The Chunking Theory

Why is Teaching Too Much Information at Once Ineffective?

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Abstract

Why is teaching too much information all at once is overwhelming for the brain and is ineffective for learning new material compared to the chunking theory? The brain has limited working memory, and therefore, processes information best in small amounts. When students are introduced to new information all at once, they will more than likely be overwhelmed. The most effective teachers present new information in small amounts and scaffolds as needed. According to Rochenshine (2012) “Only after the students have mastered the first step do teachers proceed to the next step.” (p.12) This implies that it is best to present information in small amounts because it builds stamina, perseverance and motivation to learn and practice. Therefore, the most effective teachers maximize classroom time by making sure students have mastered steps of a learning process before moving on.

Introduction

The purpose of the research is to show why teaching too much information all at once is ineffective. The working memory is limited which means it needs time to consolidate the information before it can be used effectively. The problem with the information overload teaching strategy is that since our working memory is limited, the brain can process only a certain amount of information at a time without becoming overwhelmed. To answer the research question, a paired ttest was implemented between a group of 5th grade students from Bronx district 8, New York City.

Presenting small amounts of new material and scaffolding as scholars practice the new material is extremely effective. Our working memory is limited, therefore trying to grasp new information all at once is overwhelming and can discourage scholars from learning new material. The most effective teachers present new information in chunks until it is mastered before moving on to the next step. The chunking method builds off prior knowledge, which helps the brain to process new information.

According to Thalmann (2019) “The process of chunking was first described by Miller (1956) as the recoding of several presented stimuli into a single familiar unit or chunk. Miller proposed that chunking is achieved by grouping or organizing a sequence of inputs and recoding it with a concise name.” (p.37) Xu (2016) states “A chunk is a unit of memory organization, formed by bringing together a set of already formed chunks in memory and welding them together into a larger unit. Chunking implies the ability to build up such structures recursively, this leading to a hierarchical organization of memory.” (p.1) Che Lah, Rohaida Mohd Saat and Hassan state(2014) states

“Chunking is a significant learning strategy aimed at overcoming Short Term Memory (STM) li mitations. Miller (1956) characterized chunking as a process of combining different items into a meaningful larger unit that facilitates item storage in STM.” (p.9)

According to Barak Rochenshine (2012) “Only after the students have mastered the first step do teachers proceed to the next step.” (p.12) Solopchuk, Oleg, Alamia, Andrea; Olivier, Etienne and Zénon, Alexandre also states (2016) “An important contribution of the present study is the finding that chunking improves performance in symbolic sequence processing by reducing cognitive workload and decreasing RTs over time.” (p. 110) `Yamashita, Junko;

Ichikawa, Shingo (2010) state ‘When investigating the relationship between chunking and reading, researchers have often manipulated the layout of a written text and observed the effects of such manipulation. The finding of the phenomenon that preorganization of texts into meaningful word groups can improve the reading behavior dates back several decades (Carver, 1970).” (p. 265) In correspondence to the chunking strategy being effective, Amotz Perlman, Emmanuel M. Pothos, and Darren J. Edwards (2010) states “The chunking hypothesis refers to the intuition that the knowledge acquired through experience often corresponds to chunks. The chunking hypothesis is an extremely influential set of related intuitions, which have been employed in a variety of empirical contexts.” (p.649) This proves that chunking information is more effective than presenting new information all at once because chunking helps the human mind to make connections with prior/ familiar knowledge.

According to Anggraeni (2015): “It means that, there was an improvement of students who was taught by using chunking strategy. It means that chunking strategy can help students to overcome their problem in comprehending the text while the students who were taught without using chunking strategy still lack in comprehending the reading text.” (p.306) In proving that the chunking theory is effective D. J. K. MEWHORT2 (1972) states “Thus, once the materials have undergone organization within short term memory, the relative load on memory for the two types of material ought to reverse.” (p.69) According to Perlman, Pothos, and Edwards 2010 “A key characteristic of SRNs is that their learning involves progressive sensitivity to an increasing number of elements of the preceding sequence. In other words, early in learning, an SRN may learn that after one particular element, another element is likely to follow.” (p. 649)

Methods

The population of this study included 5th grade students from district 8 in the South Bronx are of New York during the 2019-2020 school year which has 172 students currently enrolled. According to public school review.com (2020) New York City Geographic District # 8 School District, which is ranked within the bottom 50% of all 778 school districts in New York (based off of combined Math and Reading proficiency testing data) for the 2017 school year (web page) The students ages range from ten to twelve years old, roughly 5% percent of the students are Hispanic and 45% are African American and 5% are Asian. Roughly half of the parent population receives working income, the rest receive government assistance and about 4% of the student population lives under the poverty line.

Instrumentation

An assignment was used consisting of 2 short answer responses that was developed for the purpose of data collection. They were given 2 different short answer responses that they have in the beginning of the lesson to see if the chunking theory was sufficient enough to explain why teaching too much information all at once is ineffective.

- The classroom consisted of 16 participants
- The assessment consisted of 2 questions (pre and post) for both units
- The post-test scores ranged from 22 (Unit 1) to 30 (Unit 2)
- The groups were the same (had no differences)

Procedures

The study was done in one 5th grade classroom with 16 participants and the experiment was done on the same group, meaning there were no differences. Unit 1 was taught using the information overload theory and unit 2 was taught using the chunking theory. Unit 1 will begin by instructing the students to answer the short answer responses using text evidence and full

explanations in a RACECE paragraph (Restate & answer, citation, explanation, citation explanation). They were introduced to this writing format/structure all at once instead of being taught each element step-by-step. At the end of the lesson, all of the assignments were collected for data. After that, unit 2 was also used to focus on the structure of RACECE-one element was taught per lesson (students mastered each step before moving on to the next). All data was collected and analyzed. Since the same students were in each group, there were no differences in the groups.

Data Analyses

All data analysis was conducted sing the Statistical Package for the Social Sciences (SPSS, v. 13). Initial data analysis conducted of a paired *t*test that compared pre and post-tests means of normal instruction and the treatment group (chunking theory) to summarize the overall results. All data analysis was conducted sing the Statistical Package for the Social Sciences (SPSS, v. 13). Initial data analysis conducted of a paired ttest that compared pre and post-tests means of the information overload teaching strategy and the treatment group to summarize the overall results.

Results

Unit one was taught with the information overload teaching strategy, students were told to complete two short answer responses in a full RACECE paragraph without being taught the RACECE in steps. This resulted in a lower mean score compared to when students were taught how to write RACECE paragraphs using the chunking theory. The chunking theory was used to teach unit 2, it allowed students follow the step by step RACECE format which resulted in a higher probability score. Overall, the difference is statistically significant at the .05 level.

Central Tendency

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Unit 1	25.3125	16	1.92246	.48061
	Unit 2	26.5000	16	1.89737	.47434

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Post test - Posttest	-1.18750	1.27639	.31910	-1.86764	-.50736	-3.721	15	.002

The standard deviations increased from unit 1 to unit 2. The difference between the two means is statistically significant (t=3.72, p<.002,)

Test of Hypothesis

The paired *t*test compared the mean from group 1 difference of pre and post test scores to the mean from group 2 pre and post test scores. The paired *t*test resulted in a .002 probability level. Since .002 is less than .05, the difference is statistically significant at the .05 level. Therefore, the null hypothesis is rejected and the research hypothesis is accepted. The data shows that the mean posttest score for unit 2 was higher than unit 1 due to using the chunking theory teaching strategy.

Summary

The results of the study show that the chunking theory teaching strategy is more effective than the normal teaching or the overload teaching strategy because participants learned in chunks rather than all at once.

Discussion

The results of this study support the chunking theory because it proves that teaching too much information at once is ineffective. The ttest compared the same group of students' post-test results, unit one was taught with the information overload teaching strategy and unit two was taught using the chunking theory. According to Thalmann (2019) "The process of chunking was first described by Miller (1956) as the recoding of several presented stimuli into a single familiar unit or chunk. Miller proposed that chunking is achieved by grouping or organizing a sequence of inputs and recoding it with a concise name." Therefore, since our working memory is limited, it is important for educators to understand the importance of giving students enough time to process new information.

Implications for Future Research

It can be determined that the chunking theory is proven to provide higher test scores by teaching students chunks of information rather than all at once. This is beneficial and can have a positive impact on classroom management because it is purposeful and maximizes the limited amount of time teachers have with scholars on a daily basis. This also impacts assessments by helping scholars to organize their thought process, which leaves room to learn and absorb new information.

As a recommendation for future research, teachers should try the chunking theory in multiple content subjects to prove that the chunking theory is effective especially for middle school grades 5-8 The chunking theory allows students to gain mastery of a topic before moving on the next part of instruction which makes all the difference in the classroom. It would be interesting to compare scores from multiple teachers from the same district from New York City teaching subjects like math, science, literacy and even economics. In conclusion, the chunking theory maximizes learning time and allows students to process new information at their own

pace by mastering a step/topic before moving on to the next one. To take it a step further, a large scale implication that can be used and check for success are histograms. This data should be collected and compared at the end of each school year.

References

Anggraeni, R. (2015). THE EFFECTIVENESS OF USING CHUNKING STRATEGY TO IMPROVE STUDENTS' READING COMPREHENSION AT THE SECOND YEAR OF

SMP NEGERI 2 BAROMBONG . *English Education Department of UIN*, 306 . doi: https://pdfs.semanticscholar.org/4081/ce5ab4424c4b6738bfb4d35f97b5d92c26a5.pdf

Cognitive Strategy In Learning Chemistry: How Chunking And Learning Get Together . (n.d.). *The Malaysian Online Journal of Educational Science* , *2*(1), 9 . Retrieved from https://files.eric.ed.gov/fulltext/EJ1086202.pdf

MEWHORT, J. K. (1972). Memory as a Hologram: An Analysis of Learning and Recall, 69.

(2010). *Reading in a Foreign Language* , *22*(2), 265 . Retrieved from http://nflrc.hawaii.edu/rfl/October2010/articles/yamashita.pdf

PublicSchoolReview.com, 2020, www.publicschoolreview.com/new-york.

Rochenshine, B. (2012). Principles Of Instruction . *Research-Based Strategies That All Teachers Should Know , 2012, p. 212.*, , 12.

Solopchuk, O., Alamia, A., Olivier, E., & Zénon, A. (2016). Chunking improves symbolic sequence processing and relies on working memory gating mechanisms. *Learning & Memory*, *23*(3), 110. doi: 10.1101/lm.041277.115

Task-Relevant Chunking in Sequence Learning. (2010). *Journal of Experimental Psychology*, *36* (3), 649 . Retrieved from https://eds-a-ebscohost-com.ezproxy.nyack.edu/eds/pdfviewer/pdfviewer?vid=1&sid=3fd92666-1e4c-4d8b-8f2d-e249a01df316@sessionmgr4006

Thalmann, M., Souza, A. S., & Oberauer, K. (2019). How does chunking help working memory? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *45*(1), 37. doi: 10.1037/xlm0000578

Xu, F. (2016). Short-term Working Memory and Chunking in SLA. *Theory and Practice in Language Studies*, *6*(1), 1. doi: 10.17507/tpls.0601.16