

The Use of Quantum Learning Styles: A Research Design Approach to Improve Student Skills and Conceptual Understanding of the Basic Movement of Football

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Learning strategies are methods used by teachers to enable students to embed knowledge. The purpose of this study is to determine the effect of the composition of TANDUR learning strategies in increasing and understanding the concepts and movement skills of student learning styles. Research subjects comprise Grade X students of SMA Negeri 7 and 8 of the city of Kediri. The sample is determined using cluster random sampling techniques with two experimental and control group classes respectively. The instrument utilized consists of questionnaires, conceptual understanding, test questions, and movement skill tests. The results showed: 1) differences in understanding the skills between students using quantum and direct learning strategies 2) differences using visual, auditory, and kinaesthetic learning styles; 3) interaction between learning strategies and methods towards conceptual understanding, and 4) the learning strategies on movement skills. In conclusion, the composition of TANDUR learning strategy has a significant effect on understanding the concepts and movement skills in terms of learning styles.

Key words: *Learning strategies, the composition of TANDUR, quantum, direct, conceptual understanding, movement skills, football.*

Introduction

The study of conceptual understanding has been carried out in the last decade, with teachers finding it difficult to master its usage (Mansor, Halim, & Osman, 2010). However, the existence of problems in improving it has been proven by the profound understanding of elementary school students in math, especially infraction (Pujiati, Kanzunudin, & Wanabuliandari, 2018). Only 41% of students were capable of restating a concept with 33.42% presenting it in various forms of mathematical representation. Furthermore, those able to understand the idea were able to construct meaning and express it in a completely different form (Anintia, Sadhu, & Annisa, 2017).

Physical education (PE) is a subject that involves components to improve health, growth, and development of children, in accordance with their movements, processes, psychological phenomena, and as pleasant socialization (Dacica, 2015). This means that PE affects biology and movement and consequently student psychological and social skills connected with the concept of balanced, integrated personality development. A coherent PE curriculum allows students to acquire systematic and valuable learning experiences.

Football is one of the most interesting physical education methods learned through procedural and conceptual materials (Junge & Dvorak, 2004; and Ariyanto, 2014) and observation results show that teachers used a direct learning method in teaching football. The use of this method in physical education is appropriate because it is in accordance with the characteristics of the material. However, using this same teaching strategy or method for a long time can become less effective and students are prone to boredom if variety of instruction is lacking.

The low participation level of students in physical education activities is indicated by the poor quality of learning in schools (Panganiban, 2019). Teachers should be able to use varied methods that are consistent with current global innovation in the teaching and learning field (Hanief & Sugito, 2015; Wirnantika, Pratama, & Hanief, 2017). This means that all devices in the education system play a role and are factors in the functioning of a successful education system (Nurdyansyah, Rais, & Aini, 2017).

Quantum learning is carried out by teachers by providing backgrounds and strategies to increase student interest through motivation and appropriate methods. The teacher also advises the students to carry out a variety of positive activities according to their level of intelligence (Harmono, 2017). Student achievement is improved by combining quantum learning with other methods (De Porter & Hernacki, 2010) to significantly improve student achievement (Saleh, 2012; Sujarwanta, 2013; Bahaddin & Yusuf, 2014).

Learning styles plays an important role in process teaching and understanding activities (Wahyuni, 2017; Magdalena et al., 2014; Rahardianti, 2012 and Agistya, 2012). A learning style refers to the methods utilized by students to receive and process information (Tsingos, Bosnic-Anticevich, & Smith, 2015). Mintarti (2016) and Khoeron, Sumarna, & Permana (2014) concluded that learning styles influence student achievement.

In addition, Naserieh & Anani Sarab 2013 defined learning style as a method by which students are able to understand information. Interestingly, some people consider learning styles as hard-to-change-characteristics (Biggs & Tang, 2011), while others consider them as conditions determined by the environment. According to Hamzah (2008), there are several types of learning styles that can be learned and used including visual, auditory, and kinaesthetic (VAK). Visual learners rely on the sense of sight in getting information as students tend to imagine what is being said. Auditory learners rely on the sense of hearing in receiving information, while kinaesthetic learners use the sense of touch to recall particular information (Khoeron et al., 2014).

Previous findings indicate that learning styles influence (Magdalena et al., 2014 and Ahmad, 2018) and improve Sudarman & Vahlia (2016); Simak (2012) and Astuti, Masykur, & Pratiwi (2018) conceptual understanding. However, the influence of learning styles and strategies on movement skills is unknown, learning and teaching strategies have been found to influence learning outcomes (Tsingos et al., 2015).. Therefore, student learning styles and teaching strategies in the context of conceptual understanding need to be conducted. Hence, the purpose of this study is to determine the effect of the composition of TANDUR learning strategies in increasing and understanding the concepts and movement skills of student learning styles. SMA Negeri 7 and 8 in Kediri were used as the research locations, both are accredited "A" National Standard Schools/*Sekolah Standar Nasional* (SSN) where students have made significant achievement in the field of sports.

The results of this study are expected to contribute to the development of science using football basic movement skill as the variable on a broader perspective. Furthermore, students learning style and strategies are influenced by achievement. Therefore, this research was conducted to determine the effect of learning styles and approaches on conceptual understanding and movement skills.

Methodology

This is a quasi-experimental study which utilized a pre-test/post-test nonequivalent factorial control group design. The 2x3 factorial experimental designs above show the two dimensions of the learning model variable, known as quantum and direct. Conversely, the dimensions of learning style consist of visual, auditory, and kinaesthetic. The sample was determined using a

random cluster technique by selecting two classes each from SMA Negeri 7 and 8 with a total population of 137 students. Learning style variables were measured using questionnaires, while multiple-choice and practice tests were used to measure the conceptual understanding, with the basic football movement skills measured by two experts (B. DePorter & Hernacki, 2007).

Results

The mean of conceptual understanding value and football skills are 8.83 and 24.42, respectively as presented in Figure 1 below.

Figure 1. The mean of conceptual understanding and basic football skills in terms of learning styles

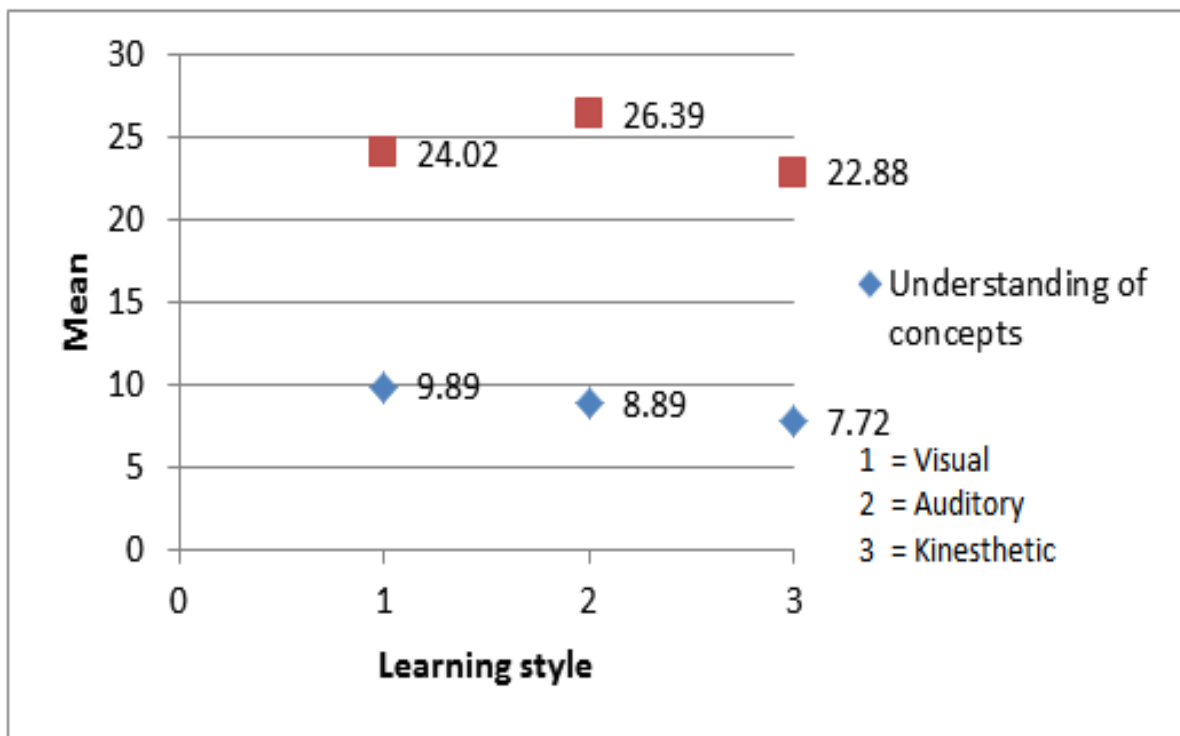


Table 1: Post Hoc test results

	(I) Learning styles	(J) Learning styles	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Bonferroni	Auditory	Visual	1.007	.742	.531	-.79	2.81
		Kinaesthetic	2.174*	.738	.011	.39	3.96
	Visual	Auditory	-1.007	.742	.531	-2.81	.79
		Kinaesthetic	1.167	.742	.355	-.63	2.97
	Kinaesthetic	Auditory	-2.174*	.738	.011	-3.96	-.39
Visual		-1.167	.742	.355	-2.97	.63	

Source: processed data

Table 1 above shows the different mean pairs in auditory-Kinaesthetic. The mean difference group is seen from the following Homogeneous Subset output presented in Table 2:

Table 2: Post Hoc test results

	Learning styles	N	Subset for alpha = 0.05	
			1	2
Duncan ^{a,b}	Kinaesthetic	46	7.50	
	Visual	45	8.67	8.67
	Auditory	46		9.67
	Sig.		.118	.176

Table 2 above shows the lowest Conceptual understanding in the Kinaesthetic group, with 7.50 and the highest in the auditory with 9.67.

Table 3: Descriptive learning style towards movement skills

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Auditory	46	24.021	5.83282	.8600	22.289	25.7539	12.50	35.00
Visual	45	26.388	6.49641	.9684	24.437	28.3406	5.00	40.00
Kinaesthetic	46	22.880	6.07745	.8960	21.075	24.6852	7.50	35.00
Total	137	24.416	6.26662	.53539	23.3573	25.4748	5.00	40.00

Table 3 above presents the mean value of: auditory learning styles, 24.02; visual 26.39 and Kinaesthetic 22.88. These results indicate that visual learning styles have the greatest influence on movement skills.

The results of the analysis obtained from the effect of learning strategies and styles on conceptual understanding and movement skills are shown in the output table of the tests between-subjects effects as follows in Table 4:

Table 4: Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Conceptual understanding	296.180 ^a	5	59.236	5.207	.000
	Football basic movement skills	795.688 ^b	5	159.138	4.587	.001
Intercept	Conceptual understanding	10130.050	1	10130.050	890.440	.000
	Football basic movement skills	81672.099	1	81672.099	2353.975	.000
Learning_styles	Conceptual understanding	108.743	2	54.371	4.779	.010
	Football basic movement skills	284.918	2	142.459	4.106	.019
Learning_methods	Conceptual understanding	62.446	1	62.446	5.489	.021
	Football basic movement skills	432.094	1	432.094	12.454	.001
Learning_styles * Learning_methods	Conceptual understanding	126.394	2	63.197	5.555	.005
	Football basic movement skills	71.663	2	35.832	1.033	.359
Error	Conceptual understanding	1490.316	131	11.376		
	Football basic movement skills	4545.096	131	34.695		
Total	Conceptual understanding	11950.000	137			
	Football basic movement skills	87012.500	137			
Corrected Total	Conceptual understanding	1786.496	136			
	Football basic movement skills	5340.785	136			

Table 4 above shows the significance of the interaction between learning styles and methods on conceptual understanding is 0.005 (H_0 is rejected because of the Sig. < 0.05). It is concluded that learning strategies and styles influence conceptual understanding. The interaction graph is shown in the following Figure 2:

Figure 2. The interaction between learning styles and methods on conceptual understanding

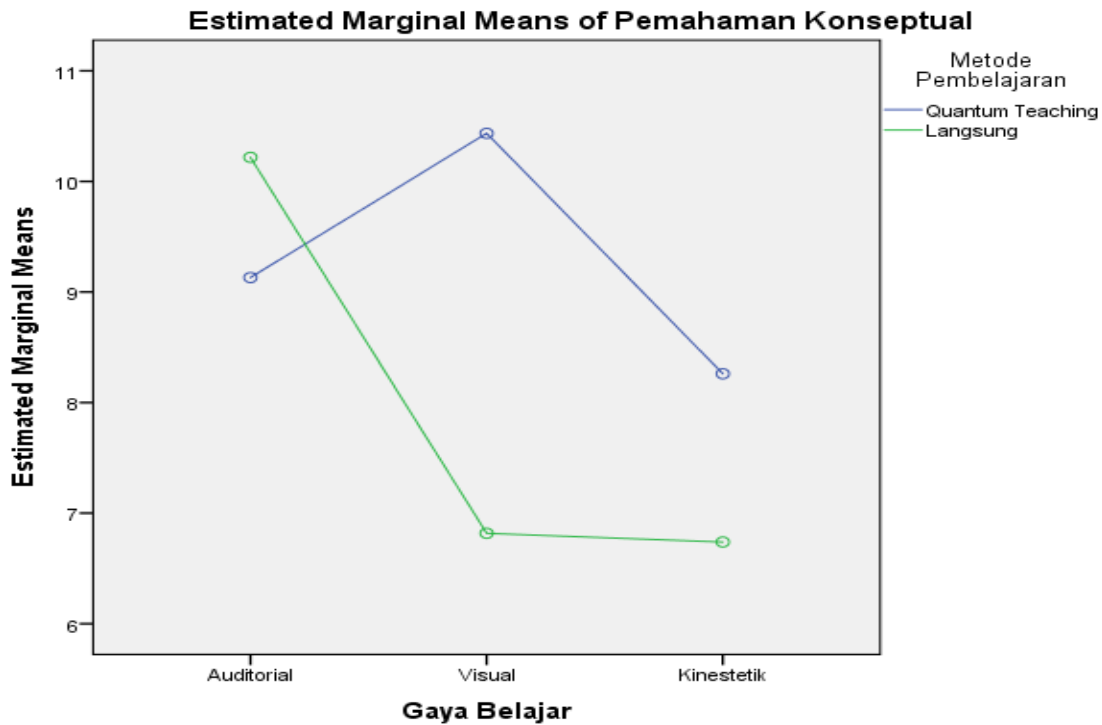
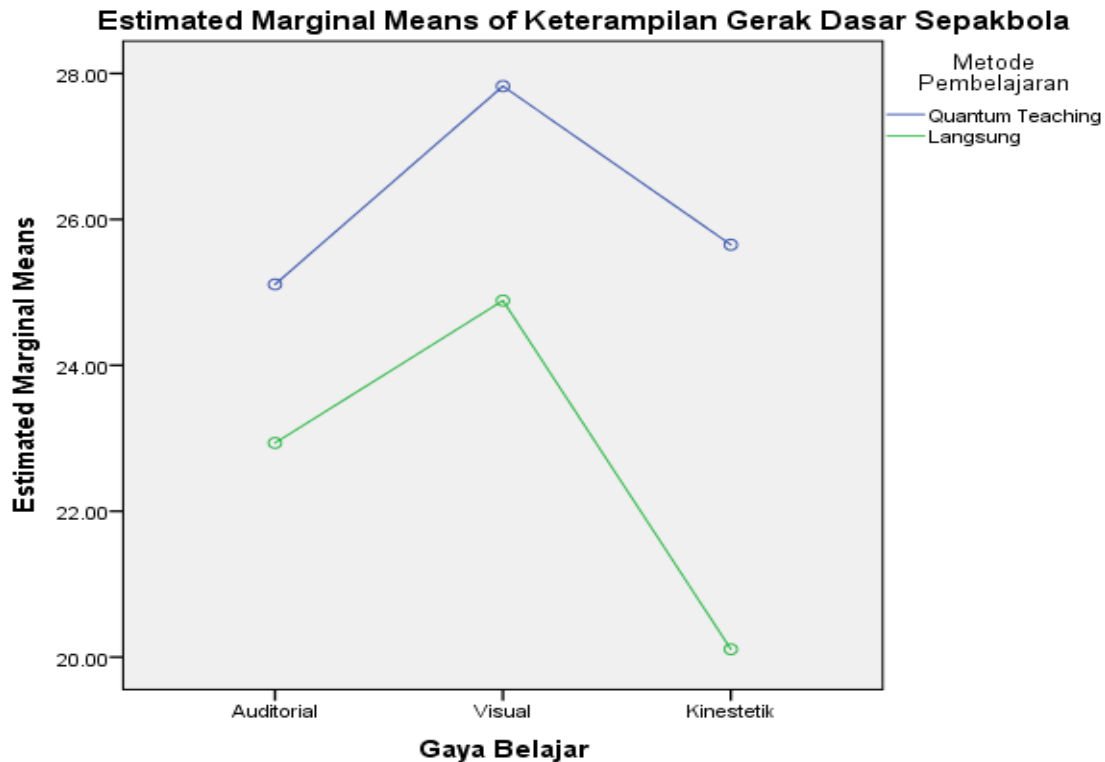


Table 4 also shows the Sig. from the interaction between learning styles and method on football is 0.359 (H_0 is accepted because of the Sig. > 0.05). It is concluded that there is no interaction between learning strategies and styles on movement skills. The interaction graph is shown in the following Figure 3:

Figure 3. The interaction between learning styles and the learning method on football basic movement skills



Discussion

This study tested the effect of the composition of TANDUR on improving conceptual understanding and movement skills in terms of student learning styles. Before analysis, the validity of the instrument was tested using 20 multiple choice questions regarding conceptual understanding and its competent validators. In addition, the adopted learning styles test questions from Bobbi DePorter (2000) were also used to determine student learning styles.

The Effect of Learning Strategy on Conceptual Understanding

The results of data analysis indicate that there are differences in movement skills between those that received quantum and direct learning. The movement skills mean value of the quantum group is 26.20, while the direct is 22.61.

In connection with the influence of learning strategies on student conceptual understanding, quantum learning strategies change the student knowledge from misconception to scientific understanding (Clayton, Blumberg, & Auld, 2010). The results of this study prove that quantum

learning strategies as opposed to direct learning strategies, have a significant effect on conceptual understanding,

The results of this study are also in line with the study conducted by Oktarina, Ismail, & Nery (2017) who found that the use of quantum in teaching tenth-grade students of SMA Ethika Palembang had a significant effect on their mathematics conceptual understanding. Astuti (2018) also found that the TANDUR learning model increased student conceptual understanding. Further, Kalsum & Fadhila (2018) also stated that the use of quantum learning methods in physics affected student outcomes. According to Sudarman & Vahlia (2016), the use of Quantum Learning learning methods in math had a significant effect on student conceptual understanding of Muhammadiyah Metro University. Yahya (2017) also showed that its use in biology had a substantial impact on student learning outcomes.

The Effect of Learning Strategies on Movement Skills

The skills in organizing movement are a result of the learning process with changes in movement skills, an indication of the learning process (Sriwahyuniwati, 2017). Therefore, movement skills are not only influenced by maturity factors but by the learning process (Sriwahyuniwati, 2017).

The necessary movement skills of football consist of passing, kicking, controlling, heading, and throwing. In the experimental group, the increase in skill movement was carried out using quantum learning strategies with the TANDUR framework. TANDUR (Growing/*Tumbuh*, Natural/*Alami*, Name/*Namai*, Demonstration/*Demonstrasi*, Repetition/*Ulangi*, and Celebration/*Rayakan*) is a quantum teaching-learning framework. The stages provide more experience, and students develop the given material independently through application of the TANDUR framework; they easily express their opinions and master theoretical and practical material.

Direct learning strategy uses the teacher as the main medium, while the quantum strategy makes use of students. Direct instruction has long been considered an appropriate teaching method by making teachers the learning centre and thereby limiting student activities. (Nova Southeastern University. School of Social and Systemic Studies, 1990). The direct learning model covers broader material within a more efficient timeframe. This method allows students to ascertain the learning objectives clearly to facilitate them in mastering the concept (Nuraini, 2018).

This study shows the difference in movement skills between students that received quantum and direct learning. The results are consistent with the study conducted by Astuti (2018),

Kalsum & Fadhila (2018), and Hirdaus, Atiq, & Supriatna (2014) in that the quantum learning strategy was found to help students to develop their basic movement skills.

The Effect of Learning Styles on Conceptual Understanding

The results of the study show that there is a different conceptual understanding among students dependent upon their preference of visual, auditory, and kinaesthetic learning styles. The auditory group has a better conceptual understanding than the kinaesthetic and visual groups. These findings are consistent with the study conducted by Hariadi & Hariadi (2015), which showed that students with auditory learning styles obtained better outcomes compared to those with visual and kinaesthetic preferences. This shows that learning styles determine student success (Madden, 2002; Nasutions, 2009).

The Effect of Learning Styles on Movement Skills

The results of the data analysis show the differences in movement skills among students with visual, auditory, and kinaesthetic learning styles.

DePorter (2000) explained the method of receiving information consisting of auditory, visual, and Kinaesthetic. In learning theory and practice, the three learning styles have different capabilities in absorbing the subject matter. *Learners with a visual preference prefer charts, graphs and flow charts among other forms of stimuli that could have otherwise been presented in words* (Braakhuis, Williams, Fusco, Hueglin, & Popple, 2015).

Based on the results of the study, all learning styles are significantly different in the effect on movement skills. However, visuals have the highest score (mean = 26.20) with a substantial effect on improving movement skills. Students with visual learning styles are able to master basic football movement skills better by copying what they see from their teacher. Someone with visual learning styles will tend to prefer the use of photo components, figures and colours to organize information while studying or when communicating with others (Kurniawan, 2017)

The Effect of Interaction between Learning Styles and Strategies on Conceptual Understanding

Interaction is disordinal (see Figure 2), which means that students with auditory learning styles have better conceptual understanding when using direct learning strategies. Conversely, those with visual and kinaesthetic learning styles tend to have a better conceptual understanding when they learn with quantum learning strategies.



The results of this study show that students who prefer visual learning styles, easily learn using a quantum technique, while those with an auditory preference are more suited to the use of direct learning strategies. This finding is consistent with the results of the study of Lodang & D. (2017); Sari, Sri, & Sugeng (2013).

The Effect of Interactions between Learning Styles and Strategies on Movement Skills

Without the existence of interaction, learning strategies influence primary football movement skills. Figure 3 shows that the lines of auditory styles in both quantum and direct learning strategies leads to interaction. The auditory, visual, and kinaesthetic learning styles have a balanced influence (Figure 4), with the increase in the three styles is not significantly different. The level of basic football technical skills is related to training activities, time, teacher or trainer, and facilities and infrastructure (Wijaya, 2012).

Conclusion

This study was conducted to review the effect of quantum learning strategies using TANDUR syntax on conceptual understanding of necessary football movement skills in terms of student learning styles. It also shows that quantum learning strategies with TANDUR syntax have a significant effect on conceptual knowledge and football basic movement skills. Further, it indicates that learning styles and strategies affect student conceptual understanding but have no impact on their football basic movement skills.

REFERENCES

- Agistya, W. N. (2012). *Penggunaan CD Interaktif dan Modul Pada Pembelajaran Kimia dengan Model Quantum Learning Ditinjau Dari Gaya Belajar dan Kemampuan Memori Siswa*. Universitas Sebelas Maret.
- Ahmad, D. N. (2018). Pengaruh Gaya Belajar Peserta Didik Terhadap Pemahaman Konsep Sistem Peredaran Darah Pada Manusia di Sekolah Menengah Atas Negeri 11 Depok. *PEMBELAJAR: Jurnal Ilmu Pendidikan, Keguruan, Dan Pembelajaran*, 2(1), 1–4. Retrieved from https://ojs.unm.ac.id/pembelajar/article/view/5010/pdf_7
- Anintia, R., Sadhu, S., & Annisa, D. (2017). Identify Students' Concept Understanding Using Three-Tier Multiple Choice Questions (TTMCs) on Stoichiometry. *International Journal of Science and Applied Science: Conference Series*, 2(1), 308–317. Retrieved from <https://jurnal.uns.ac.id/ijsascs/article/view/16734/13518>
- Ariyanto, K. (2014). Analyzing the Conflict between Football Organizations in Indonesia. *Procedia - Social and Behavioral Sciences*, 115, 430–435. <https://doi.org/10.1016/J.SBSPRO.2014.02.450>
- Astuti, T. P. (2018). *Pengaruh Model Pembelajaran Tandır (Tumbuhkan, Alami, Namai, Demonstrasi, Ulangi, dan Rayakan) Terhadap Peningkatan Kemampuan Pemahaman Konsep dan Penalaran Matematis Peserta Didik Kelas VII SMP (Universitas Islam Negeri Raden Intan Lampung)*. Retrieved from [http://repository.radenintan.ac.id/4829/1/TITIN PUJI ASTUTI.pdf](http://repository.radenintan.ac.id/4829/1/TITIN%20PUJI%20ASTUTI.pdf)
- Astuti, T. P., Masykur, R., & Pratiwi, D. D. (2018). Pengaruh Model Pembelajaran Tandır Terhadap Kemampuan Pemahaman Konsep dan Penalaran Matematis Peserta Didik. *AKSIOMA*, 7(2), 201–209. <https://doi.org/10.1895/wormbook.1.83.2.1>
- Bahaddin, M., & Yusuf, A. Y. (2014). An Investigation the Effect of Quantum Learning Approach on Primary School 7th Grade Students' Science Achievement, Retention and Attitude. *Educational Research Association The International Journal of Research in Teacher Education*, 5(2), 11–23.
- Biggs, J., & Tang, C. (2011). *Teaching for Quality Learning at University* (4th editio). England: Open University Press.
- Braakhuis, A., Williams, T., Fusco, E., Hueglin, S., & Popple, A. (2015). A Comparison between Learning Style Preferences, Gender, Sport and Achievement in Elite Team Sport Athletes. *Sports*, 3(1), 325–334.



- Clayton, K., Blumberg, F., & Auld, D. P. (2010). The relationship between motivation, learning strategies and choice of environment whether traditional or including an online component. *British Journal of Educational Technology*, 41(3), 349–364.
- Dacica, L. (2015). The Formative Role of Physical Education and Sports. *Procedia - Social and Behavioral Sciences*, 180(November 2014), 1242–1247. <https://doi.org/10.1016/j.sbspro.2015.02.256>
- De Porter, B., & Hernacki, M. (2010). *Quantum Learning: Membiasakan Belajar Nyaman dan Menyenangkan*. Bandung: Kaifa.
- DePorter, B., & Hernacki, M. (2007). *Quantum Learning: Unleashing the Genius In You* (A. Abdulrahman, Ed.). Bandung: Kaifa.
- DePorter, Bobbi. (2000). *Quantum Teaching: mempraktikkan Quantum Learning di Ruang-Ruang Kelas*. Bandung: Kaifa.
- Hamzah. (2008). *Orientasi Baru dalam Psikologi Pembelajaran*. Jakarta: PT Bumi Aksara.
- Hanief, Y. N., & Sugito, S. (2015). Membentuk Gerak Dasar Pada Siswa Sekolah Dasar Melalui Permainan Tradisional. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, 1(1), 60-73. doi:10.29407/js_unpgri.v1i1.575
- Hariadi, B., & Hariadi, B. (2015). Web-Based Cooperative Learning, Learning Styles, and Student's Learning Outcomes. *Jurnal Cakrawala Pendidikan*, 2(2). <https://doi.org/10.21831/cp.v2i2.4821>
- Harmono, S. (2017). Pengaruh Model Pembelajaran Quantum Dan Gaya Belajar Terhadap Pemahaman Konseptual Dan Keterampilan Gerak Pada Mata Pelajaran Pendidikan Jasmani Olahraga Dan Kesehatan Siswa SMA Kota Kediri. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, 3(1), 103. https://doi.org/10.29407/js_unpgri.v3i1.745
- Hirdaus, H., Atiq, A., & Supriatna, E. (2014). Penerapan Metode Pembelajaran Quantum Teaching Terhadap Hasil Belajar Forehand Permainan Tennis Meja di SMP. *Jurnal Pendidikan Dan Pembelajaran*, 3(7). Retrieved from <http://jurnal.untan.ac.id/index.php/jpdpb/article/view/6475/6696>
- Junge, A., & Dvorak, J. (2004). Soccer Injuries: A Review on Incidence and Prevention. *Sports Medicine*, 34(13), 929–938. <https://doi.org/10.2165/00007256-200434130-00004>



- Kalsum, U., & Fadhila. (2018). Implementation of Quantum Teaching Method with TANDUR Techniques on Learning Physics Student Result Class XI IPA SMA PPM Al-Ikhlas. *Journal of Physics: Conference Series*, 1028(1). <https://doi.org/10.1088/1742-6596/1028/1/012202>
- Khoeron, I. R., Sumarna, N., & Permana, T. (2014). Pengaruh gaya belajar terhadap prestasi belajar peserta didik pada mata pelajaran produktif. *Journal of Mechanical Engineering Education*, 1(2), 291–297.
- Kurniawan, M. R. (2017). Analisis Karakter Media Pembelajaran Berdasarkan Gaya Belajar Peserta Didik. *JINoP (Jurnal Inovasi Pembelajaran)*, 3(1), 491–506.
- Lodang, H., & D, N. A. (2017). Keefektifan Penerapan Model Pembelajaran Quantum Berdasarkan Gaya Belajar Siswa pada Materi Sistem Sirkulasi Pada Siswa Kelas XI IPA SMAN 1 Bontosikuyu Kepulauan Selayar. *Sainsmat*, 6(2), 1–15. Retrieved from <https://ojs.unm.ac.id/sainsmat/article/view/6464/3697>
- Madden, T. L. (2002). *Fire-Up Your Learning: Accelerated Learning Action Guide* (A. B. I. Suryana, Ed.). Jakarta: PT. Gramedia Pustaka Utama.
- Magdalena, M., Rahmawati, E., & Budiningsih, C. A. (2014). Pengaruh Mind Mapping Dan Gaya Belajar Terhadap Pemahaman Konsep Siswa Pada Pembelajaran IPA. *Inovasi Teknologi Pendidikan*, 1(2), 123–138.
- Mansor, R., Halim, L., & Osman, K. (2010). Teachers' knowledge that promote students' conceptual understanding. *Procedia - Social and Behavioral Sciences*, 9, 1835–1839. <https://doi.org/10.1016/J.SBSPRO.2010.12.410>
- Mintarti, S. B. (2016). Pengaruh Gaya Belajar Visual dan Aktivitas Belajar Terhadap Prestasi Belajar Siswa Kelas IX. *Jurnal Penelitian Dan Pendidikan IPS (JPPI)*, 10(1), 90–100.
- Naserieh, F., & Anani Sarab, M. R. (2013). Perceptual learning style preferences among Iranian graduate students. *System*. <https://doi.org/10.1016/j.system.2013.01.018>
- Nasutions, S. (2009). *Berbagai Pendekatan dalam Proses Belajar & Mengajar*. Jakarta: Bumi Aksara.
- Nova Southeastern University. School of Social and Systemic Studies., P. (1990). The qualitative report : an online journal dedicated to qualitative research since 1990. In *The Qualitative Report* (Vol. 19). Retrieved from <https://nsuworks.nova.edu/tqr/vol19/iss1/1>

- Nuraini, F. (2018). *Pengaruh Model Pembelajaran Langsung (Direct Instruction) dan Model Pembelajaran Kooperatif Teams Game Tournament (TGT) Terhadap Peningkatan Motivasi Belajar dan Penguasaan Konsep Fisika Kelas X MIPA 1 Dan Kelas X MIPA 2 SMA Negeri 1 Turi*. Universitas Negeri Yogyakarta.
- Nurdyansyah, Rais, P., & Aini, Q. (2017). The Role of Education Technology in Mathematic of Third Grade Students in MI Ma'arif Pademonegoro Sukodono. *Madrosatuna: Journal of Islamic Elementary School*, 1(1), 37–46.
- Oktarina, S., Ismail, F., & Nery, R. S. (2017). Pengaruh Model Quantum Teaching Terhadap Pemahaman Konsep Matematika Siswa di Kelas X SMA Ethika Palembang. *Jurnal Pendidikan Matematika RAFA*, 3(1), 39–56. Retrieved from <http://jurnal.radenfatah.ac.id/index.php/jpmrafa/article/view/1440>
- Panganiban, T. D. C. (2019). Quality assessment of physical education program of state universities in the Philippines. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, 5(2), 167–175. https://doi.org/10.29407/js_unpgri.v5i2.12983
- Pujiati, P., Kanzunudin, M., & Wanabuliandari, S. (2018). Analisis Pemahaman Konsep Matematis Siswa Kelas IV SDN 3 Gemulung pada Materi Pecahan. *ANARGAYA : Jurnal Ilmiah Pendidikan Matematika*, 1(1), 37–41.
- Rahardianti, R. (2012). *Eksperimentasi Pembelajaran Matematika Menggunakan Pendekatan Quantum Learning dengan Metode Discovery dan Contextual Teaching And Learning Pada Pokok Bahasan Limit Fungsi Ditinjau dari Gaya Belajar Peserta Didik*. Universitas Sebelas Maret Surakarta.
- Saleh, S. (2012). The Effectiveness of the Brain Based Teaching Approach in Enhancing Scientific Understanding of Newtonian Physics among Form Four Students. *International Journal of Environmental and Science Education*, 7(1), 107–122. Retrieved from <https://eric.ed.gov/?id=EJ972447>
- Sari, S. P., Sri, N. H., & Sugeng, S. (2013). Penggunaan Pendekatan Kontekstual dengan Gaya Belajar-VAK (Visual-Auditory-Kinestetik) dalam Upaya Meningkatkan Pemahaman Konsep Matematis Siswa (Studi pada Siswa Kelas VIII Semester Genap SMP Negeri 1 Sekampung Udik Tahun Pelajaran 2012/2013). *Jurnal Pendidikan Matematika*, 2(2), 106–111.
- Simak, E. Y. F. (2012). Pengaruh Model Quantum Teaching Terhadap Pemahaman Konsep IPA dan Keterampilan Berpikir Kreatif Siswa SMP. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, 2(1). Retrieved from http://119.252.161.254/e-journal/index.php/jurnal_ipa/article/view/401/193



- Sriwahyuniwati, C. F. (2017). *Belajar Motorik* (Edidi Pert). Yogyakarta: UNY Press.
- Sudarman, S. W., & Vahlia, I. (2016). Efektifitas Penggunaan Metode Pembelajaran Quantum Learning terhadap Kemampuan Pemahaman Konsep Matematis Mahasiswa. *Al-Jabar : Jurnal Pendidikan Matematika*, 7(2), 275–282. Retrieved from <http://ejournal.radenintan.ac.id/index.php/al-jabar/article/view/42/36>
- Sujarwanta, A. (2013). Pengaruh Metode Quantum Learning dan Pengetahuan tentang Lingkungan Terhadap Kepedulian Lingkungan (Studi Eksperimen pada Pembelajaran Pengetahuan Lingkungan di Universitas Muhamma-diyah Metro). *Jurnal Bioedukasi*, 4(1), 14–20.
- Tsingos, C., Bosnic-Anticevich, S., & Smith, L. (2015). Learning styles and approaches: Can reflective strategies encourage deep learning? *Currents in Pharmacy Teaching and Learning*. <https://doi.org/10.1016/j.cptl.2015.04.006>
- Wahyuni, Y. (2017). Identifikasi Gaya Belajar (Visual , Auditorial, Kinestetik) Mahasiswa Pendidikan Matematika Universitas Bung Hatta. *Jurnal Penelitian Dan Pembelajaran Matematika*, 10(2), 128–132.
- Wijaya, W. A. (2012). *Tingkat Keterampilan Teknik Dasar Bermain Sepakbola Peserta Putra Ekstrakurikuler Sepakbola SMP Negeri 2 Wonosobo*. Universitas Negeri Yogyakarta.
- Wirnantika, I., Pratama, B. A., & Hanief, Y. N. (2017). Survey Tingkat Kebugaran Jasmani Siswa Kelas IV SDN Puhrubuh I dan MI Mambaul Hikam di Kabupaten Kediri Tahun Ajaran 2016/2017. *Jurnal SPORTIF : Jurnal Penelitian Pembelajaran*, 3(2), 240-250. doi:10.29407/js_unpgri.v3i2.11898
- Yahya, H. (2017). Pengaruh Penerapan Model Pembelajaran Quantum Teaching Terhadap Hasil Belajar Biologi Siswa SMP Islam Terpadu Al-Fityan Gowa. *Jurnal Biotek*, 5(1), 155–166.