculum Development In Malaysia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4786-4791
- [25]. Mohd Norazmi bin Nordin, Mohammad Fikri Sharbini, Muhammad Talhah Ajmain@Jima'ain, Pg Ahmad Hasanuddin PgTejudin, Nor Diana Mohd Idris, Muhd Zulhilmi bin Haron, Elia binti Md Zain, Aslindawati Abdullah (2021j). Education Performance Test in Malaysia. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2539-2545
- [26]. Mohd Norazmi bin Nordin, Mohd Ali Masyhum, Anis Norma Mohamad Jaafar, Shiveh Sivalingam, Sharifah Fazirah Syed Ahmad (2021k). The Concept Of Research Of Educational Leadership Practice In Malaysia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4824-4829
- [27]. Mohd Norazmi bin Nordin, Mohd Hilmi bin Ahmad, Nor Adila binti Mohd Noor, Norathirah Nabila binti Abd Mutalib, Asbullah bin Sidek (2021l). Teacher Education In Malaysia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4810-4816
- [28]. Mohd Norazmi bin Nordin, Nor Fauziyana binti Mosbiran, Noor Maimun Abdul Wahab, Siti Aida Shari, Nadia Anuar (2021m). Factors Affecting The Use Of Technology In Special Education Classrooms. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4836-4843

- [29]. Mohd Norazmi bin Nordin, Nor Idayu binti Ibrahim, Amirah Hazimah Borhanordin, Wan Ismail Abd Halim, Mohamad Zaid Mustafa (2021n). Teacher Education In Australia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4804-4809
- [30]. Mohd Norazmi Bin Nordin, Pg Ahmad Hasanuddin Pg Tejudin, Nor Adila binti Mohd Noor, Senin M.S, Juereanor binti Mat Jusoh (2021p). Application Of Theory In The Process Of Guidance And Counseling In Schools. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4667-4672
- [31]. Mohd Norazmi bin Nordin, Pg Ahmad Hasanuddin Pg Tejudin, Nor Fauziyana binti Mosbiran, Senin M.S, Ardzulyna binti Anal (2021q). Special For Special Education: Its Unique Leadership Theory 2020. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4662-4666
- [32]. Mohd Norazmi bin Nordin, Salwati binti Su@Hassan, Mohd Izyan Zuhaili bin Zainudin, Mazida binti Mohd Desa, Mohd Rafi bin Yaacob (2021r). What Is Superior Leadership? Teachers And School Staff Provide Answers. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4733-4738
- [33]. Mohd Norazmi bin Nordin, Senin M.S, Ardzulyna binti Anal, Aidah Alias, Siti Noor Aneeis bt Hashim (2021s). The Effect Of Using Malaysian Sign Language In The Construction Of Proper Malay Sentence Structure: A Case Study Of Year 5 Students With Hearing Problems In Batu Pahat. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4691-4700
- [34]. Mohd Norazmi bin Nordin, Siti 'Afiat Jalil, Mohammad Fikri Sharbini, S. Johari, Siti Noor Aneeis Hashim, Sharifah Fazirah Syed Ahmad, Sharifah Nurshahida Syed Ahmad (2021t). Teacher Characteristics that are in Line with Students Cognitive Learning Styles. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2734-2345
- [35]. Mohd Norazmi bin Nordin, Syukriani Yulia, Nor Fauziyana Mosbiran, Sharifah Fazirah Syed Ahmad, Syarifah Norsollehatun Syed Mohamad Kher (2021u). Special Education Requires Leadership Or Conversely. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4727-4732
- [36]. Mohd Norazmi bin Nordin, Zulfadli Mohd Saad, Intan Suraya Noor Arzahan, S. Johari, Kavita Vellu, Santibuana Abd Rahman, Siti Noor Aneeis Hashim (2021v). Cognitive Learning and Its Relationship with Student Academic Achievement. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2719-2733
- [37]. Mohd Norazmi Nordin, Mohd IzyanZuhaili Zainudin, Nasaie Zainuddin, Muhammad Hisyam Zakaria, Norzilawati Zainal Abidi (2021w). Analysis of Teacher Education Contradictions In Malaysia And Australia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4817-4823
- [38]. Mohd Norazmi Nordin, Navaratnam Vejaratnam, Norathirah Nabilah Abd Mutalib, Syahiru Shafiai, Nor Shadira Jamaluddin, S. Johari, Jumiah Mustafa (2021x). Stimulating Self -Confidence of Special Education Students. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2687-2696.
- [39]. Mohd Norazmi Nordin, Norathirah Nabilah Abd Mutalib, Elia Md Zain, Amirah Hazimah Borhanordin, Maymunah Ismail, Syaiful Osman, Mansur Ahmad (2021y). Preparation of Daily Lesson Plan for Enhancing Self Esteem Teaching Strategy for Special Education Students. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2708-2718
- [40]. N. Amanian, and D.Waldron, "Design of labyrinth weir spillways. *J. Hydraulic*", Eng., ASCE, 121(3), 247–255, 1995
- [41]. Nazrah Binti Jamaludin, Eng Hock Kway, Rohaizat Ibrahim, Siti Noor Aneeis bt Hashim, Harlina binti Ismail, Senin M.S, Ashari Ismail, Mohd Norazmi bin Nordin

- (2021). Understanding the Social Interactions of Students with Special Educational Needs in Inclusive Education at Secondary Schools. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2675-2686
- [42]. Nor Zanira Abd Manan, Hafizul Fahri Hanafi, Sanura Jaya, Mohd Norazmi Nordin, Intan Maizura Abd Rashid (2021). Challenges Of Using Technology In Learning In Special Education Classrooms. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4854-4865
- [43]. Nurhidayah Yaakop, Mohd Norazmi Nordin, Helvinder Kaur a/p Balbir Singh, Nor Fauziyana Mosbiran, Noorasyikin Mohd Noh (2021). Non-Directive Teaching: A Review. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4866-4870
- [44]. O. Bilhan, M.E. Emiroglu, and O. Kisi, "Use of Artificial Neural Networks for Prediction of Discharge Coefficient of Triangular Labyrinth Side Weir in Curved Channels", *Journal of Advances in Engineering Software*, 42, 208-214, 2010
- [45]. P. K. Swamee, "Generalized Rectangular Weir Equations", *Journal of Hydraulic Engineering*, Vol. 114, No. 8, August, ©ASCE, 1988
- [46]. R. M. Anderson, and B. P. Tullis, "Comparison of Piano Key and Rectangular Labyrinth Weir Hydraulics", *J. Hydraul. Eng.* 138:358-361, 2012
- [47]. Salmiwati Othman, Mohd Norazmi bin Nordin, Siti Azura Bahadin, Halimatun Sa'adiyah Abdul Jalil, Masita Hj Ismail, Hadiati Fitri, Shaharulliza Saharudin (2021). Women Leadership and Its Superior Effect to Organisation. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2775-2781
- [48]. Salsuhaida Sulaiman, Mohd Norazmi bin Nordin, Nor Zanira Abd Manan, Norfatiha Othman, Abdul Rahman Abdul Latip, Zaleha Arshad, Mohd Arafat Jaafar (2021). Field Dependence and Field Independence Learning Styles Special Needs Students: Identifying, Planning Activities and Evaluating Effectiveness. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2746-2762
- [49]. Senin M.S, Mohd Norazmi bin Nordin, Fatin Razak, Robaisya binti Rahmat, Muhd Zulhilmi bin Haron (2021a). The Review Of Adedeji Tella Research Of The Impact Of Motivation On Student's Academic Achievement And Learning Outcomes In Mathematics Among Secondary School Students In Nigeria. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4682-4690
- [50]. Senin M.S, Mohd Norazmi bin Nordin, Norathirah Nabila Abd Mutalib, Intan Maizura Abd Rashid, Mohamad Zaid Mustafa, Abdul Rasid Abdul Razzaq, Badarudin Ibrahim (2021b). Teaching Similarities and Differences between Non Directive Teaching and Enhancing Self Esteem of Special Education Students. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2697-2707
- [51]. Senin M.S, Mohd Norazmi bin Nordin, Norazura Said, Mastura Roni, Zuriani Yaacob (2021c). Asia Tigers In Pisa: Comparative Education. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4792-4796
- [52]. Senin M.S, Mohd Norazmi bin Nordin, Norzilawati Zainal Abidin, Ahmad Fauzi, Mastura Roni (2021d). Teacher Education: Issues and Considerations Between Malaysia And Australia. *Turkish Journal of Physiotherapy and Rehabilitation*; 32(3): 4797-4803
- [53]. Siti Farhani Mohd Ali, Ahmad Jalaluddin Al-IslamiMoh Shin, Quah Wei Boon, Senin M. S, Mohd Norazmi bin Nordin, Ashari Ismail, Nor Azlina Mohd Noor (2021). Meta Analysis for Google Translate Related Studies on Error Analysis in Malaysia. *LINGUISTICA ANTVERPIENSIA*, 2021 Issue-2: 2763-2774
- [54]. Siti Saidatul Azween ISMAIL, Zulfadli Mohd Saad, Nurul Shahadahtul Afizah Asman, Ripen J., Senin M.S5, Quah, Mohd Norazmi Nordin (2021). Difference Hysteresis



- Result between Filter Paper Method and Pressure Plate on Laterite Soil in Engineering.  
LINGUISTICA ANTVERPIENSIA, 2021 Issue-2: 2555-2571
- [55]. Wan Nor Faezah binti Wan Mustaffa, Adi Irfan bin Che Ani, Nur Khairul Faizah binti Mustafa, AM Hakim, Norazmi bin Nordin (2021). The 100 Top Cited Studies In Post Occupancy Evaluation (Poe): Trend Setting Analysis Using Bibliometric Citation Approach, Turkish Journal of Physiotherapy and Rehabilitation; 32(3): 4757-4769
- [56]. Zulfadli Mohd Saad, Navaratnam Vejaratnam, Mohd Norazmi bin Nordin, Yusmi Mohd Yunus, Noorsuraya Mohd Mokhtar, Junaidah Yusof, Senin M.S (2021). Case Study: Implementation of Education Performance Test for Year 3 in Batu Pahat. LINGUISTICA ANTVERPIENSIA, 2021 Issue-2: 2546-2554