Cognitive Impact of eLearning based on Associative Relevance

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Abstract

Studies on finding the dominant instructional techniques for learning and knowledge-transfer have been gaining remarkable momentum. By having an efficient instructional technique, we can better transfer of knowledge among knowledge pursuers and knowledge contributors. Moreover, these research studies show the ways for a wide range of applicability in learning processes of numerous materials based on diverse aspects. In this study, we conducted a series of tests to collect data from participants who took part in this research investigation. We analyzed the collected data to verify our proposition that the learning materials based on associative relevance had cognitively improved the process of learning for human adaptive minds. The experimental proofs and analyzed data confirmed the proposition that cognitively, there occurred significant enhancement of learning process in terms of knowledge acquisition for eLearning materials based on associative relevance.

Keywords: *Cognition, Associative relevance, eLearning, Perception*

1. Introduction and background

Studies on eLearning and instructional techniques are getting exponential growth with innovative probes and outcomes day-by-day. One of the core studies about eLearning gets concentration on cognitive impact of eLearning. These works, which are significant for further advancement of undeveloped and partially developed techniques and methodologies that are generally in practices until now. Multidimensional applicability of these knowledge specifics in scientific, social, technological, and business domains appeal considerable encouragements among Researchers, Scholars, Educators, Teachers, Professionals, and Social Practitioners in recent years [1-13].

Subsequently, crucial endeavors are put in practice to study the cognitive impact of Learning and henceforth, influential underlying factors of human cognition on eLearning process. Undoubtedly, by improving the influential underlying factors in eLearning materials, we may strengthen the process of learning as well [1-13].

Human cognition is a system consisting of numerous neurological, perceptual, and cognitive phenomena happening unceasingly. In the midst of these happenings, there exists an essential and mandatory process, i.e. the process of viewing the objects and assigning relative identities. The human viewing process initiates a series of cognitive functions, including visual attention, perception, analogical thoughts, cognitive reasoning, and metacognition. These are bound to exist until the end of viewing of objects [3-14].

During the viewing of eLearning materials, a human regards the materials and underlying cognitive processes make efforts for efficient retrieval of knowledge or information that are displayed. Further, human mind is working for memory management and permanent storage of the human brain [1-13].

By adapting an instructional technique of learning in accordance with human cognitive phenomena that exist during the learning process, we can improve the learning process. At the same time, the mind can perceive and withstand gigantic amount of knowledge and retain it in memory for longer duration. The eLearning based on associative relevance is proposed instructional technique that can assist and enhance learning process.

Associative relevance is evolutionary and cohesive notion that emanated from thoughts of analogy. We can sense associative relevance along and after the happening of the analogy phenomena. Like analogy, associative relevance is significant in cognitive processes and is key mechanism in concluding creativity that is also a part of the subject, like eLearning. Further, associative relevance is related similarity in which the same relations or likeness hold between different domains or systems. The focus of our research is over the associated thoughts and processes, placed in eLearning materials. In the eLearning materials, the correlated and coexisted objects have considerable relevance by which people understand one state or pattern in terms of another [14-19].

We employ learning techniques based on associative relevance for e-Learning materials. In this approach, we aim to transfer the associative contexts or intents of e-Learning material to the learners. The associative chaining connects the contexts or intents as per existing relation among the contexts, concepts, or even, scenarios. By doing so, we intend to initiate human's cognitive processes, including consciousness, perception, analogical thoughts, reasoning, metacognition, and the most importantly, the notion of associative relevance. Therefore, the learner's mind could in turn, associate and organize the memory as per the contexts of e-Learning materials unambiguously and naturally.

The term cognitive impact stands for the existence of the influential factor based on cognitively generated associative relevance notion and impact of this influential factor on eLearning materials during the transfer of learning processes through efficient instructional technique. In this study, we carry out qualitative as well as quantitative analysis for the measurement of cognitive impact based on associative relevance on eLearning materials. The key purpose of this cognitive impact of eLearning study is to prove the instructional technique based on associative relevance is improved, imperative, and decisive for learning process than general instructional technique. In fact, this aim is our proposition as well.

2. Present study

We investigate the eLearning materials from cognitive perspective, including the underlying mechanism of associative relevance, during viewing of eLearning materials. For the purpose, we follow along and finish steps of planning experimental set up, statistical data analysis, and data visualization for interpretation, which are the key steps during the entire study.

Initially, participating students view general eLearning materials that we show in the classrooms as general learning technique. Further, we collect the data related to this eLearning material based on general instructional technique from questionnaires of participants as feedbacks.

Thereafter, we demonstrate to the participants the eLearning materials based on cognitively engendered associative relevance. Additionally, we collect the data related to this eLearning material based on associative relevance as well in terms of questionnaires as feedbacks. Finally, we analyze all collected data for interpretation statistically. Finally, we carry out the interpretation with the help of statistically existing parameters for the study.

Moreover, as we perform a number of steps in this study, figure 1 illustrates this study of cognitive impact of eLearning. In this graphic representation, we clearly display the steps in the adjacent flow chart diagram (in figure 1). This is a comparative study of two datasets (the dataset from general instructional learning technique and the dataset from associative relevance learning technique).

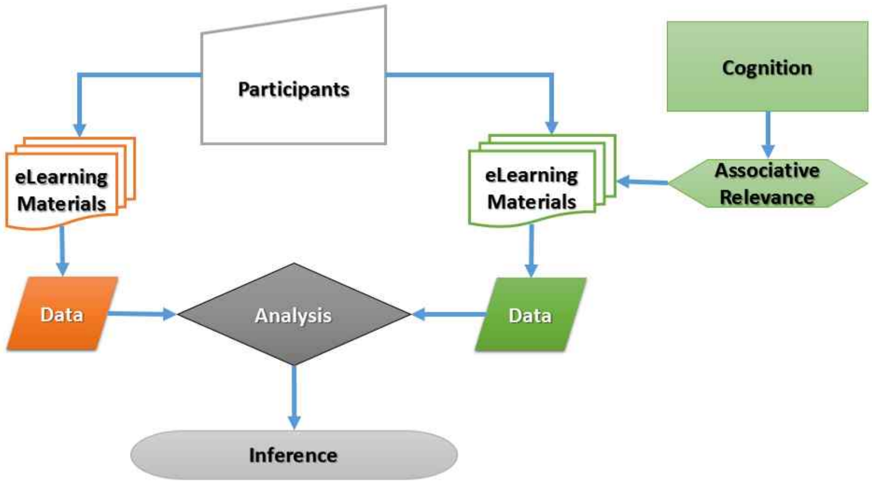

Figure 1. Flow chart of research study.

3. Method

We selected 140 participants from a number of classes randomly, aging from 21 years to 30 years. We assigned these participants to view two sets of ordinary slides as shown below in figure 2.

In simplistic manner, the first set of slides (in first row) consists of four slides related to the topic of 'Algorithm' and the second set of slides (in second row) consists of three slides related to the topic of 'Computer Languages'. We demonstrate these general slides, related to computer science course, during active viewing of the participants.

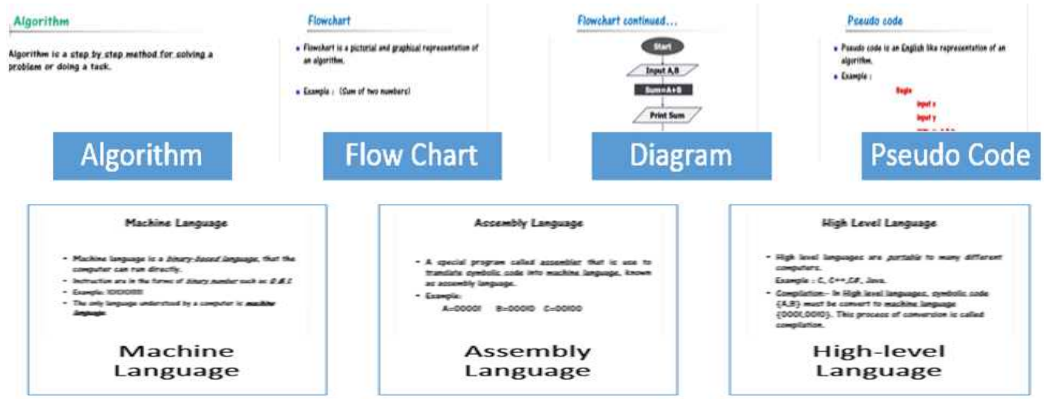

Figure 2. Selected Learning Slides for research study

4. Analysis

At first, we studied the two sets of slides as 'Analysis 1' and 'Analysis 2' for our experimentations. Thereafter, we carried out detailed data analyses for interpretations of the results.

4.1. Analysis 1: Study of first set of slides for 'Algorithm'

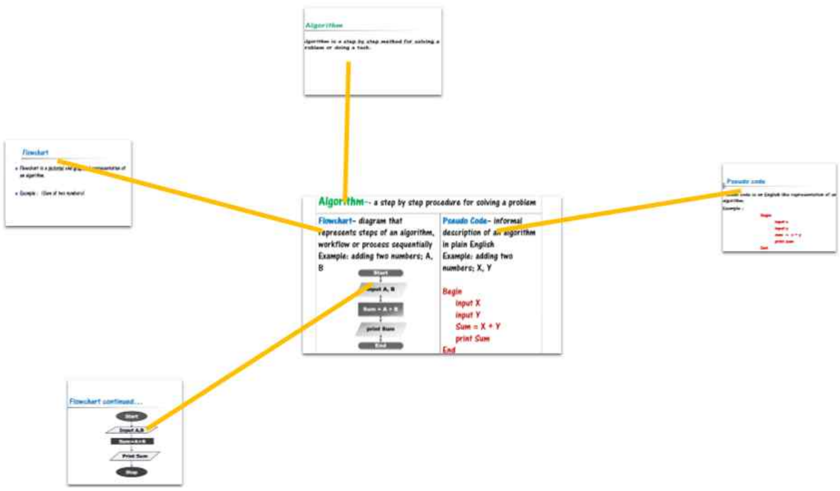

Figure 3. A set of slides and their associative relevance in reformed slide

In this analysis for the set of slides related to 'Algorithm' (figure 3), at first, we followed the general learning mode of instructional technique. In this general technique, keeping single topic for single slide had considered the easiest and the most efficient way of learning. Therefore, the participants regarded the individual four slides and concluded their feedback after experimental set up.

Afterward, we displayed to the participants the modified slide (the central slide in figure) based on associative relevance consideration, i.e., keeping the associated topics in unified form, just in single slide rather than separating for individual slides. We collected the data as feedback of participants' responses in the survey.

4.2. Analysis 2: Study of second set of slides for 'Computer Language'

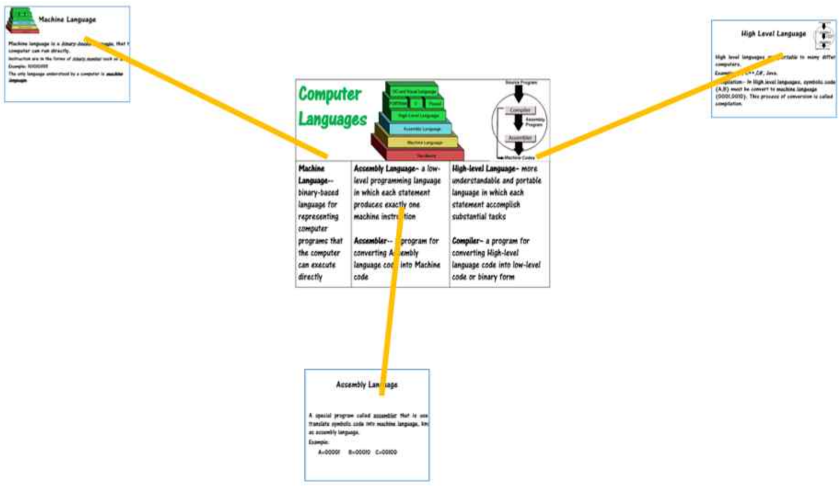

Figure 4. A set of slides and their associative relevance in reformed slide

In this analysis of slides for 'Computer Language' (in figure 4), at first, we conducted experimentation and recorded the observation as data from participants who looked for the individual three slides. The basis of these slides was on the general learning technique that stated that for the easiest and optimized mode of learning, there should be separate slide for separate topic.

Afterward, we set up experimentation for the modified slide (the central slide in the figure) based on associative relevance consideration. The participants viewed the slide and gave us feedbacks that we gathered as data for further analysis.

5. Statistical data analysis

Based on gathered data from the participants as feedbacks, we analyze the data statistically. The plotted graph for the all the observations is in figure 5 that is basically number of participants versus participant's learning ability in fractional proportion.

Here, we measure the knowledge acquisition by the human adaptive mind of participant in terms of the metric of learning ability of participant in fractional proportion of cent percent. This statistical representation is a measure of human ability to acquire knowledge as the process of learning sets with the intention for transfer of knowledge.

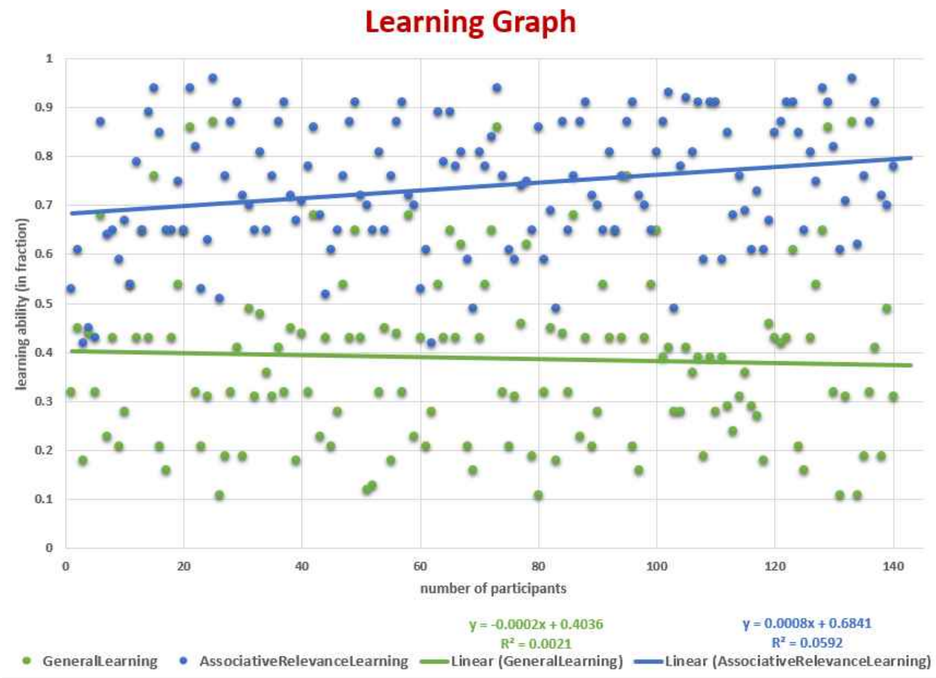

Figure 5. Graph for learning capabilities of participants and regression lines

As we observe from the plotted graph, there are two sets of points for two types of learning processes (blue colored points for the learning based on associative relevance, and green colored points for the learning based on general instructional technique).

At first, the plotted graph shows that most of the blue points that represent participants belonging to associative relevance learning technique exist at the upper portions of the graph. This indicates that there is growth of learning ability for the participants who choose the learning instruction based on associative relevance technique.

Secondly, we plotted the linear regression lines for both learning techniques. The gradients (slope) of the regression line are different for both learning techniques. On the one hand, the gradient of regression line for the learning based on associative relevance is positive and high, on the other hand, the gradient of regression line for the learning based on general instructional technique is negative and lower than gradient for the line of associative relevance learning technique. This indicates that the learning based on associative relevance technique has increased positively and more optimized than its counterpart is.

Further, detailed statistical analysis reveals the following parameters (Table 1) for both types of learning techniques. These parameters are essentials representation for any statistical analysis [20-23].

Table 1. Details of statistical analysis for learning techniques

General Learning Technique		Associative Relevance Learning Technique	
Mean	0.389214286	Mean	0.739857143
Standard Error	0.015220229	Standard Error	0.011145117
Median	0.39	Median	0.75
Mode	0.43	Mode	0.65
Standard Deviation	0.180088179	Standard Deviation	0.131870799
Sample Variance	0.032431752	Sample Variance	0.017389908
Kurtosis	0.146289004	Kurtosis	-0.618122699
Skewness	0.729080607	Skewness	-0.316259649
Range	0.76	Range	0.54
Minimum	0.11	Minimum	0.42
Maximum	0.87	Maximum	0.96
Sum	54.49	Sum	103.58
Count	140	Count	140
Confidence Level(95.0%)	0.030093098	Confidence Level(95.0%)	0.022035876

As we observe from the statistically analyzed information, within marginal standard errors (nearly 1 to 1.5%) for both cases, there exists considerable mean difference between these two. Further, the sample variance of general learning technique is almost double of the sample variance of associative relevance learning technique. This fact indicates that there is higher level of dispersion in the sample of general learning technique, in turn, the higher scattering in the sample points of general learning technique based dataset. Hence, we conclude that the learning technique based on associative relevance is quantitatively better than the general learning technique.

Further, we observe that statistical parameters like, the kurtosis and skewness of both learning techniques has substantial difference. The data distributions based on kurtosis indicate that the two learning techniques are very different in their shapes. While general learning technique-based sample has relatively peaked distribution, the associative relevance learning technique based sample has relatively flat distribution. The measures of the asymmetry of the probability distribution in terms of skewness are also different as being positive and negative values [20-23].

These findings lead towards an interpretation that the cognitive impact of eLearning based on associative relevance is more powerful than the general learning technique. In addition to these, we compute the statistical correlation and covariance (Table 2) for both learning techniques.

Table 2. Statistical covariance and correlation of both learning techniques

Statistical Covariance		
	GeneralLearning	*AssociativeRelevanceLearning*
GeneralLearning	0.032200097	
AssociativeRelevanceLearning	0.010489173	0.017265694

Statistical Correlation		
	GeneralLearning	*AssociativeRelevanceLearning*
GeneralLearning	1	
AssociativeRelevanceLearning	0.444857237	1

As we see from the above-mentioned statistical data, the statistical covariance between the general learning and the associative relevance learning is minimal (1.04%) which is quite low. It means the learning based on generalized instruction, and the learning based on associative relevance, have inconsistency, and there exist a wide range of dispersion between the two learning techniques. Hence, these two learning techniques are independent understandably.

The statistical correlation between the learning of generalized technique and the learning based on associative relevance is not within highly acceptable range (85 - 100%). As we observe that, the statistical correlation for two learning techniques is only 44.4%. This fact specifies that there is no relativity between these two learning techniques. Hence, the two learning techniques are not relevant effectively, and in turn, they are drastically different.

6. Conclusion

We conclude that the cognitive impact of eLearning based on associative relevance is more obvious, beneficial, and efficient in comparison to the learning technique based on general instructions. The qualitative analysis reveals that our proposition is perfect, absolute, and factual.

Our statistical evidences provide a vibrant and ideal support to this proposition about cognitive impact of eLearning based on associative relevance. Besides, these quantitative analyses lead to the deduction that our proposition is accurate, and precise.

7. Future research plan

We plan to proceed with the direction of associative relevance notion to further our research works. A fair number of experimental setup has already put in place to extend the proposal as well. Moreover, we devise to testify the idea of associative relevance in a number of reference frames and contexts under numerous scenarios.

Further, exaggeration in the area of eLearning has intention of its applicability. We design to extend our findings towards associative relevance applicability in the eLearning domain and aim for more exploration in this research direction with better technological advancements.

8. Acknowledgement

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