Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

The Effects of Different Text Design and Learner Cognitive Style on Learning Effectiveness and Appeal

Made Duananda Kartika Degeng[1]

Abstract

Elaboration model was used as a basis to develop instructional text design in this research. The models developed were the Elaboration step by step model (SM) and the Elaboration linear model (LM). The interactive effect that may occur from the previously mentioned variables was examined with learners cognitive style as a moderator and learning appeal and effectiveness as dependent variables. The proposed hypotheses were analyzed using experimental factorial design (2X2). Two groups of students were selected through cluster sampling. It was concluded that the Elaboration model with Step-by-step configuration could be more appealing and effective in the learning process. The second hypothesis indicated that, compared to field Independence students, the group of Field Independences achieved significantly higher scores. The third hypothesis showed that there was no interaction between the two variables in terms of learning effectiveness.

Keywords: *Elaboration Model, Cognitive Style, Learning Effectiveness, Learning Appeal.*

Introduction

Instructional Design in Higher Education

Many researcher often evaluate the effectiveness of instructional strategies in a sporadic manner, failing to consider the uniqueness of each student's innate characteristics in the class. Khalil concluded that omission of instructional design principles due to the lack of instructional design competencies leads to unanticipated and unexplained learning outcomes (Khalil & Elkhider, 2016). However, there is some valid research founding's that between instructional strategies use in learning and instructional conditions have an interactive effect, especially those stemming from learner characteristics, it remains underappreciated (Gašević et al., 2016). Many instructional designers assumed that instructional strategies have no interactive effect with learner's charateristics, in the end they tend to ignore this. This is often found at the higher education level.

Educational theory informs the design of instruction and instructional design models provide guiding framework for the development of effective, appealing, consistent, and reliable instruction. This study is intended to examine the combined impact of instructional strategies, how to design a text, and the influence of learner characteristics on the appeal and effectiveness of learning.

Theoretically, the validation of the instructional strategy by not knowing or realizing how it interacts with various instructional conditions variables, isn't very helpful. This approach doesn't align with established principles for developing effective instructional theories. These assumption based on the idea of instructional strategy will only become effective when it's applied in specific contexts or align to the characteristics of particular learners.

In this research, the focus of the instructional strategy as an independent variable was limited on how to design text and organize instructional content effectively. Degeng named them structural strategy (Degeng & Degeng, 2018). As an addition, the development results from their research also produced a learning model that is also known as Elaboration model. To evaluate the effectiveness of this model in the learning

[1] Department of Educational Technology, Faculty of Education, Universitas Negeri Malang, Email: made.degeng.fip@um.ac.id.

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

process, they conducted an assessment by comparing it to the commonly used existing model in further education in Indonesia.

In a unique way, the strategy or the idea for organizing instructional content plays a crucial role in instructional design. One of the benefits arranging instructional design can impact learner's cognitive load and learning outcomes, learner's with less intrinsic cognitive load reported had higher post-test scores (Andrade et al., 2015). This kind of strategy highlights the importance of sequencing and synthesizing content by subject.

In this matter, the sequencing process becomes more demanding. Synthesizing will be effective only if the subject content sequencing is done using specific and appropriate strategies, while most subject materials require certain learning precondition (Richey, 2009). Also, when information synthesized, a subtopics within a particular area of study gain more significance and meaningful for students (Reigeluth & Merrill, 1979). Students construct this meaningfulness based their own experience and relating it to a topic (Bryce & Blown, 2024), or it can be done simultaneously by demonstrating how these topics fit into the broader context of the subject. This meaningfulness sparks students' interest in learning, and in the end improving the achievement and efficiency in learning process.

The preparation and arrangement of instructional design is almost always overriding instructional organization strategy. Nowadays, educators typically taught their lessons by following to the sequence, subject, or topics and content of a textbooks page by page. Each topic is discussed in an order, one after the other, as laid out in the textbooks. This method of teaching approach with the use of this set of instructional sequence is seen as conventional or traditional.

Nonetheless, instructional strategies are crucial in determining the quality of learning. In instructional design, there are several variables that influence instructional quality, and instructors must accept these variables as given and used those foundational elements to guide their instructional practices (Degeng & Degeng, 2018). For instance, an instructional designers cannot manipulated instructional goals and objectives. This is due to the fact that both of these have been systematically arranged in the curriculum, included as well are the subject contents charateristics and the limitations of learning resources, which are also predetermined.

Cognitive Style

One of the key variables in this context is the learner's characteristics. Theoretically, these characteristics cannot be altered nor modified. Therefore, this uniqueness must be accepted as it is. One of the variable has greatest impact in influencing instructional quality originated from variable conditions which is the student, and the part of it that least explored is cognitive styles. Despite this, cognitive styles proved to has a considerable impact to influence the effectiveness of an instructional strategy used, particularly those on the order of sequencing and organization of instructional content (Sholahuddin et al., 2021). More precisely, it was initially defined as a style of information processing that remains unaffected by experience and defines how an individual interprets the world (Witkin et al., 1977).

Field-independence (FI) individuals typically utilize an internal frame of reference and are therefore better able to disregard misleading information from the external sensory environment. In contrast, field-dependence (FD) individuals tend to rely more on an external frame of reference and are more susceptible to being misled by deceptive cues in their environment (Rostampour & Niroomand, 2014). In another research findings, those who ended up as FD individuals struggled to separate the information they received, as they were influenced and attached stronger to external factors. An individual with FD's tend to be less selective in processing the information they received (Teghil et al., 2023). In contrast, FI individuals find it easier to distinguish important information, as they are more influenced by internal cues and more meticulous towards the processing of the information they receive (Guisande et al., 2007).

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

Elaboration Model

At first, the Elaboration model was introduced by Reigeluth. Futher, intensively adopted by (Degeng, 1988; 2013; Degeng & Degeng, 2018). The first step of elaboration model begins with an Epitome. In this phase the Instructional text design is by epitomizing the information to be taught. Configuring large amounts of information then divided into smaller units of information, when needed, this smaller unit is further divided into more smaller information (whole content-topics-subtopic). The elaboration phase start since the very first information that divided into smaller unit of information with continuous development to achieve the expected level of details. This structured approach ensures that each student has the ability to continuously relate each piece of information, whether as a whole or in fragments, into a larger context.

The elaboration model is a prescriptive model. This model was developed with the aim of integrating existing knowledge about organizing instruction or instructional text, especially for multiple related ideas or topics (macro level). Elaboration model is the main choice that can be used to conduct research on the use of subject content structure analysis and understanding of cognitive processes and learning theories in designing strategies for selecting, sorting, synthesizing, and summarizing subject content. To determine reliable and accurate indicators in analyzing the level of learning effectiveness. Results related to the initial hypothesis that if the text is designed using an appropriate model, it will lead to increased levels of learning, synthesis, retention, transfer, and motivation (Degeng & Degeng, 2018). Degeng in his latest research, which is based on an elaboration model, further develops theory and concept in the field of learning appeal (Degeng, 2013).

It is hypothesized that the use of suited model, in this case elaboration model, will make both appeal and instruction more effective. A limitation of this model is that the more focused the amount of information possessed by a subject matter, the lesser the impact of using an elaboration model will be. This means that when a topic is narrower in scope, its influence will be less significant, regardless of the method the lecturer used to sequence those subject matter. It is urgent to test the effectiveness of organizing instructional text based on the elaboration model by looking its interactive effects with learner's characteristic. This is since there have been less studies conducted in this area, and the existing findings show inconsistency.

The inconsistency in these findings is likely due to the connection between the elaboration model and the subjects' learning characteristics that interact. Out of the four studies mentioned, only one tried to link the model with learner characteristics. In theory, this is disadvantageous, it does not align with established assumptions to develop an instructional theory. Degeng assumed that under specific conditions, the implementation of an instructional strategy is demonstrated to have strong appeal and significant effectiveness (Degeng & Degeng, 2018).

(Hanclosky, 1986) found that elaboration model to be ineffective, while (Degeng, 1997) demonstrated that this model was very effective in enhancing learning outcomes. However, (Hoffman, 1997) reported that the elaboration model did not significantly impact learning outcomes. Contrary, (Safaruddin et al., 2020) reaffirmed its effectiveness for medical and science students, in their dissertations. Thus, these findings highlight a lack of consistency, possibly this is because a failure to figure out the interactive effects of the subjects' characteristics variables.

Degeng's study (Degeng, 1988) in his dissertation, was intended specially investigating the effectiveness from elaboration model to learning concept in the field of biology. However, this model has yet to be researched for its effectiveness with other types of content, i.e. learning principles or learning procedures.

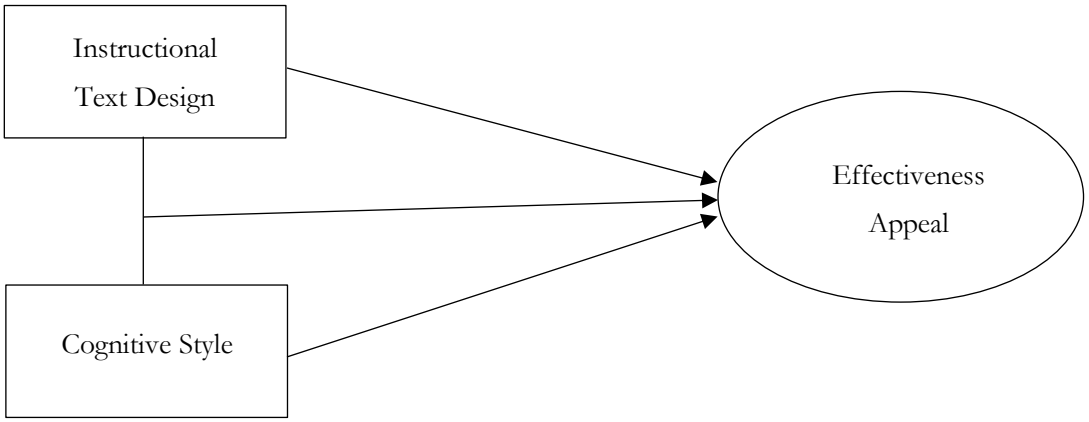
Purpose of Study

Currently, the interactive effect that tend to appear between the characteristics of learners and the strategies of instructional design in content organizing tend to be ignored, moreover by instructional designers in higher education. They also fail to consider the specific attributes of the subject matter. As a result, while they may succeed in organizing the content, but their approach does not align with the inherent structure of the subject being taught.

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

This research conducted to find an interactive effect that appear between the instructional text design based Elaboration model and the cognitive style of the students on appealingness and effectiveness in learning. The characteristics of students that were anticipated to have affection with the elaboration model included cognitive style.

The following picture shown the variables interrelatedness in this study:



The research questions retracted from the following background as follows: First, do different instructional text designs lead to varying levels of learning effectiveness and appeal? Second, do different cognitive styles result in different degrees of learning effectiveness? Third, is there an interaction between instructional text design and cognitive styles regarding the level to which learning is more effective?

Method

Sample

The subjects of this experiment were students who took the course on Educational Research at Universitas Negeri Malang. It was taken, by cluster, 2 groups of students. The total subjects were 89 students (43 was assigned into experimental group and 46 as a control group). Data tabulation at the end of the research revealed that not all of the students were involved directly in each stage of the experiment: treatment, post-test, and another variable test. To maintain the internal validity of the results of this experiment, all data measured from the subjects who were not involved in each stage of the experiment were not included in the statistical analysis. The subjects whose data met the requirement to be analyzed further were 84. All the subjects met the category of variable sorting as determined previously. Table 1 showed the real distribution of the subjects included in the analysis.

Table 1. Research Subject

	Instructional Text Design		
Cognitive Style	Linear Model (LM)	Step-by-step Model (SM)	Total
Field Independence (FI)	22	23	45
Field Dependence (FD)	21	18	39
Total	43	41	84

Instrument

The instrument used for measuring the learning achievement (the indicator for the degree of effectiveness) after treatment (posttest) was the achievement test. For measuring the degrees of appeal was used questionnaires and check list. For measuring the cognitive styles, the Group Embedded Figure Test (GEFT), which was developed by (Witkin et al., 1971) was used. The questionnaire was used for measuring

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

Text design appeal. Prior to the administration of those instruments, all of them were validated in the context as predetermined in this study.

Procedures

The experiment was conducted by using the posttest only procedure. During the preliminary measurement, moderator variables were also measured (cognitive styles). After the treatment, the posttest was administrated. The posttest score was used as the indicator for the degree of effectiveness. Another instrument unit was also administrated to find out the degrees of learning appeal.

Analysis

Experimental factorials design (2 X 2) was used to test all the data mentioned in hypothesis. A Strategy for organizing text design (instructional content) selected as independence variable of this research, it was divided into two classifications, step-by-step model (SM) and linear model (LM). Both designs used Elaboration model as a basis for further implementation of this research. Cognitive style as an innate trait of the learners are used as a moderator variables that are suspected to have a contribution to the level of learning effectiveness. This variable consists of two dimensions, which are field independence and field dependence. Meanwhile, the dependence variable ss the final result of the experimental process in this study was learning effectiveness and appeal.

All the results about the learning effectiveness were analyzed using Anova (2x2), which suite the number of variables involved. For analyzing the text design appeal was used significance test of the difference between two proportions.

Results

Summary Analysis of Variances

Data analysis for the learning effectiveness were summarized in the table 2. This table mentions that the value of F for the Text design was 19,846 (P=0,000), value F cognitive style was 5,0602 (P=0,027). Meanwhile, the F value for interaction between text design and cognitive style was 0,984 (P=0,324).

Table 2. Tests of Between-Subjects Effects

Dependent Variable: Learning Effectiveness

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4095,932a	3	1365,311	9,198	,000
Intercept	393875,381	1	393875,381	2653,408	,000
Text Design	2945,960	1	2945,960	19,846	,000
Cognitive style	751,047	1	751,047	5,060	,027
Text design * Cognitive style	146,079	1	146,079	,984	,324
Error	11875,306	80	148,441		
Total	414792,000	84			
Corrected Total	15971,238	83			

a. R Squared = ,256 (Adjusted R Squared = ,229)

Following the analysis as shown on table 2, there was one null hypothesis (Ho) not rejected, that was interaction effect of text design and cognitive style. Two others null hypothesis (Ho) related to main effects were rejected. Using this calculation, it was concluded that text design using step by step elaboration model and linear model gave significantly different effects on learning effectiveness. It also happens for cognitive style, difference occur in this varabel cause different results in achievement effectiveness. More specifically,

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

students with field independence characteristics got higher on effectiveness measurement than student with field dependence.

Verification of the instructional appeal was conducted by testing the significance of the difference of two proportions. That was the proportion of the subject who interested in elaboration model for designing text compared to the proportion of the subject who interested in linear elaboration. Data about instructional appeal were collected by questionnaire after finishing studying the instructional materials, for the two groups of subjects. Two versions of instructional materials were shown to them and let them compare and evaluated following the check-list items.

There were five questions on the checklist that all subjects should answer to all questions. Those questions were related to: (1) Easy-not easy to be learned, (2) Interesting-not interesting, (3) Choice to be learned, (4) Choice to be own, and (5) marketing price. The total of the subject gave data of the instructional appeal was shown in the following table.

Distribution of Subjects for Appeal Analysis

Data analysis used for the five questions were as follow. Question number 1 (Do the instructional material easy to learn: Yes/No) and question number 2 (Do the instructional material interesting: Yes/No) were analyzed by significance of the difference between two independent proportions. Question number 3 (Which one do you want to learn: LM/SM) and question number 4 (Which one do you to want to be yours: LM/SM) were analyzed by significance of the difference between two correlated proportions. Question number 5 was analyzed by percentage.

Table 3. Distribution of Subjects

Subjects	Linier Model (LM)	Step by Step Model	Total
Total Subjects	43	41	84

Proceed by tabulating the data in the form of fourfold, or 2 X 2 table. Five tables with four cell frequencies were obtained, those were Table 4, 5, 6, 7, 8.

Instructional Text Design Appeal: Easy/Not Easy to Learn

Table 4. Instructional Text Design

	Linier Model	Step by Step Model
Yes	22	36
No	21	5
n	43	41

Based on table 4 data on the question asked was analyzed by significance of the difference between two independent proportions (Step by step Elaboration model and Linear model groups: how they feel on the instructional materials). In the Step-by-step Elaboration model of 41 subjects, 36 (proportion = 0.878) subjects indicated that the instructional text design was easy to learn. In the Linear model of 43 subjects, 22 subjects indicated agreement. The proportion was= 0.512. By combining data for the two groups of subjects obtained a value of proportion 0,690 and the estimate of the standard error of the difference was= 0.100. The calculated Z value was= 3.660 ($p < 0.01$). Based on this Z value, it was very safely concluded from these data that a real difference exists between step-by-step elaboration model and linear model subjects on the question. More specifically, Ste-by-step elaboration model was easier to learn than linear model.

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

Instructional Text Design Appeal: Interesting/Not Interesting

Table 5. Instructional Text Design Interesting/Not Interesting

	Linier Model	Step by Step Model
Yes	23	38
No	20	3
N	43	41

Data on table 5 using the same procedure indicated that for the Step-by-step Elaboration model of 41 subjects, 38 subjects (the proportion was 0.927) indicated that the instructional text design was interesting. In the Linear model of 43 subjects, 23 subjects or by proportion= 0.535 indicated interesting. The combine proportion was 0,726 and the estimate of the standard error of the difference was 0.094. The calculated Z value was 4,179 ($p < 0.01$). Support the prior conclusion this Z value was also significant. It was very safety to conclude that a real difference existed between step-by-step elaboration model and linear model subjects on the question about the appeal of the instructional text design. More specifically, step-by-step elaboration model was more interesting to learn than linear model.

Instructional Text Design Appeal: To Be Learned

Table 6. Instructional Text Design Appeal: To Be Learned

After				
		Linier Model (LM)	Step by Step Model (SM)	
Before	SM	0	41	41
	LM	15	28	43
	n	15	69	84

Data from the question number 3 and number 4 were analyzed by statistical test of the difference between two correlated proportions. Proceed by tabulating the data in the form of 2 X 2, Table 6 indicated that subjects choosing step-by-step elaboration model were 41 from the total 41 and 28 from the total 43. The first was pl 0.490 and the second was p2 = 0.780. This analysis was assigned to test the significance of the difference between p1 and p2.

The estimate of the standard error of the difference between two correlated proportions was 0.062 and the value of Z was 4,647 ($p < 0.01$). Here the difference was significant. It exceeds the value of 2.58 required for significance by 1 percent. It was concluded that more subjects choose step-by-step elaboration model than linear model.

Instructional Text Design Appeal: To Be Own

Table 7. Instructional Text Design Appeal: To Be Own

After				
		Linier Model (LM)	Step by Step Model (SM)	
Before	SM	0	41	41
	LM	3	40	43
	n	3	81	84

Inspection of Table 7 indicated that subjects choosing step-by-step elaboration model were 41 from the total 41 and 40 from the total 43. The first was pl= 0.49 and the second was p2 = 0.96. The estimate of the standard error of the difference between two correlated proportion was 0.075 and the value of Z was 6.266 ($p < 0.01$). Again, that difference was significant, so it was safe to conclude that more subjects chose step-by-step elaboration model than linear model.

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

Analysis for the data from question number 5 was using percentage calculation as shown on table 8. From this table it can be said that instructional material using step-by-step elaboration model was more expensive than linear model. Or it means that elaboration model with step-bystep configuration was more interesting and appealing for the learners than the other model for designing instructional material.

Table 8. Instructional Material

Choice	Frequency	Percentage
a. SM more expensive	76	90 %
b. LM more expensive	0	0 %
c. The same price	4	5 %
d. Do not know	4	5 %
Total	84	100 %

Discussion

This research was urgently conducted for providing latest evidence aimed at enhancing the quality of learning in further education. The findings are particularly valuable for developing instructional theories and principles, especially those related on identifying the most effective strategies for achieving specific instructional objectives. Based on the findings in this reserach, all efforts aimed to these goals should be integrated into the field of Educational Technology. Consequently, this research contributes findings and empirical evidence that bolster the foundation of Educational Technology.

This research also holds significant practical value, particularly in the development of instructional materials such as textbooks, modules, and other printed resources. The most notable contribution will be in the organization of these materials. The elaboration model tested in this experiment provides a guideline for organizing instructional content, particularly in designing text. Therefore, it is recommended that designers incorporate the step-by-step elaboration model when organizing instructional materials, especially those in printed form.

Conclusion

The conclusions can be drawn from the research:

- The step-by-step Elaboration model proved to be more appealing and effective than the Elaboration model with linear configuration when it was use as a strategy to designing instructional text.
- Students with field independence style shows higher result than the field dependence student significantly.
- No interaction occurred between cognitive style, which is a student's innate trait, and the instructional text design used in terms of learning effectiveness.

References

Andrade, J., Huang, W. H. D., & Bohn, D. M. (2015). The Impact of Instructional Design on College Students' Cognitive Load and Learning Outcomes in a Large Food Science and Human Nutrition Course. Journal of Food Science Education, 14(4), 127–135. https://doi.org/10.1111/1541-4329.12067

Bryce, T. G. K., & Blown, E. J. (2024). Ausubel's meaningful learning re-visited. Current Psychology, 43(5), 4579–4598. https://doi.org/10.1007/s12144-023-04440-4

Degeng, I. N. S. (1988). Pengorganisasian pengajaran berdasarkan teori elaborasi dan pengaruhnya terhadap perolehan belajar informasi verbal dan retensi. Universitas Negeri Malang.

Journal of Ecohumanism
2024
Volume: 3, No: 3, pp. 1558 – 1566
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i4.3815

Degeng, I. N. S. (1997). Strategi Pembelajaran : Mengorganisasi Isi dengan Model Elaborasi. MALANG IKIP MALANG.

Degeng, I. N. S. (2013). Ilmu pembelajaran: Klasifikasi variabel untuk pengembangan teori dan penelitian. In Bandung: Kalam Hidup.

Degeng, I. N. S., & Degeng, P. D. D. (2018). ILMU PEMBELAJARAN, Klasifikasi Variabel untuk Pengembangan Teori dan Penelitian (2nd ed., Vol. 2). YAYASAN TAMAN PUSTAKA KRISTEN INDONESIA.

Gašević, D., Dawson, S., Rogers, T., & Gasevic, D. (2016). Learning analytics should not promote one size fits all: The effects of instructional conditions in predicting academic success. The Internet and Higher Education, 28, 68–84. https://doi.org/10.1016/J.IHEDUC.2015.10.002

Guisande, M. A., Páramo, M. F., Tinajero, C., & Almeida, L. S. (2007). Field dependence-independence (FDI) cognitive style: An analysis of attentional functioning. Psicothema, 19(4), 572–577.

Hanclosky, W. V. (1986). A Comparison of Task Analysis, Advance Organizer, and Concept Elaboration Methods in Teaching Concepts and Principles.

Hoffman, S. (1997). Elaboration Theory and Hypermedia: Is There a Link? Educational Technology, 37(1), 57–64.

Khalil, M. K., & Elkhider, I. A. (2016). Applying learning theories and instructional design models for effective instruction. Advances in Physiology Education, 40(2), 147–156. https://doi.org/10.1152/ADVAN.00138.2015

Reigeluth, C. M., & Merrill, M. D. (1979). Classes of Instructional Variables. Educational Technology, 19(3), 5–24. http://www.jstor.org/stable/44421327

Richey, Rita C., E. (2009). Design and Development Research Methods, Strategies, and Issues (Reprinted). Taylor & Francis Group.

Rostampour, M., & Niroomand, S. M. (2014). Field Dependence/Independence Cognitive Styles: Are They Significant At Different Levels Of Vocabulary Knowledge? International Journal of Education and Literacy Studies, 2(1), 52–57. https://doi.org/10.7575/aiac.ijels.v.2n.1p.52

Safaruddin, S., Degeng, I. N. S., Setyosari, P., & Murtadho, N. (2020). The Effect of PjBL with WBL Media and Cognitive Style on Studentsâ€TM Understanding and Science-Integrated Concept Application. Jurnal Pendidikan IPA Indonesia, 9(3), 384–395. https://doi.org/10.15294/jpii.v9i3.24628

Sholahuddin, A., Susilowati, E., Prahani, B. K., & Erman, E. (2021). Using a Cognitive Style-Based Learning Strategy to Improve Students' Environmental Knowledge and Scientific Literacy. International Journal of Instruction, 14(4), 791–808. https://doi.org/10.29333/iji.2021.14445a

Teghil, A., D'Antonio, F., Di Vita, A., Guariglia, C., & Boccia, M. (2023). Temporal learning in the suprasecond range: insights from cognitive style. Psychological Research, 87(2), 568–582. https://doi.org/10.1007/s00426-022-01667-x

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 47(1), 1–64. https://doi.org/10.2307/1169967

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). A Manual for the Group Embedded Figures Test. Mind Garden, Inc.